INFANT FEEDING WITHIN THE CONTEXT OF HIV

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DECLARATION OF INDEPENDENT WORK

DECLARATION WITH REGARD TO INDEPENDENT WORK

I, Liska Janse van Rensburg, identity number 8705160027088 and student number 2005083734, do hereby declare that this research project submitted to the University of the Free State for the degree MAGISTER SCIENTIAE: Infant Feeding Within the Context of HIV, is my own independent work, and has not been submitted before to any institution by myself or any other person in fulfilment of the requirements for the attainment of any qualification. I further cede copyright of this research in favour of the University of the Free State.

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SUMMARY

The potential problems that HIV (human immunodeficiency virus) and AIDS (acquired immune deficiency syndrome) cause are multifaceted and can have devastating effects on a community. These problems are closely related to issues such as unemployment, poverty and co-morbidities. Another dilemma that is created by HIV involves the feeding of infants born to HIV-infected women, and it is especially the poor who experience the burden of this predicament.

In an ideal setting where resources are reliably available, it is recommended that HIV-infected mothers do not breastfeed as the risk of postnatal HIV transmission remains. The use of anti-retroviral medications can however, significantly decrease this risk. In resource-poor areas, such as in many South African communities, mothers are generally recommended to breastfeed. In these circumstances the safe and sustainable procurement and preparation of replacement feeds cannot be assured. It has been shown that the incorrect preparation of formula milk or the use of unsuitable breastmilk substitutes can notably increase infant mortality and morbidity, while breastfeeding has a major protective effect. Each HIV-infected pregnant woman must therefore weigh these options and attempt to make the best decision for her unique situation. Good quality counseling from health care workers is imperative to aid her in this process.

The purpose of this cross-sectional descriptive study was to investigate the knowledge, attitudes and practices of health care workers (n = 64) in the maternity wards of Pelonomi Regional Hospital in the Free State regarding infant feeding in the context of HIV. This was also determined in HIV-infected mothers (n = 100) who had recently given birth at the same health care institution.

The knowledge, attitudes and practices of health care workers were determined by means of self-administered questionnaires. The researcher completed the following questionnaires with the HIV-infected mothers during private structured interviews: socio-demography; household food security; anthropometry (infant / infants), reported health

and medical histories (including infant / infants); knowledge, attitudes and practices regarding HIV and infant feeding; and, questions based on the 2010 WHO (World Health Organisation) Guidelines on HIV and Infant Feeding. Information that was obtained from patient files included in-hospital medication, CD4 cell counts and haemoglobin levels of mothers, as well as birth weight and birth length of infants.

The over-all level of knowledge of the health care workers related to infant feeding in the context of HIV was not adequate, when it is considered that they interact with and counsel HIV-infected women on a daily basis and should be very well-informed regarding all of the related issues. Few of them could comprehensively explain what 'exclusive breastfeeding' entails (6.7%). Many felt that they lacked practical knowledge related to breastfeeding, as 25.6% felt that they only had low to moderate confidence in showing a mother how to breastfeed, and 35.9% felt that they only had low to moderate confidence in showing a mother how to express breastmilk. However, most of the health care workers (89.1%) had a positive attitude towards South Africa promoting breastfeeding for infants of HIV-infected mothers if they cannot safely and sustainably procure formula milk.

Most of the mothers participating in this study were black, unmarried, unemployed and Sotho-speaking. Although most mothers lived in brick houses (84.0%) with access to electricity (83.0%) and tap water (96.0%), a large percentage of mothers indicated that food and money shortages do occur in their households (64.0%). However, very few mothers reported that they had a vegetable garden (23.0%) or owned livestock (4.0%).

Some of the mothers experienced symptoms such as chest pain (16.0%), diarrhoea (18.0%), loss of appetite (36.0%) and involuntary weight loss (11.0%). Hypertension was common in both mothers (26.0%) and their family members (42.0%). A large percentage of mothers had a relatively low (< 350 cells/mm^3) CD4 count (46.3%), and a low (< 11.0 g/dL) haemoglobin level (37.3%), indicators of HIV disease progression and anaemia respectively. Approximately 25.0% of infants were classified as premature according to the WHO definition, and most mothers planned to breastfeed their infant/s (70.9%). The median z-scores for the length-for-age parameter in the full-term group (n = 75) was in the normal category, while the weight-for-age and weight-for-length parameters in the full-term

group were slightly below the WHO median reference values. Twenty-six breastfeeding problems were reported in total, with low milk production (38.5%) and sore breasts and nipples (46.2%) the main breastfeeding problems that were experienced.

Most mothers correctly planned to wean their infants at six months, with the median value for the introduction of both solids and liquids being six months. The majority lacked adequate knowledge regarding general correct formula feeding practices, and when mothers decided on formula feeding it was mainly done in an attempt to prevent postnatal HIV transmission (76.7%).

A large percentage of the mothers were not aware of the fact that HIV can be transmitted to an infant via breastfeeding (43.0%) even when anti-retroviral medications are used. They knew that HIV-infected breastfeeding mothers should not practice mixed feeding (80.0%), but they lacked knowledge related to the new WHO guidelines. As AFASS (affordable, feasible, acceptable, sustainable, safe) criteria for formula feeding were not met by most mothers, a large percentage of mothers correctly opted to breastfeed their infants. Almost all of the mothers regarded animal milks such as cow's milk as the least preferable infant feeding option (83.0%). In general, counseling that mothers had received was not adequate, or information was not retained by the mothers, since certain concepts related to HIV and infant feeding could mostly not be described sufficiently. Only 16.7% of mothers who chose to formula feed could comprehensively explain the correct procedure. Mothers were mostly either ignorant or skeptical regarding expressed heat-treated breastmilk as an infant feeding option (78.0%).

Nursing personnel were significantly more accepting of heat-treated expressed breastmilk as an infant feeding method than the doctors and dieticians group combined (53.2% and 23.5% respectively), and they also felt a higher confidence in showing a mother how to breastfeed (78.7 % and 58.8% respectively).

The age of the mothers did not influence their knowledge related to HIV and infant feeding significantly. Mothers with higher educational levels were significantly more aware that HIV can be transmitted via breastfeeding and they were also more concerned about

transmitting HIV via breastfeeding than they were of the increased morbidity and mortality risks related to replacement feeding.

The provision of high quality counselling related to infant feeding and follow-up visits can improve the knowledge of HIV-infected mothers and lead to better infant feeding decisions being made. These actions will ultimately benefit both the mother and her infant.

OPSOMMING

Die potensiële probleme wat MIV (menslike immuniteitsgebrekvirus) en VIGS (verworwe immuniteitsgebrekvirus) veroorsaak, is veelvuldig en het verwoestende gevolge in 'n gemeenskap. Hierdie probleme hou nou verband met werkloosheid, armoede en verwante morbiditeite. Nog 'n dilemma van MIV is die voeding van die babas van MIV-geïnfekteerde moeders met veral die armes wat die las van hierdie verknorsing ondervind.

In 'n ideale omgewing waar hulpbronne betroubaar beskikbaar is, word aanbeveel dat MIV-geïnfekteerde moeders nie borsvoed nie as gevolg van die risiko vir MIV oordrag na geboorte. Die gebruik van antiretrovirale middels kan hierdie risiko merkwaardig verlaag. In hulpbron-arm gebiede, soos in baie Suid-Afrikaanse gemeenskappe, word daar algemeen vir moeders aanbeveel om te borsvoed. In hierdie gevalle kan dit nie verseker word dat die gebruik van plaasvervanger voedings, in die vorm van die formule melk, op 'n veilige en volhoubare manier voorberei sal kan word nie. Daar is bewys dat die verkeerde voorbereiding van formule melk of die gebruik van nie-geskikte borsmelk vervangers, infantiele mortaliteit en morbiditeit verhoog, terwyl borsvoeding 'n belangrike beskermende effek uitoefen. Elke MIV-geïnfekteerde swanger vrou moet dus hierdie opsies opweeg en probeer om die beste besluit vir haar unieke situasie te maak. Goeie kwaliteit berading deur die gesondheidsorgwerkers is noodsaaklik om haar in hierdie proses te help.

Die doel van hierdie dwarssnit-beskrywende studie was om ondersoek in te stel na die kennis, houdings en praktyke van gesondheidsorgwerkers (n = 64) in die kraamsale van die Pelonomi Streekshospitaal in die Vrystaat ten opsigte van babavoeding in die konteks van MIV. Dit is ook in MIV-geïnfekteerde moeders (n = 100) wat onlangs geboorte by dieselfde gesondheidsorginstansie geskenk het, bepaal.

Die kennis, houdings en praktyke van gesondheidsorgwerkers is met gebruik 'n van self-geadministreerde vraelys bepaal. Die navorser het die volgende vraelyste vir die MIV-geïnfekteerde moeders gedurende private gestruktureerde onderhoude voltooi: sosio-demografie; huishoudelike voedselsekuriteit; antropometrie (baba / babas);

gerapporteerde gesondheids-en mediese geskiedenis (insluitende baba / babas); kennis, houdings en praktyke ten opsigte van MIV en babavoeding; asook vrae wat op die 2010 WGO (Wêreld Gesondheid Organisasie) Riglyne vir MIV en Babavoeding gebaseer is. Inligting wat van pasiëntlêers verkry is, het die volgende ingesluit: medikasie tydens hospitalisasie; CD_4-seltellings en hemoglobienvlakke van die moeders; asook die geboortemassas en geboorte lengtes van die babas.

Die algehele vlak van kennis van die gesondheidsorgwerkers in verband met babavoeding in die konteks van MIV was nie voldoende nie, veral indien dit in ag geneem word dat hulle op 'n daaglikse basis met MIV-geïnfekteerde moeders kommunikeer asook raad verskaf, en moet dus uiters goed oor al die verwante kwessies ingelig wees. Die minderheid van die gesondheidsorgwerkers kon presies verduidelik wat 'eksklusiewe borsvoeding' behels (6.7%). 'n Groot proporsie het gevoel dat hulle 'n gebrek aan praktiese kennis met betrekking tot borsvoeding het, aangesien 25.6% gevoel het dat hul slegs 'n lae tot matige vlak van selfvertroue het om 'n ma te wys hoe om te borsvoed, en 35.9% het gevoel dat hul slegs 'n lae tot matige vlak van selfvertroue het om 'n ma te wys hoe om borsmelk uit te melk. Die meeste gesondheidsorgwerkers (89.1%) het 'n positiewe houding teenoor Suid-Afrika se bevordering van borsvoeding vir babas van MIV-geïnfekteerde moeders gehad, indien moeders nie op 'n veilige en volhoubare wyse formule melk aan hulle babas kan verskaf nie.

Die meeste moeders wat aan die studie deelgeneem het was swart, ongetroud, werkloos en Sotho-sprekend. Alhoewel die meeste moeders in baksteenhuise (84.0%) met toegang tot elektrisiteit (83.0%) en kraanwater (96.0%) bly, het 'n groot persentasie van die moeders aangedui dat voedsel-en geldtekorte tog in hul huishoudings voorkom (64.0%). Baie min moeders het egter gerapporteer dat hulle 'n groentetuin (23.0%) besit of vee aanhou (4.0%).

Sommige moeders het simptome soos borspyn (16.0%), diarree (18.0%), aptytverlies (36.0%) en onwillekeurige massaverlies (11.0%) ervaar. Hipertensie was algemeen in beide die moeders (26.0%) asook hul familie lede (42.0%). 'n Groot persentasie moeders het relatiewe lae (< 350 cells/mm^3) CD_4-tellings (46.3%) en lae (< 11.0 g/dL) hemoglobienvlakke

(37.3%) gehad, wat onderskeidelik MIV-siekte progressie en anemie aandui. Ongeveer 25.0% van die babas was as prematuur volgens die WGO se definisie geklassifiseer, en die meeste moeders het beplan om hul babas te borsvoed (70.9%). Ses-en-twintig borsvoedingsprobleme is in totaal gerapporteer, met lae melkproduksie (38.5%) en seer borste en tepels (46.2%) aangedui as die hoof borsvoedingprobleme wat ondervind was.

Die meeste moeders het korrek beplan om hul babas op ses maande te speen, met die mediaanwaarde van beide die bekendstelling van vaste voedsels en vloeistowwe, as ses maande. Die meerderheid het nie voldoende kennis ten opsigte van korrekte formule voeding gehad nie, en wanneer moeders wel op formule voeding besluit het, is dit hoofsaaklik gedoen in 'n poging om MIV-oordrag na geboorte te voorkom (76.7%).

'n Groot persentasie moeders was nie bewus van die feit dat MIV na 'n baba deur middel van borsvoeding oorgedra kan word nie, selfs wanneer antiretrovirale middels gebruik word (43.0%). Moeders het geweet dat MIV-geïnfekteerde borsvoedende moeders nie gemengde voeding ('mixed feeding') moet beoefen nie (80.0%), maar het gebrek aan kennis met betrekking tot die nuwe WGO-riglyne getoon. Aangesien die meeste moeders nie aan die AFASS ('affordable, feasible, acceptable, sustainable, safe') kriteria vir formule voeding voldoen het nie, het 'n groot persentasie van die moeders korrek gekies om hul babas te borsvoed. Byna al die moeders (83.0%) het diere melk, soos byvoorbeeld koeimelk, as die minste geskik vir babavoeding beskou. Oor die algemeen was die berading wat moeders ontvang het nie voldoende nie, of die inligting is nie deur moeders onthou nie, aangesien sekere konsepte wat met MIV en babavoeding verband hou, meestal nie voldoende beskryf kon word nie. Moeders wat verkies het om hulle babas met formule melk te voed kon oor die algemeen nie volledig verduidelik hoe om dit korrek te doen nie, aangesien slegs 16.7% wel dit kon doen. Hulle was ook óf oningelig óf skepties oor hitte-behandelde borsmelk as 'n babavoedingopsie (78.0%).

Verpleegpersoneel het aansienlik meer aanvaarding vir hitte-behandelde borsmelk as 'n babavoedingopsie as die groep dokter en dieetkundige groep getoon (53.2% en 23.5% onderskeidelik), en hul het ook gevoel dat hul meer selfvertroue het om 'n moeder te wys hoe om te borsvoed (78.7% en 58.8% onderskeidelik).

Die ouderdom van moeders het nie hul se kennis met betrekking tot MIV en babavoeding beduidend beïnvloed nie. Moeders met 'n hoër opleidingsvlak was aansienlik meer bewus van die feit dat MIV deur middel van borsvoeding oorgedra kan word, en hul was banger vir die oordrag van MIV via borsvoeding as die verhoogde morbiditeit en mortaliteit risiko's wat met formule voeding verband hou.

Die voorsiening van hoë gehalte berading ten opsigte van babavoeding asook opvolgbesoeke kan die kennis van MIV-geïnfekteerde moeders verbeter wat tot beter babavoedingbesluite kan lei. Hierdie aksies sal uiteindelik beide die moeder en haar baba bevoordeel.

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LIST OF ABBREVIATIONS

3TC	Lamivudine
AA	Arachidonic Acid
AAP	American Academy of Paediatrics
AFASS	Acceptable, Feasible, Affordable, Sustainable and Safe
AHA-FS	Assuring Health for All – Free State
AIDS	Acquired Immune Deficiency Syndrome
AND	Academy of Nutrition and Dietetics
ARVs	Anti-retroviral Drugs
ART	Anti-retroviral Therapy
AZT	Zidovudine
BFHI	Baby Friendly Hospital Initiative
BAN	Breastfeeding, Antiretrovirals and Nutrition (study)
CDC	Centres for Disease Control
CI	Confidence Interval
cm	Centimetre
DHA	Docosahexanoic Acid
DNA	Deoxyribonucleic acid
DoA	Department of Agriculture
DoH	Department of Health
EBF	Exclusive Breastfeeding
EBM	Expressed Breastmilk
EFF	Exclusive Formula Feeding
EFV	Efavirenz
EP	Equivalent Person
ESPGHAN	European Society for Paediatric Gastroenterology, Hepatology and Nutrition

FI	Fusion Inhibitors
FTC	Emtracitabine
g	Gram
g/DL	Grams per decilitre
GDG	Guideline Development Group
HAART	Highly Active Antiretroviral Therapy
HALS	HIV-Associated Lipodystrophy Syndrome
Hb	Haemoglobin
HDL	High Density Lipoprotein
HDR	Household Density Ratio
HELLP	Haemolysis Elevated Liver Enzyme Levels and a Low Platelet Count
HIV	Human Immunodeficiency Virus
kg	Kilogram
LDL	Low Density Lipoprotein
mm	Millimetre
MIV	Menslike Immuniteitsgebrekvirus
MTCT	Mother-to-Child Transmission
MUAC	Mid-upper arm circumference
n	Frequency
NCHS	National Center for Health Statistics
NGO	Non-government Organisations
NVP	Nevirapine
NRTI	Nucleoside Reverse Transcriptase Inhibitors
NNRTI	Non-Nucleoside Reverse Transcriptase Inhibitors
No.	Number
PCR	Polymerase Chain Reaction

PI	Protease Inhibitors
PMTCT	Prevention of Mother-to-Child Transmission
SA	South Africa
SADHS	South African Demographic and Health Survey
SASAS	South African Social Attitudes Survey
SD	Standard Deviation
StatsSA	Statistics South Africa
TB	Tuberculosis
TDF	Tenofovir
UFS	University of the Free State
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNFPA	United Nations Populations Fund
UNICEF	United Nations International Child Emergency Fund
VIGS	Verworwe Immuniteitsgebreksindroom
vs.	Versus
WABA	World Alliance for Breastfeeding Promotion
WGO	Wêreld Gesondheid Organisasie
WHO	World Health Organization
ZDV	Zidovudine
3TC	Lamivudine

LIST OF SYMBOLS

=	Equals to
≤	Smaller and equal to
>	Larger than
<	Smaller than
^{o}C	Degrees Celsius
&	And
mm^3	Millimetre cubed
%	Percentage
et al.	And others

LIST OF APPENDICES

CHAPTER 1

HIV-FREE CHILD SURVIVAL

1.1 INTRODUCTION

"Zero new HIV infections. Zero discrimination. Zero AIDS related deaths." These are the three main visions established by the Joint United Nations Programme on HIV/AIDS (UNAIDS) to halt the spread of HIV/AIDS and the negative effects thereof on the communities of the world. A specific goal for the year 2015 is to eliminate the vertical transmission of HIV (human immunodeficiency virus); a target which at first glance seems unattainable (UNAIDS, 2010a:7). However, during the period of 2001 to 2009, there was a significant reduction in mother-to-child transmission (MTCT) of HIV. The global vertical transmission rates decreased from 500 000 infants infected during the perinatal and breastfeeding period in 2001, to 370 000 in the year 2009 (UNAIDS, 2010b:9).

1.2 MOTHER-TO-CHILD TRANSMISSION OF HIV

More than half of the 33.3 million people in the world living with HIV are women and girls of reproductive age. High prevalence is especially noted in Sub-Saharan Africa, where women aged 15-24 years are up to eight times more likely than males to be infected with HIV. This highlights the importance of the primary prevention of HIV infection in women and the subsequent prevention of MTCT (Lallemant & Jourdain, 2010:1570; UNAIDS, 2010b:10).

Vertical transmission of HIV can occur in three ways: during pregnancy, labour or via breastfeeding (Lallemant & Jourdain, 2010:1570). In the absence of specific interventions, HIV-infected women will transmit the virus to their infants in 15.0-25.0% of cases during pregnancy and labour. An added 5.0-20.0% of infants are at risk of being infected during the breastfeeding period. According the World Health Organization (WHO), the use of anti-retroviral drugs (ARVs), elective caesareans and correct infant feeding practices can drastically reduce the number of HIV-infected infants and improve overall child health in a community (WHO, 2007:6). The use of ARVs has recently come under the spotlight. New

evidence reports that ARVs given to the HIV-infected mother or to the HIV-exposed infant during the breastfeeding period can notably decrease the risk of HIV transmission through breastfeeding (WHO, 2010:9). This data will undoubtedly lead to governments re-evaluating the nutrition aspect of their programme on preventing MTCT of HIV. It will also provide desperate mothers with a powerful tool to help ensure the health of their infants.

Most of the factors that affect the vertical transmission of HIV are related to the general health of the mother. An advanced clinical HIV stage of the mother, a high viral load, a low CD_4 (number of T-helper lymphocytes per cubic millimetre of blood) cell count, prolonged exposure of the infant to maternal fluids intrapartum, and a high viral heterogeneity in the mother are factors which correlate with HIV transmission. Infections of a viral, fungal or bacterial origin during pregnancy can cause placental disruption which can increase transmission risk. Vaginal deliveries and breastfeeding also increase the risk of transmission; however, these risk factors are not always avoidable, especially in resource-poor settings (Metha, 2008:34-35). Caesarean sections decrease contact time between the mother's blood and fluids and the new-born infant. Elective caesarean sections have been proved efficacious by a Cochrane review to reduce intrapartum HIV transmission. Table 1.1 lists factors which increase the risk of MTCT of HIV (Ramaiah,2008:111).

Table 1.1 Factors that increase the risk of MTCT (Ramaiah, 2008:111).

Strong evidence	Limited evidence
Factors related to the mother: High viral load Type of virus Advance stage of HIV infection Immune deficiency HIV infection acquired during pregnancy or breastfeeding period	*Factors related to mother*: Vitamin A deficiency Anaemia Sexually transmitted disease Chorioamnionitis Smoking Injected drug use Unprotected sex
Factors related to type of delivery: Vaginal delivery Prolonged rupture of membranes	*Factors related to type of delivery:* Invasive procedures such as forceps Episiotomy
Factors related to infant: Premature birth Breastfeeding	*Factors related to infant:* Lesions of skin and/or mucous membranes (oral thrush)

Sub-Saharan Africa as well as East, South and South-East Asia account for 91.0% of the 1.4 million pregnant women who require ARVs in an attempt to prevent MTCT. Ninety-one percent of children under the age of fifteen years needing ARVs are also from these countries. In 2009, 210 000 pregnant women in South Africa were in need of ARVs to prevent HIV transmission to their infants (WHO, 2010a: 85-86).

1.3 INFANT FEEDING AND HIV FREE SURVIVAL

The HIV-infected mother, who has to choose an infant feeding mode, finds herself in a predicament. Exclusive breastfeeding (EBF) will provide for all of the infant's nutritional needs for the first six months of life and carries a low risk of HIV infection; however, few mothers successfully practice EBF, and non-exclusive breastfeeding significantly increases the risk of transmission. Avoiding breastfeeding will eliminate the risk of postnatal HIV infection, but carries different, yet dangerous risks. Replacement feeds, such as formula milks, can safely and effectively be used in ideal circumstances (Rollins et al., 2008:2350). Conversely, in resource poor settings where HIV and other infections are prevalent, the incorrect and unhygienic use of replacement feeds can greatly increase the risk of infections, malnutrition and death (Mbori-Ngacha et al., 2001:2413-2414).

1.3.1 BREASTFEEDING

In areas where HIV is prevalent and alternative feeding options are limited, breastfeeding remains common (Slater et al., 2010:1). The first documented case of MTCT of HIV via breastfeeding occurred in 1983 in Australia, and the WHO estimates that almost half of the 500 000 new HIV infections in children each year is the result of the virus passing via the mother's breastmilk to the infant (Walls et al., 2010:349). A longer duration of breastfeeding is associated with an increased cumulative risk of MTCT, and the pattern of breastfeeding will also influence the risk of transmission (Becquet et al., 2009:1). The risk of MTCT ranges between 20.0% - 45.0% without intervention. The risk of postnatal transmission through breastfeeding can be decreased to 5.0% or less when specific intervention strategies are implemented (WHO, 2010b:6).

1.3.1.1 EXCLUSIVE BREASTFEEDING

Breastfeeding has the potential to save countless lives in developing countries. According to Doherty et al. (2011:3), approximately 1.3 million deaths per year could be prevented (13.0% of deaths of children aged five years and less) if the rate of universal EBF is increased to 90.0% among infants birth to six months old (Doherty et al., 2011:3).

It has been reported that exclusively giving breastmilk to an infant has a lower risk of postnatal HIV transmission than giving breastmilk together with other milks, fluids and solid foods (Becquet et al., 2009:1; Fowler, 2008:359). Early research done by Coutsoudis et al. (2001:379) in KwaZulu-Natal, South Africa, suggested that infants who were exclusively breastfed for three months or more, did not have a higher risk of HIV infection at six months than those who were never breastfed (Coutsoudis et al., 2001:379). Landmark studies, such as those done by Coutsoudis et al., have changed the way infant feeding in the context of HIV is viewed. The Vertical Transmission Study in South Africa and the Zambia Exclusive Breastfeeding Study are some of the studies that have been undertaken to assess MTCT. These studies have shown that EBF during the first six months of life significantly reduces the postnatal transmission risk (Kuhn, 2010:1). In a recent South-African study by Coovadia et al. (2007:1107), it was found that infants who received both breastmilk and formula milk were twice as likely to contract HIV as infants who were fed breastmilk alone. An infant who was breastfed and received solid foods any time after birth was eleven times more likely to be infected than if breastfeeding was done exclusively. Standard PMTCT (prevention of mother-to-child transmission) ARV protocols were followed (Coovadia et al., 2007:1107).

Breastfeeding grants numerous advantages to the infant, the mother and to the community at large. One of the most important benefits is the protective role of breastmilk against acute health problems of the infant. In the general population of a resource-poor area, an exclusively breastfed infant is fourteen times less likely to die from diarrhoea and approximately three times less likely to die from respiratory diseases and other infections, than a non-breastfed infant (Choudhary, 2006:418). It is a well-known fact that infections, especially those that cause diarrhoea, can lead to severe malnutrition and

impaired growth and weight gain in children (Merson et al., 2005:222). HIV itself can negatively affect the nutritional status of mothers and concerns have been raised about the possible negative effects of breastfeeding on these mothers, as a study in Kenya reported an increased risk of maternal mortality when breastfeeding (Nduati et al., 2001:1651). Numerous subsequent studies have however clearly indicated that breastfeeding does not pose any health risk to the HIV-infected mother (Enwonwu, 2006:9;Taha et al., 2006:546).

1.3.1.2 MIXED FEEDING

Mixed feeding (feeding breastmilk together with any other liquids or foods) results in the highest risk of morbidity and mortality when compared with either EBF or exclusive formula feeding (EFF). Infants do not receive the full protective benefits from breastmilk, and the risk of HIV transmission is doubled. It is believed that foods and fluids other than breastmilk contain antigens which cause inflammation in the gut of the infant, making it vulnerable to HIV infection. A study by Maru et al. (2009:1114) to determine social determinants of mixed feeding behaviours among HIV-infected mothers in Jos, Nigeria, elucidated some of the main contributing factors. Women who chose to EFF designated family pressure as the main reason for mixed feeding. Women who initially decided to EBF reported insufficient breastmilk as motivation for mixed feeding. The importance of disclosure and the support of the partner of the feeding choice were also highlighted as predictors of mixed feeding behaviour (Maru et al., 2009:1114).

Mixed feeding is associated with an increased risk for diarrhoea which can increase intestinal permeability, possibly increasing the chances of the virus entering the body. When an infant receives mixed feeding, it can be hypothesized that breast suckling will be less vigorous due to decreased hunger. This can lead to breastmilk stasis and mastitis which might increase vertical transmission risk (Lunney et al., 2010:763).

1.3.1.3 DURATION AND CESSATION OF BREASTFEEDING

Evidence is becoming available which demonstrates that early weaning in low-resource settings may reduce HIV transmission but leads to a much higher rate of morbidity and

mortality in the infants (McIntyre, 2010:51). In a study by Coovadia et al. (2007:1107), the risk of postnatal transmission during EBF was calculated in 723 HIV-infected mothers in KwaZulu-Natal, South Africa. The cumulative risk of infection at one month was 1.1%, after two months it was 2.2% and at six months it was 4.0% which corresponded with the findings of a recent Zambian study (Coovadia et al., 2007:1107; Kuhn et al., 2007:1). Early cessation of breastfeeding causes an increase in infant mortality. In previous control studies where breastfeeding cessation was at around six months, a significant increase in infant mortality was noticed – two of these studies were stopped for ethical reasons due to the pronounced effect that they had (Kuhn, 2010:3).

1.3.1.4 HEAT-TREATED EXPRESSED BREASTMILK

When the expressed breastmilk (EBM) of HIV-infected mothers is correctly heat-treated, HIV is inactivated. Different methods of heat-treatment have been described and tested, both in controlled and 'real life' settings. The WHO considers heat-treated EBM as a potential safe feeding approach for HIV-infected mothers since the nutritional and immunological composition of breastmilk is not significantly altered during the process (WHO, 2010:38). Holder pasteurization (62°C for 30 minutes), flash-heating (heating human milk in a water bath until water starts to boil, then removing the milk form the water), as well as Pretoria pasteurization (boiling water, removing it from the heat and immediately placing a closed jar of human milk in the water for 20 minutes) have all been used to inactivate HIV in the laboratory. Although the use of heat-treated EBM appears to be a promising infant feeding choice, the problem of acceptability thereof exists (Israel-Ballard, 2006:49). According to a UNICEF (United Nations International Child Emergency Fund) report on the acceptability of this method of infant feeding in sub-Saharan Africa, few participants spontaneously mentioned heat-treatment of EBM as an infant feeding option for HIV-infected mothers. The responses of the participants also indicated that this method would not easily be accepted by the mothers (UNICEF, 2000). A study by Sibanda (2003:23) in Zimbabwe found similar results; heat-treatment of EBM was the least frequently mentioned infant feeding option in the 240 women interviewed, and it was found to be the least acceptable method. It would be of value to explore the responses of the women, but unfortunately the reasons for the low acceptability were not investigated or clearly

understood (Sibanda, 2003:23). Israel-Ballard et al. (2006:48) also investigated the acceptability of the heat-treatment of EBM in Zimbabwe. The researchers conducted focus group discussions with community members. Not surprisingly, the idea of the use of this method was initially met with scepticism, and time constraints as well as social and cultural stigma were mentioned as obstacles. The researchers however, found that while interviewing the respondents and further exploring the topic, all of the groups began to feel more accepting of this infant feeding method. The affordability and potential to prevent HIV transmission prompted the respondents to believe that this method can be a feasible infant feeding option for HIV-infected women in Zimbabwe (Israel-Ballard, 2006:48).

The WHO HIV and Infant Feeding Guideline Development Group notes that there is insufficient and scarce programmatic data available that can demonstrate the acceptability and sustainability of heat-treated EBM at a large scale in the community. The group is not yet confident in recommending this method to all HIV-infected mothers who wish to breastfeed. However, the use of heat-treated EBM can be considered as an interim feeding option such as when the infant is low-birth weight or ill and unable to suckle, when a mother has a temporary health problem such as mastitis, when ARVs are temporarily not available, or to assist mothers in breastfeeding cessation (WHO, 2010:38).

1.3.1.5 WET NURSES AND HUMAN MILK BANKS

The use of wet-nurses is not common nor without challenges. The woman who is providing the breastmilk must remain HIV-uninfected and always available to feed the infant. They are rare and there is little evidence of the actual use of them in high-or low-income settings. This feeding option is not discussed in the new WHO guidelines, presumably as a result of these difficult challenges (Young et al., 2011:229).

Human milk banks are important sources of safe (pasteurized) breastmilk for vulnerable infants, such as those with low-birth weight, those who are preterm, malnourished, orphaned, or those born to HIV-infected mothers who choose not to breastfeed (Young et al., 2011:229). The large-scale use of breastmilk banks for HIV-exposed infants has not been implemented in South Africa. A study by Chopra et al. (2002:302) in Khayelitsha, South

Africa, found that this method was uniformly rejected by HIV-infected women who were interviewed (Chopra et al., 2002:302).

1.3.1.6 BREAST PATHOLOGIES

Breastmilk stasis and engorgement, leading to mastitis (an inflammatory process in the breast) and breast abscesses, increase the HIV viral load in breastmilk, and are therefore considered as important risk factors in the postnatal transmission of HIV. When cell membranes become disrupted, the extracellular ratio of sodium to potassium become elevated which can facilitate an increased leakage of HIV from plasma to the breastmilk. Up to 50.0% of breastfeeding-associated HIV transmission can be attributed to subclinical mastitis (Lunney et al., 2010:763). Literature suggests that mastitis occurs commonly in resource-poor and -rich settings. Even though the importance of mastitis in postnatal transmission is known, as well as the fact that research indicates a high prevalence of mastitis in HIV-infected populations in Sub-Saharan Africa, researchers have not directed much effort into investigating the problem (De Allegri et al., 2007:2). Good lactation management is essential to assist in the prevention of mastitis development and the increased transmission risk caused by it.

1.3.2 REPLACEMENT FEEDING

1.3.2.1 FORMULA MILK

Although avoiding breastfeeding will reduce the risk of HIV infection in the infant, HIV-free survival does not improve due to the increased mortality rates as a result of other causes in these infants. Sub-Saharan studies show that using infant formula in PMTCT programmes can double the mortality rate (Kuhn, 2010:2). In Botswana, a randomized controlled trial was implemented to compare EBF together with a six month course in infant zidovudine (ZDV) prophylaxis versus formula feeding with one month of infant ZDV prophylaxis. The incidence of infant mortality was significantly higher in the formula-fed group (9.3%) than in the breastfed group (4.9%). However, in this study, the eighteen month morbidity and mortality rates in the two groups did not differ significantly and both strategies had

comparable HIV-free survival at eighteen months (Doherty et al., 2011:4). Evidence from Malawi found that avoidance of breastfeeding was significantly associated with decreased growth rates as evidenced by decreased mean length-for-age, weight-for-age and weight-for-length z-scores (Taha et al., 2010:514).

To some mothers, formula milk can be a blessing. If a mother's circumstances meet the requirements, using this appropriate replacement feed will eliminate postnatal MTCT. Formula milk does contain critical nutrients for growth and development, but by not breastfeeding, the infant is deprived of the maternal antibodies which will support the infant's maturing immune system. Shapiro et al. (2007:563) proved that breastmilk contains these immunologic factors regardless of the mother's HIV status (Shapiro et al., 2007:563).

The WHO states that women can only consider formula feeding if certain conditions are met. The well-known 'AFASS' (acceptable, feasible, affordable, sustainable and safe) criteria should be used to assess the possibility of formula feeding safely. The assessment of each woman's individual situation is unfortunately not as simple as these five words might suggest, and the WHO has recently modified the wording of the AFASS criteria to make it more understandable and simpler (WHO, 2010:8). The amended criteria include statements related to the circumstances of the mother (e.g. her access to safe water and healthcare) instead of using single words. It is anticipated that this will lead to women making better informed choices regarding infant feeding.

Inappropriate preparation of formula milks is a major contributor to morbidity and mortality among infants in developing countries. Faecal bacteria in infant milk and food are a common cause of infections and malnutrition. Studies show that poor hygiene, unclean preparation utensils, low socio-economic status and prolonged periods of storage are linked to high bacterial contamination of especially the feeding bottles (Andresen et al., 2007:409). A commentary by the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) committee states that powdered infant formula is not sterile and may contain certain pathogenic bacteria. In addition, milk products are excellent media for bacteria to proliferate in (Agostini et al., 2004:320). Outbreaks of *Enterobacter sakazakii* might be particularly problematic for infants younger than two

months, immuno-compromised infants, preterm infants, as well as small for gestational age infants. Areas of low-resources can be hit hard, especially where adequate diagnostic facilities are lacking (Carletti & Cattaneo, 2008:1131). Errors in the correct ratio of powder to water can also result in serious health problems. Over-dilution of feeds is related to economic constraints and increases the risk of malnutrition. Over-concentration is related to misunderstanding of preparation instructions, errors in scoop measurements or the notion that extra powder will be beneficial to the infant. Hyperglycaemia, dehydration, gangrene and coma can result (Andresen et al., 2007:409).

Some of the AFASS criteria were investigated in a small study in South Africa. Faecal bacteria were found in 81.0% of home samples of milk bottles, and over-dilution occurred in 47.0% of home samples (Andresen et al., 2007:413). To avoid incorrect dilution and contamination of milk feeds, it must be clearly understood that formula feeding involves numerous critical steps ranging from handling, storage, preparation and hygiene (Agostini et al., 2004:320). It cannot be assumed that every mother, irrespective of socio-economic status and education, will be able to correctly and hygienically prepare formula milk. This can ultimately contribute to increased morbidity and mortality risks in the infants.

A contrasting case is made by John-Stewart (2007:11) who quotes a study in Abidjan, Cote d'Ivore by Becquet et al. (2007:139) to argue against the hasty dismissal of formula feeding. The authors found that the risk of hospitalization, over a two-year follow up period, did not differ between infants who were formula-fed or infants who were breastfed for four months. When both groups were compared to a historical cohort where breastfeeding was prolonged, the two-year survival of HIV-uninfected children was excellent regardless of feeding choice. Long-term breastfed infants had a survival rate of 95.0% and infants who were breastfed for four months or never breastfed had a survival rate of 96.0%. Becquet et al. (2007:139) concluded that "given appropriate nutritional counselling and care, access to clean water, and a supply of breastmilk substitutes, these alternatives to long-term breastfeeding can be safe interventions to prevent mother-to-child transmission of HIV in urban African settings" (Becquet et al., 2007:139; John-Stewart, 2007:11). However, in rural African settings, the use of infant formula is complicated by, among others, limited access to clean water and health care. A study done by Kagaayi et al. (2008:5) in rural Uganda to

compare mortality rates and HIV-free survival among formula-fed and breastfed infants born to HIV-infected mothers, showed mortality rates of six times higher in the formula-fed group. This suggests that mortality rates in rural African areas can be greater than in some urban communities (Kagaayi et al., 2008:5). Unfortunately this does not translate to the assumption that the preparation of formula milk in urban areas can automatically be regarded as safe.

1.3.2.2 ANIMAL MILK

Modified animal milk is usually fresh milk or powdered milk to which water, sugar, oil and a micronutrient mix is added. According to Shetty (2002:26), animal milk should not be fed to infants since the renal solute load is too high, and the vitamin and mineral concentrations are inappropriate (Shetty, 2002:26). Wijndaele et al. (2009:2018) is in agreement with Shetty and cites further reasons for the avoidance of cow's milk below the age of one year. An increased blood loss from the gastro-intestinal tract (which contributes to an iron deficiency), chronic constipation and anal fissures, as well as an increased risk for type 1 and type 2 diabetes mellitus, are some of the reasons the authors provide (Wijndaele et al.,2009:2018). Papathakis & Rollins (2004:1) examined the adequacy of animal milk for infants of HIV-infected mothers in the South African context. They found that no home-modified animal milk met all of the estimated micronutrient and essential fatty acid requirements in infants younger than six months (Papathakis & Rollins, 2004:1).

The WHO previously recommended the use of modified animal milk as one of the replacement infant feeding options. However, home-modified animal milk is no longer recommended to be used in the first six months of life. The micronutrient mix that needs to be added is not always available, and the milk does not provide all of the necessary nutrients for optimal growth and development. The WHO explicitly states that home-modified animal milk should not be used as a replacement feed in infants under the age of six months. After the age of six months, boiled whole cow's milk can safely be given as primary milk source in resource-poor settings (WHO, 2010:7).

1.4 INFANT FEEDING CHALLENGES IN PMTCT PROGRAMMES

1.4.1 EXCLUSIVE BREASTFEEDING

Nationally in South Africa, EBF is not the norm and this country has one of the lowest rates of EBF in the world. According to the most recent South African Demographic and Health Survey (SADHS) from 2003, only eight percent of infants under the age of six months were exclusively breastfed. Prevalence of EBF might be low, but mothers tend to breastfeed for extended periods as evidenced by the median duration of breastfeeding as being 16.6 months. The median duration is longer in rural areas (18.6 months) compared to urban areas (14.3 months) (DoH, 2004:144). Although these data are not specific to the HIV-infected population of South Africa, it can give an indication of the general attitudes and practices regarding breastfeeding. Doherty et al. (2011:7) attempt to provide reasons for the low EBF rates in South Africa: longstanding cultural practices, the support of formula milk by the government nutrition supplementation programme, the lack of breastfeeding promotion due to high HIV prevalence, and the provision of free formula milk through the PMTCT programme (Doherty et al., 2011:7).

1.4.2 FORMULA MILK

As previously mentioned, using formula milks to feed infants in low-resource settings is associated with higher morbidity and mortality rates. Much debate has arisen regarding the free distribution of formula milk to HIV-infected mothers. Coutsoudis et al. (2002:157) states that subsidized or free formula milk benefits groups which do not necessarily require it. Families and mothers, who would want to take advantage of free formula milk due to economic restraints, are the very same people who will likely not meet all of the AFASS criteria for safe formula feeding. The women's perception of the health care workers is another important factor to consider. When health care personnel distribute formula milk, it might be seen as an endorsement of these products. Since the health care workers are usually held in high regard, this can lead to more women opting for formula feeding even though it may not suit their circumstances (Coutsoudis et al., 2002:157).

The cost associated with formula feeding is perhaps one of the most important factors to consider. For the average mother in sub-Saharan Africa, it is nearly impossible to afford an adequate supply of formula milk and the necessary provisions needed for safe preparation. When using formula milk to maximise HIV-free survival, it must be made clear that the complete practice should be safe: fuel, clean utensils, sterilizing liquid, fresh preparation of feeds and correctly measuring the amount of powder and water are all important factors to consider – not simply the accessibility of the formula milk. Many women cannot guarantee the sustained availability of all these factors due to poverty (Coutsoudis et al., 2002:157).

In 2000, the PMTCT programme in South Africa set aside 24.0% of the total budget for the procurement of formula milk (Wilkinson et al., 2000:794). This expenditure of PMTCT programmes will decrease substantially when a government adopts the breastfeeding and ART (antiretroviral therapy) approach to PMTCT. A recent analysis requested by the WHO to estimate the cost of PMTCT per 10 000 women in Southern African countries, further highlighted the high cost of formula milk. The cost of breastfeeding plus maternal highly active antiretroviral therapy (HAART) for women with a CD4 count $\leq$350 cells/mm^3, or breastfeeding with infant Nevirapine (NVP) prophylaxis for women with CD4 count > 350 cells/mm^3 for six months, was calculated at US$ 522 542. In comparison it would cost US$ 2 063 100 to provide the mothers with maternal HAART and six months of formula milk for women with CD4 count $\leq$350 cells/mm^3 or for six months of formula milk for women with CD4 count > 350 cells/mm^3. In this report it was concluded that "any feeding strategy that includes free provision of infant formula to HIV-infected mothers, even for a limited period of six months, is between two and six times more costly than a strategy that provides ARVs as prophylaxis to reduce postnatal transmission. The costing model took a conservative approach to the cost of providing infant formula, with likely underestimates of staff time required to dispense and counsel on formula feeds and the storage costs of tins of formula milk". The costing did not however include extra costs due to nutritional support of breastfeeding mothers who need additional nutritional support and nutrients (WHO, 2010:20).

Another significant problem in the provision of free formula milk to HIV-infected mothers is interruptions in the supply of formula milk, which may increase the risk of malnutrition and

infections in the infant if the mother is not able to bear the financial burden during periods when free formula milk is not available. Serious gaps in supply have been noted in the South African PMTCT programme and mothers commonly ran out of milk or had to wait for weeks for new stock to arrive (Doherty et al., 2006:93).

Access to free formula milk does not translate to compliance with EFF, and mixed feeding can often be a result. In a randomized study in ante-natal clinics in Nairobi, Kenya, Nduati et al. (2000:1167) found that only 70.0% of women who were receiving free formula were exclusively giving formula milk, despite having access to piped water and adequate sanitation (Nduati et al., 2000:1167). The concern also exists that formula milk is not used by the intended beneficiary but by family members instead, as similar experiences have been noted in food distribution programmes (Doherty et al., 2006:93). The temptation to sell the tins might be too much for some, and this can undeniably contribute to malnutrition in the infants.

Eminent South African authors such as Coutsoudis and Coovadia (Coutsoudis et al., 2008:213; Coutsoudis et al., 2002:158) have persistently argued against the distribution of free formula milk in resource-poor areas with high HIV prevalence. They reiterate that, while free formula milk can appear to be a blessing by decreasing postnatal HIV transmission, it cannot be justified by the evidence. Denying infants the nutrition, protective factors and sustainability of breastmilk can increase morbidity and mortality from other infectious diseases. They recommend that free formula milk should not be distributed in PMTCT programmes, but rather that counselling on infant feeding should be improved. These authors recommend that EBF and other safer breastfeeding practices as well as ARVs, should be used to reduce HIV transmission via breastfeeding (Coutsoudis et al., 2008:213; Coutsoudis et al., 2002:158).

A factor which does not always receive enough attention, is the 'spill-over' effect that the distribution of free formula milk has on HIV-uninfected women. The general public can be influenced to rather choose formula milk, or to not breastfeed exclusively. These children might be at an increased risk for infection and death than infants who are exclusively breastfed. Evidence of this 'spill-over' effect is apparent in countries such as Botswana,

Kenya, Namibia and Uganda. Breastfeeding promotion efforts in the general population have declined as a result of formula feeding interventions in an attempt to prevent the postnatal transmission of HIV (Coutsoudis et al., 2002:158). The 2010 WHO Guidelines on HIV and infant feeding constructed a recommendation related to the elimination of this problem. Principle seven states that health messaging to the general population, and counselling to HIV-infected women should be carefully delivered. The undermining of optimal breastfeeding practices among the general population will then be avoided (WHO, 2010:26).

1.4.3 HOUSEHOLD FOOD SECURITY

Household food security plays an important role in the nutritional status of all of the individuals residing in a dwelling, including that of formula-fed infants. According to the Department of Agriculture (DoA), (Department of Agriculture, 2011:4) the overall food security in South Africa is adequate since there are enough staple foods being produced to provide for the entire population. If it is needed, South Africa is also able to import food stuffs to support the population. However, food security is not always present at household level. Inadequate household food security is prevalent in South Africa, with 20.0% of the population experiencing a low level of food security (DoA, 2011:4). In 2008, 33.5% of households in the Free State experienced a low level of household food security, the highest rate in the country (DoA, 2011:4). When there is a lack of food and money in the household, there will likely be a lack of funds available for procuring adequate formula milk, as well as sanitizing materials. This lack of funds is one factor involved in the development of malnutrition of formula-fed infants.

1.5 COUNSELLING

In order for the PMTCT programmes to work optimally, governments need to ensure that high quality counselling is available to all pregnant women and mothers. The choice of whether to formula feed or to breastfeed cannot be made without careful consideration of each woman's unique household, socio-economic and cultural situation. Neither EBF nor non-exclusive breastfeeding is the cultural norm in most African settings, which translates

to the unsafe practice of mixed feeding being extremely common. It is therefore of the utmost importance that HIV-infected mothers understand exactly how to minimize the risk of HIV transmission through correct breastfeeding practices; on the other hand, mothers who chose to give formula milk to their infants must also receive sufficient good quality counselling and support to do so in a safe and successful manner (Doherty et al., 2006:90).

When the choice of infant feeding mode is considered, lack of knowledge as well as implementing incorrect infant feeding practices have exacerbated the HIV dilemma. Interventions to promote the importance of EBF through counselling in PMTCT programmes have only achieved partial success. In a study in Cote d'Ivoire, only 66.0% of women in PMTCT programmes could correctly define EBF. According to two separate studies in India and Kenya, mixed feeding is also very common with a prevalence of 21.0-43.0% (Maru et al., 2009:1115). A study by Ladzani et al. (2011:539) in Mpumalanga, South Africa, revealed similar results: 38.0% of mothers partaking in the study, who were enrolled in the PMTCT programme, admitted to giving replacement feeds together with breastmilk. Only 53.0% of the mothers were shown how to breastfeed correctly (Ladzani et al., 2011:539).

A study by De Paoli et al. (2002:144) testing the knowledge of sixteen nurses, two doctors and five HIV/AIDS counsellors in Tanzania, exposed alarming results. WHO/UNAIDS/UNICEF guidelines were seriously compromised by, amongst others, inaccurate advice given, directive counselling methods and incomplete explanations of infant feeding options. The risks and benefits of the different feeding options were not only complicated and complex to the mothers, but to the counsellors themselves (de Paoli et al., 2002:144). Many women in Sub-Saharan African countries take the recommendations of health care workers as the final word, and the opinions and advice given by them are highly respected. Health care workers therefore have an extremely powerful tool at their disposal, namely high quality, comprehensive counselling and support (Piwoz et al., 2006:3).

The importance of quality counselling was recognized by Piwoz et al. (2007:1250) in an educational intervention study undertaken in Zimbabwe, where testing of HIV status was encouraged and all 437 mothers were counselled on preventing MTCT of HIV. The

researchers implemented educational contact sessions (maximum of four) with the women during the ante-natal period as well as at intervals postpartum. During ante-and postnatal contacts, the women were shown videos and given pamphlets regarding prevention of HIV transmission and the implications on infant feeding and safer breastfeeding practices, mainly through group talks. During individual post-test counselling sessions, women who tested HIV-negative were advised about appropriate breastfeeding practices. Women who tested positive were educated about different infant feeding options. If these women chose to breastfeed, they were counselled on safer breastfeeding and EBF until six months. The cumulative postnatal HIV transmission was 8.2%. Each additional contact session was associated with a 38.0% reduction in postnatal transmission. HIV-infected women who were exposed to both print and video materials, had a 79.0% reduced risk of infecting their infants, compared to women with no exposure (Piwoz et al., 2007:1250). Consequently, the worth of implementing more than one counselling session, together with the use of educational materials, cannot be overemphasized. Adaptations of the current South African PMTCT programme to include more contact sessions between trained health care workers and HIV-infected women should become a priority. Educational materials that are designed for South African populations should be developed and integrated into counselling sessions to decrease HIV transmission rates and malnutrition.

1.6 KNOWLEDGE, ATTITUDES AND PRACTICES

Even if a mother has received adequate counselling, her environment, socio-cultural background and the attitude of her community towards the feeding choice, can influence and dictate her practices. These discrepancies can further complicate infant feeding in high HIV prevalence areas (Engebretsen et al., 2010:2). Health care workers counselling HIV-infected mothers about infant feeding can play a major role in the outcome of the feeding mode. Some key challenges in the PMTCT programmes have been attributed to poor training of counsellors and subsequent poor counselling by these health care workers to the mothers (Koricho et al., 2010:2).

Ladzani et al. (2011:539) conducted a study to determine knowledge, attitudes and practices of 815 HIV-infected mothers in the Gert Sibanda district, South Africa, regarding

infant feeding. Ninety-four percent of the mothers agreed that HIV can pass through breastmilk to the baby, and 93.0% had received information on the dangers of mixed feeding. Fifteen percent of the mothers did not receive any infant feeding counselling within 72 hours of giving birth. Approximately half of the mothers started with EBF within an hour of giving birth, and just over half of the mothers were shown how to breastfeed. Seventy-one percent of the mothers were not asked about the attachment of the baby to the breast. This is a vital first step in successful EBF, and neglecting education regarding attachment can lead to mothers experiencing early problems with EBF, and the ultimate discontinuation thereof. Forty-three percent of the women opted for the use of free formula milk, but a quarter of the mothers were not shown how to correctly prepare the milk. This can lead to unsafe formula milk being provided to infants that can contribute to infections such as gastro-enteritis as well as malnutrition. Some mothers also expressed difficulties in obtaining formula milk from the clinics. It was found that between the ages of three to six months, 36.0% were practising EBF, 51.0% were practising EFF and 12.0% were mixed feeding their infants. Conflicting messages by health care workers encouraged the practice of mixed feeding, which could lead to health problems in the infant (Ladzani et al., 2011:539).

A study of 93 pregnant HIV-infected women by Minnie & Greeff (2006:24) in clinics in Potchefstroom, South Africa, was done to assess knowledge and perceptions of these women related to infant feeding. It was found that they were not sufficiently empowered to make informed decisions regarding infant feeding mode. The women were ignorant regarding the different ways of MTCT as well as the factors which influence the risk of HIV transmission. The age at which solid foods should be introduced was also not clear. Forty-four percent indicated that solids should be given before the age of four months. Thirty-eight percent of the women who had given birth and breastfed previously, gave complimentary fluids to the infant before the age of one month, and fifty percent supplemented their breastmilk by the age of six months. This is worrying since mothers might continue this practice when their next infant is born (Minnie & Greef, 2006:24).

Maputle & Jali (2008:47) interviewed 100 pregnant women in Polokwane, South Africa. Only 10.0% of the women understood the rationale for EBF by explaining that it could

decrease the risk for MTCT. Women who chose to breastfeed were counselled not to mix feed as this can damage the gut-wall and increase transmission risk. This is a difficult concept for women to understand because of the cultural influences in infant feeding. In many communities it is acceptable to give water and herbal teas very early in the infant's life, and to give solid foods within the first month of life. Only approximately 26.0% of the women understood that breast pathology such as mastitis can increase the risk of transmission. This was vital for the women to understand as failure thereof can lead to unnecessarily high MTCT rates. Lastly, only 14.0% of the women understood the fact that oral thrush in the infant's mouth can increase the risk of transmission (Maputle & Jali, 2008:47-50).

A study by Koricho et al. (2010:3) in Addis Ababa, Ethiopia, revealed that the choice of infant feeding mode made by HIV-infected mothers was strongly influenced by their fear of infected breastmilk. Mothers expressed disgust at even the thought of breastfeeding their infants with their 'poisonous milk'. They referred to the act of breastfeeding as a 'sin and thus an offence against God'. Some were so afraid of the risk of transmitting HIV via breastmilk that they preferred to feed their infants with formula milk or cow's milk. These replacement feeding attempts were made despite a small chance of actually being able to adhere to it, since formula milk is extremely costly and highly uncustomary. The health care workers active in the PMTCT programmes shared the women's fear of breastfeeding, and the mothers' fears were clearly linked to the counselling they had received. The nurse counsellors were afraid of even giving the mother the option of breastfeeding, and the information given about infant feeding options was often ruled by their own emotions and preferences. They did not always introduce all of the infant feeding options as described by the WHO (Koricho et al., 2010:3-8).

De Paoli et al. (2003:613) held focus group discussions in Tanzania with HIV-infected mothers about infant feeding. Five percent of the mothers stated that formula milk was the most feasible option, scoring low as an affordable and sustainable choice. However, if the infant formula were to be provided for free, 83.0% of the mothers responded that they would then choose to feed their infants with formula milk. This is a high percentage and the general dangers of formula feeding in low-resource setting must be kept in mind. Almost

96.0% of the mothers regarded cow's milk as the most feasible option as it was seen as affordable and available (De Paoli et al., 2003:613-616). As previously mentioned, cow's milk is not an adequate replacement feed and is not recommended by the WHO (WHO, 2010:38). Neither expressed heat-treated breastmilk nor wet-nursing was well accepted or regarded as feasible, and these practices may also arouse suspicion among neighbours and family. EBF was received with some scepticism as mothers were unsure of the safety and adequacy thereof. The authors concluded that the early introduction of fluids other than breastmilk would have to be challenged and that further research is necessary to ascertain why mothers practice mixed feeding and whether this practice can be reversed in sub-Saharan Africa (De Paoli et al., 2003:613-616).

Wachira et al. (2009:124) collected qualitative and quantitative data on the knowledge, attitudes and practices of infant feeding in the context of HIV in the Rift Valley Province in Kenya. Male (194) and female (191) community members participated in the survey. Fifteen percent of the respondents did not know that breastfeeding was a route of postnatal HIV transmission; age and educational level was highly correlated with an increased knowledge regarding HIV transmission. Most respondents selected cow's milk as the preferred infant feeding option. Although 90.0% of the respondents did indicate that it is necessary to modify cow's milk before feeding the infant, they were not clear on how this should be done. As previously mentioned, the WHO does not recommend home-modified animal milk as replacement feed during the first six months of life since it does not provide the infant with all of the necessary nutrients (WHO, 2010:38). Only 15.0% preferred EBF, and heat-treating expressed breastmilk, wet-nursing and milk banks were the least preferred (Wachira et al., 2009:124). When HIV-infected mothers heat-treat their breastmilk, they will not transmit HIV and the milk stays nutritionally and immunologically superior to formula milk (Chantry et al., 2009:264). Unfortunately, most of the respondents did not believe that this method was completely safe since they did not believe that the virus would be destroyed. Forty-two percent preferred infant formula as a feeding mode for the infant (Wachira et al., 2009:124).

The previously mentioned study by Minnie and Greeff (2006:22) also questioned midwives in ante-natal clinics in Potchefstroom, South Africa. They found that only eleven percent of

the midwives, who were registered at the South African Nursing Council, knew what advice to give to women suffering from breast pathologies or for an infant who has oral candida or gastro-enteritis. Less than half of them knew the correct way to wean an infant, and only 24.0% considered pasteurised breastmilk as an ideal food for premature HIV-exposed infants. Midwives were also not clear on the matter of ARV use and HIV transmission risk. Interestingly, the midwives themselves admitted that the education that they presented to the pregnant women was not sufficient. Factors such as a low socio-economic status and fear of victimisation or stigma if HIV status was made known, were cited as explanations for their perceptions. In addition, communication problems were experienced between the midwives and the women. They mentioned language and cultural differences, as well as denial of HIV and ignorance as the main problems. Lastly, the midwives stated that a lack of time, staff and educational materials impeded their ability to counsel effectively (Minnie & Greeff, 2006:22-23).

From the studies that have been referred to, it is clear that much confusion and misconception remain regarding infant feeding and HIV. Communities as well as health care workers should be educated using innovative, integrated and comprehensive counselling methods to decrease the transmission of HIV to infants.

1.7 GUIDELINES ON HIV AND INFANT FEEDING

1.7.1 EVOLUTION OF GUIDELINES

The global partners UNAIDS, WHO, UNICEF and UNFPA (United Nations Populations Fund) have developed guidelines for HIV and infant feeding. In 1987 and 1992 the first guidelines were released which recommended continued breastfeeding by infected mothers in low-resource settings. The option of giving replacement feeds was first introduced in 1998 by the WHO. Technical consultations followed in 2001, 2006 and 2009 which attempted to clarify and distinguish when formula milks can safely be used by these mothers. The AFASS concept for safe formula feeding was introduced in 2001 and, if a mother chose to breastfeed, EBF was recommended for "the first months of life" (Chinkonde et al., 2010:8). The importance of breastfeeding in the absence of access to

suitable and sustainable formula milk, was always highlighted. However, some perceived the WHO guidelines regarding the use of formula milks as a major shift away from the longstanding promotion of breastmilk as the gold standard infant feeding milk (Young et al., 2011:228)

1.7.2 THE NEW 2010 WHO GUIDELINES

Since the WHO Infant Feeding and HIV Guidelines update in 2006, significant programmatic experience and research have accumulated which have had major implications for HIV-infected women feeding their infants, as well as the methods that health care workers should use to counsel and support them. The WHO held a meeting in Geneva on 22-23 October 2009 to update these recommendations. The Guideline Development Group (GDG) agreed upon nine key principles and seven evidence-based recommendations. These principles and recommendations can be used by policy makers, academics and health care workers to assist in formulating national or sub-national recommendations for HIV and infant feeding. The use of ARVs for either the HIV-infected mother or for the HIV-exposed infant to significantly decrease postnatal transmission is seen as an important prevention tool (WHO, 2010:1-15).

The main points that were reviewed since 2006 are as follows:

- the risks and benefits of breastfeeding and formula feeding to improve HIV-free survival of HIV-exposed infants, taking into account interventions to improve maternal health and to prevent postnatal transmission of HIV;
- the duration of breastfeeding according to maternal health, access to ARV interventions and environmental circumstances;
- the support of HIV-infected women who plan to stop breastfeeding and how to meet the nutritional needs of infants after cessation of breastfeeding; and,
- the feasibility and cost of supporting different infant feeding practices to improve child survival in the context of HIV (WHO, 2010:9).

1.7.2.1 THE NINE GUIDING PRINCIPLES OF THE NEW 2010 WHO GUIDELINES

These nine principles in the WHO guidelines should not be read in isolation, but together with the recommendations that follows. The principles can be used when planning and providing care in programmatic settings, and they represent public health approaches and preferences (WHO, 2010:15).

(i) Key Principle 1 – Balancing HIV prevention with protection from other causes of child mortality

The first principle involves the importance of HIV-free survival of infants. HIV-infected mothers should receive recommendations on infant feeding practices which will result in the highest likelihood of HIV-free survival of the infants, and to prevent harm to the mothers themselves (WHO, 2010:16). The crux of the matter is balancing the risk of postnatal HIV transmission via breastmilk, and the risk of infant mortality from causes other than HIV when formula feeding, as non-breastfed infants are at risk for malnutrition and infections ultimately leading to death (Bahl et al., 2005:418).

(ii) *Key Principle 2 – Integrating HIV interventions into maternal and child health services*

Integration of HIV testing, care and treatment into maternal and child health services is an important factor to be considered by the national authorities. Identification of women who are infected is the first step in protecting the infant from infection. Investigating the CD_4 counts and the optimal use of ARVs must follow to prevent vertical HIV transmission. Although this principle does not directly relate to infant feeding, it was still considered important to emphasize (WHO, 2010:17).

(iii) *Key Principle 3 – Setting national or sub-national recommendations for infant feeding in the context of HIV*

This principle suggests that governments must decide which approach to infant feeding will primarily be supported and promoted – breastfeeding within the context of ARV

interventions or the complete avoidance of breastfeeding. It is important that the decision should provide infants with the highest chance of HIV-free survival. However, the decision should be made by taking certain factors into consideration: socio-economic and cultural contexts, the availability and quality of health care, the local epidemiology, as well as the causes of infant malnutrition and mortality. Previous recommendations included counselling mothers on feeding options and leaving it up to them to decide which course of action to take (WHO, 2010:20). In South Africa, HIV-infected women are supposed to be counselled during pregnancy and advised as to the best option for them, but ultimately the decision to breastfeed or not lies with the women themselves (Department of Health, 2010:33). The WHO and UNICEF will help countries in this decision-making process by developing guides and implementation frameworks (WHO, 2010:21).

(iv) *Key Principle 4 – When antiretroviral drugs are not (immediately) available, breastfeeding may still provide infants born to HIV-infected mothers with a greater chance of HIV-free survival*

WHO states that while ARV interventions are being implemented and scaled up, the national authorities should not be discouraged from recommending breastfeeding as an infant feeding option for HIV-infected women. If ARVs are not available, mothers should be counselled to breastfeed exclusively for six months and to continue breastfeeding after the age of six months unless her circumstances can support safe and sustainable replacement feeding. This recommendation is also valid for emergencies, as illustrated in the aftermath of the recent earthquake in Haiti (January 2010). During emergencies, safe drinking water and sanitation might not be available, and the benefits of breastfeeding can be significant even in the absence of ARVs (WHO, 2010:23).

(v) *Key Principle 5 – Informing mothers known to be HIV-infected about infant feeding alternatives*

This principle involves informing HIV-infected women about the infant feeding option that the national or sub-national authority recommends. They can also be informed that there are alternatives, but it is not required of the authority to organize its services to provide

alternative therapies. General health messaging and group sessions can be used to raise awareness about infant feeding options (WHO, 2010:24).

(vi) *Key Principle 6 – Providing services to specifically support mothers to appropriately feed their infants*

Even if a national health framework recommends a single option, the need for skilled counselling and support regarding appropriate infant feeding practices and the use of ARVs to promote HIV-free survival to HIV-infected women, remains (WHO, 2010:25).

(vii) *Key Principle 7 – Avoiding harm to infant feeding practices in the general population*

It is crucial to prevent any negative effects that counselling to HIV-infected women might have on the general population. Health messaging to HIV-uninfected women and the direct counselling and support to HIV-infected women, should be carefully delivered to prevent misconceptions that can endanger general infant health in a country. Breastfeeding is critical for child survival and HIV has unfortunately caused confusion among health care workers and communities about appropriate infant feeding practices (WHO, 2010:26).

(viii) *Key Principle 8 – Advising mothers who are HIV uninfected or whose HIV status is unknown*

When a mother is known to be uninfected, or when her status is unknown, counselling should be given which promotes EBF for six months. Complementary foods should be introduced after six months, and breastfeeding should continue for 24 months or beyond. When the woman's status is unknown, she should be offered testing, and all women should be counselled on preventing HIV infection or HIV re-infection (WHO, 2010:27).

(ix) *Key Principle 9 – Investing in improvements in infant feeding practices in the context of HIV*

The last principle is included to remind national and international agencies of their responsibilities to all mothers and infants. Governments, stakeholders and donors must increase their commitment and resources to assist in the prevention MTCT of HIV (WHO, 2010:28).

1.7.2.2 THE SEVEN RECOMMENDATIONS OF THE NEW 2010 WHO GUIDELINES

The recommendations made by the WHO, reflects the current evidence based on research. Potential risks and benefits, cost implications and feasibility factors were considered while developing these guidelines (WHO, 2010:30).

(i) *Recommendation 1 – Ensuring mothers receive the care they need*
(Strong recommendation; high quality of evidence)

The first recommendation is in support of the recent evidence regarding ARV prophylaxis and lifelong ART and its ability to drastically reduce the risk of transmission during breastfeeding. Mothers who are HIV-infected should have access to these medications according to the WHO guidelines (WHO, 2010:30).

Recommendations two to four are applicable to settings where the national or sub-national authorities have decided that maternal, new-born and child health services will principally promote and support breastfeeding and ARV interventions, while formula milk distribution will be omitted.

(ii) *Recommendation 2 – Which breastfeeding practices and for how long*
(Strong recommendation. High quality of evidence for first six months; low quality of evidence for recommendation for twelve months)

HIV-infected mothers should exclusively breastfeed their infants for the first six months of life, whether the infant is uninfected or of unknown status. At the age of six months appropriate complementary foods should be added to the diet, while the mother continues to breastfeed for the first twelve months of life. Breastfeeding should then only stop once a safe and nutritionally adequate diet without breastmilk can be provided (WHO, 2010:31). The early cessation of breastfeeding before the age of six months is no longer recommended unless the mother's situation changes and she meets the criteria for safe formula feeding (WHO, 2010:6). This is a major change from the previous recommendations and it is expected that it might cause confusion among the HIV-infected women and health care workers. Adequate training and counselling will hopefully circumnavigate this problem.

This recommendation was made based on research which proved that, despite the fact that the risk of HIV transmission continues as long as the mother breastfeeds, the HIV-free survival of HIV-exposed infants who were breastfed beyond six months was better, or not statistically different, than that of formula-fed infants. The use of ARVs will also assist in reducing transmission risk. The combination of breastfeeding up to twelve months together with the use of ARVs is seen as the best balance of protection from morbidity and mortality versus the risk of transmission (WHO, 2010:32).

(iii) *Recommendation 3 – When mothers decide to stop breastfeeding*
(Strong recommendation, very low quality of evidence)

The abrupt cessation of breastfeeding is not recommended as it can cause negative effects on the mother as well as the infant, such as growth failure and diarrhoea. When an HIV-infected mother decides to stop breastfeeding at any time she should do so gradually within one month. ARV prophylaxis should continue for one week after breastfeeding is completely stopped. Even though there is not much direct evidence in support of this recommendation, the group felt that the WHO should make a recommendation which will relieve health care workers of this problem (WHO, 2010:34).

(iv) *Recommendation 4 – What to feed infants when mothers stop breastfeeding*
(Strong recommendation, low quality of evidence)

This recommendation states that when HIV-infected mothers decide to stop breastfeeding at any time, infants must be provided with a safe and adequate replacement feed which will enable normal growth and development. Alternative feeds include formula milk as long as the criteria for safe feeding are met. Expressed, heat-treated breastmilk is also an option. Home-modified animal milk is not recommended before the age of six months, but for infants above six months, boiled animal milk can be part of an adequate diet with complementary foods. Formula milk is an option if the home situation is conducive to safe feeding (WHO, 2010:36).

(v) *Recommendation 5 – Condition needed to safely formula feed*
(Strong recommendation, low quality of evidence)

HIV-infected mothers should only give formula milk to their un-infected infant or infant with an unknown status as long as all of the following conditions are met:

1. safe water and sanitation are assured at the household level and in the community; **and**
2. the mother, or other caregiver can reliably provide sufficient infant formula milk to support normal growth and development of the infant; **and**
3. the mother or caregiver can prepare it cleanly and frequently enough so that it is safe and carries a low risk of diarrhoea and malnutrition; **and**
4. the mother or caregiver can, in the first six months, exclusively give infant formula milk; **and**
5. the family is supportive of this practice; **and**
6. the mother or caregiver can access health care that offers comprehensive child health services (WHO, 2010:37).

The abovementioned criteria represent the AFASS concept, but define it in everyday language.

(vi) *Recommendation 6 – Heat-treated, expressed breastmilk*
(Weak recommendation, very low quality of evidence)

HIV-infected mothers may consider the use of heat-treated expressed breastmilk as an infant feeding choice. However, it is suggested to be used only as an interim strategy such as for low-birth weight infants, temporary health problems in the mother, to help the mother with breastfeeding cessation or if ARVs are temporarily not available. The reason for the recommendation for interim feeding strategy only, is the available data which demonstrates poor acceptability and sustainability thereof at scale (WHO, 2010:38).

(vii) *Recommendation 7 – When the infant is HIV-infected*
(Strong recommendation, moderate quality of evidence)

The same recommendation applies to infants who are already HIV-infected as for the general population, namely EBF up to the age of six months with continued breastfeeding for two years and beyond (WHO, 2010:39).

1.7.2.3 POSSIBLE DIFFICULTIES IN RESPONDING TO POLICY CHANGES FOR HIV AND INFANT FEEDING

Counsellors are an important aspect of any PMTCT programme and they are in ideal positions to educate communities on infant feeding. Unfortunately, inadequate training regarding the new WHO guidelines and recommendations can decrease the quality of counselling that is offered. According to Ramdhial and Coovadia (2010:61), inadequate one-on-one counselling contributes to poor outcomes. They suggest that the implementation of the new guidelines should be preceded by training of the health care workers. Difficulties in translating the new guidelines to HIV-infected women have been experienced, and anecdotal evidence suggests that health care workers fail to grasp the important concepts of these guidelines. If health care workers cannot understand guidelines, it is impossible to appropriately educate patients (Ramdhial & Coovadia, 2010:61).

Chinkonde et al. (2010:1) investigated difficulties with responding to the 2010 WHO guidelines in Malawi. They found a lack of consensus at all levels and confusion about the 2006 guidelines. The guideline stating that mothers should breastfeed for up to at least twelve months (if replacement feeding is not a safe option) was found especially difficult by the health care workers to advise the women. They were concerned that they would lose the trust of their patients and they worried about the safety of continued breastfeeding with regards to the risk of HIV transmission. The authors concluded that health care workers need up-to-date information, easy to follow guidelines and support and supervision during the process of change to the new guidelines (Chinkonde et al., 2010:1).

1.7.2 SOUTH AFRICAN PMTCT GUIDELINES

President Jacob Zuma announced new ART guidelines on World AIDS day, 2009. As part of the guidelines, all HIV-infected women with a CD_4 count of 350/mm^3 or less qualify for lifelong ART. For women who do not qualify for lifelong ART, prophylaxis ART treatment is given at fourteen weeks gestation when the mother is on the PMTCT regime. Infants of mothers on lifelong ART receive Nevirapine at birth and daily thereafter for six weeks irrespective of feeding choice. Infants of mothers on the PMTCT regime receive Nevirapine at birth and daily for six weeks. If the baby is being breastfed, Nevirapine is given for as long as any breastfeeding is taking place, and for one week after breastfeeding cessation. Infants fed on formula milk only receive daily Nevirapine up to the age of six weeks (National Department of Health, 2010:30).

The guidelines state that health care workers, lay counsellors, and community caregivers should receive standardized training on infant feeding, counselling, and HIV. They should provide patients with high quality counselling regarding the risk of transmission via breastfeeding together with ARV use, as well as the risks associated with formula feeding. All HIV-infected women should be counselled on infant feeding at each antenatal visit. During follow-up postnatal visits, infant feeding practises should be reviewed, breast health checked, and general support given (NDoH, 2010:32).

Before August 2011 (see 1.7.3), women who had opted for formula feeding should have been trained on safe preparation and feeding schedules, including demonstrations. Health facilities should have secured an uninterrupted supply of formula milk (NDoH, 2010:33). Unfortunately, this practice was not an easy feat.

These guidelines were important steps for South Africa's PMTCT programme. For the most part, the guidelines were in line with the new WHO guidelines on HIV and infant feeding. Yet, there was an aspect which had to be addressed soon after the release of these guidelines. The new guidelines stated that the programme "adopts an approach to infant feeding that maximises child survival, not only the avoidance of HIV transmission". However, the distribution of free infant formula would still be provided for at least six months. Women would still be presented with two infant feeding options: EBF or EFF. The WHO suggests that authorities should decide whether breastfeeding with the use of ARVs will mainly be promoted and supported, or if the avoidance of all breastfeeding will be the recommended and enforced. The continued provision of free formula milk can complicate and cloud feeding decisions. Research in South Africa already indicates that women are choosing formula feeding despite not meeting the WHO AFASS criteria, which is very likely to contribute to infant morbidity and mortality (Doherty et al., 2011:2).

Although it has not officially been written into the PMTCT guidelines yet, the infant feeding aspect of the new 2010 SA (South African) PMTCT guidelines have subsequently been changed as discussed in 1.7.3.

1.7.3 THE FUTURE OF INFANT FEEDING PRACTICES IN SOUTH AFRICA

In a historic media statement on 23 August 2011 made by Health Minister Doctor Aaron Motsoaledi, it was announced that the government will be adopting a new breastfeeding-only infant feeding strategy. He recognized the importance of breastfeeding in the prevention of malnutrition and mortality, and stated that it is unacceptable for South Africa to be one of twelve countries in the world where infant mortality has increased. In a consultative conference it was unanimously decided that the provision of free formula milk will be discontinued, except when it is recommended by authorised health care

practitioners for medical reasons. Dr Motsoaledi also stated that he will strengthen regulations to enforce the International Code of Marketing of Breastmilk Substitutes. He made it clear that the promotion of sustained and EBF should be seen in the context of strengthening primary health care. He called upon all spheres of government, traditional leaders and healers, business and labour, NGOs (non-government organisations), as well as civil society to commit to and support EBF. He welcomed the Tshwane Declaration of Support for Breastfeeding in South Africa which was released in August 2011. This declaration aligns South Africa to the 2010 WHO Guidelines on HIV and Infant Feeding, by promoting EBF with the use of ARVs. Dr Motsoaledi invited the media to partner with government to ensure that the policy shift be publicised as widely as possible (DoH, 2011: online). The media will undeniably play an important role in the public awareness of these changes and can be an asset. However, the media will not always support these changes. An example of this is an article that was recently printed in a respected newspaper, *The Mail & Guardian*. The author of this article, with the title "Exclusive breastfeeding plan 'impractical'", gave an unbalanced report on the situation, and increased confusion and suspicion regarding the policy changes (Malan, 2011: online). Efforts must be made to create a partnership with all forms of media to assure a united approach against the challenges created by infant feeding in the context of HIV.

KwaZulu-Natal, a province in South Africa, was the first province to withdraw the free provision of formula milk, and the rest of the country adopted this practice in December 2011.

1.8 PROBLEM STATEMENT

Most HIV-infected women in Sub-Saharan Africa will discover their HIV status during pregnancy since HIV testing is available as part of the PMTCT programme. When a pregnant woman is HIV-infected, many important decisions need to be made which include the infant feeding option she will employ after birth. Disclosure rates of HIV status remain very low in countries such as South Africa, and a woman often decides on the course of action she plans to take without consulting family members or friends (Doherty et al., 2006:90). In a study undertaken by Doherty et al. (2006:92) in the Eastern Cape, Western

Cape and in KwaZulu-Natal, it was found that HIV-infected women who chose to give formula feeds mainly did so in order to protect the infant from HIV; however, the fear that HIV can be transmitted via breastfeeding often resulted from inaccurate information that over-estimated the risk of transmission. Lack of basic knowledge regarding HIV transmission risk can persuade a woman to choose formula milk, even though it might not suit her unique situation. Some of the women also reported feeling 'forced' into a particular feeding choice by health care workers (Doherty et al., 2006:92). Health care workers are extremely important in the education and support of these women. Few studies have reported what health care workers believe and practice regarding infant feeding for HIV-infected women. Counselling behaviour may be influenced by the health care workers' own attitudes, cultural beliefs and biases (Piwoz et al., 2006:3). This can lead to further confusion regarding infant feeding in the HIV-infected population and the care-givers of the infants of HIV-infected women.

Counselling on infant feeding should begin during ante-natal visits to ensure that the mother has already made a decision before giving birth. It is essential to determine if the counselling that these mothers receive is clear, based on the newest guidelines, is unbiased, and will present all of the advantages and disadvantages of each feeding option based on scientific evidence. This is vital to assist a woman to make the most appropriate choice for her situation. The knowledge, attitudes and practices of these women must be examined and related to the associated factors, including socio-demography, anthropometry, household food security and medical history. To further test the compliance with international guidelines, it is important to compare current practices and actions taken with the newest 2010 WHO Guidelines on HIV and Infant Feeding.

The problems facing South Africa and other countries with a high HIV prevalence are overwhelming and numerous. Further studies exploring all of the factors associated with infant feeding in the context of HIV are needed to attempt to improve HIV-free child survival. This study contributes to gaining insight into the complex issues existing within this effort. The information that was gathered can prove vital in creating adapted PMTCT programmes for the target population that take cultural, socio-economic and programmatic factors into consideration.

1.9 OBJECTIVES

The following main aim and sub-objectives were set for this study:

1.9.1 MAIN AIM

The main aim of this study was to assess the knowledge, attitudes and practices of health care workers and HIV-infected mothers regarding HIV and infant feeding in the urban area of Bloemfontein, Free State.

1.9.2 SUB-OBJECTIVES NECESSARY TO ACHIEVE THE MAIN AIM

In order to achieve the main aim, the following were determined:

1.9.2.1 FOR THE HEALTH CARE WORKERS:

- Knowledge, attitudes and practices regarding HIV and infant feeding; and,
- Comparison of current practices and knowledge with 2010 WHO Guidelines for HIV and Infant Feeding

1.9.2.2 FOR THE MOTHER/INFANT PAIRS:

- Socio-demography;
- Anthropometry (infant only);
- Household food security;
- Medical histories and reported health of mothers;
- Knowledge, attitudes and practices of mothers regarding HIV and infant feeding; and,
- Comparison of current practices and knowledge with 2010 WHO Guidelines for HIV and Infant Feeding.

1.9.2.3 ASSOCIATIONS BETWEEN SOME OF THE ABOVE (BASED ON THE DIFFERENCES OBSERVED IN THE DESCRIPTIVE STATISTICS).

1.10 OUTLINE OF DISSERTATION

Chapter 1: HIV-free child survival (problem statement)

Chapter 2: Literature review: Infant feeding

Chapter 3: Literature review: HIV/AIDS

Chapter 4: Methodology

Chapter 5: Results

Chapter 6: Discussion of results

Chapter 7: Conclusions and recommendations

CHAPTER 2

INFANT FEEDING

2.1 INTRODUCTION

Infant feeding practices have a rich symbolic content and occur in accordance with the cultural and social norms of a certain society. The issues surrounding infant feeding can lead to highly emotive debates, and can in some circumstances, lead to controversial or inappropriate choices. Internationally, breastfeeding is viewed as the best option for infant feeding, although in some situations, replacement feeds might be necessary. Infant feeding choices are sometimes influenced by family, friends, health care workers and society at large, which can be to the benefit or detriment of the infant. It is important to always be cognisant of the fact that each woman has her own unique circumstances which should be taken into consideration when making a decision about infant feeding practices (Liamputtong, 2011:2).

2.2 GROWTH, HEALTH AND DEVELOPMENT

Inadequate and poor nutrition in infancy was related to an estimated 9.5 million deaths in 2006 in children under the age of five years. This illustrates the direct and indirect relationship between poor nutrition, undernutrition and illness. Conversely, inappropriate nutrition may lead to obesity in children, which is becoming a formidable public health problem in many countries (WHO, 2009a:3).

Undernutrition is one of the leading causes of mortality in children under the age of five years, as evidenced by the fact that 35.0% of these deaths are associated with undernutrition. When children do survive, undernutrition can prevent them from reaching their full potential (WHO, 2009a:2). Figure 2.1 shows the major causes of death in neonates and children under the age of five years in the world. The causes of malnutrition are complex and interrelated, but there is definite consensus about two of the immediate causes of malnutrition: inadequate and improper nutrition, as well as an increased incidence of infectious diseases (Wuehler et al., 2011:6). After the neonatal period,

diarrhoeal diseases and acute respiratory infections are the main causes of malnutrition and mortality (WHO, 2009a:2).

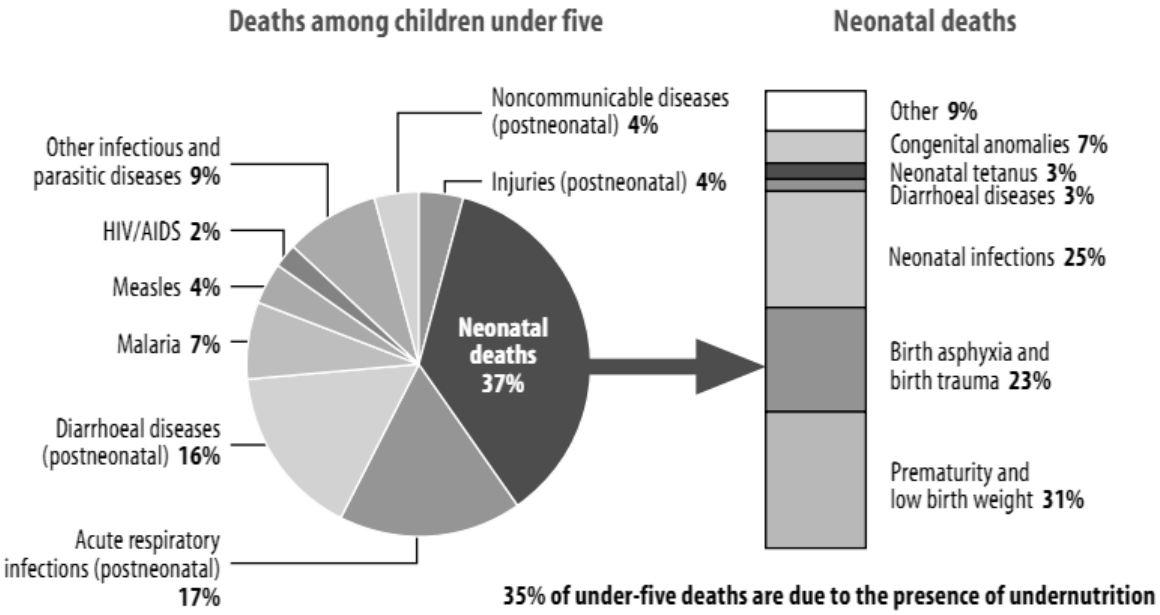

Figure 2.1 Major causes of death in neonates and children under five in the world, 2004 (WHO, 2009a:3).

In children aged six to twenty-four months, malnutrition is associated with more than 41.0% of deaths that occur in developing countries. Malnutrition leads to growth problems, and as a result Sub-Saharan Africa has a high prevalence of stunting, acute malnutrition and low weight-for-age (Matthew et al., 2009:12). Globally, 178 million (one-third of all children under 5) are stunted, 112 million are underweight, 55 million are wasted and 13 million infants are born each year with intrauterine growth retardation (WHO, 2006a:245). In addition to growth retardation, malnutrition in early childhood can lead to impaired intellectual performance and capacity for physical work in adulthood (WHO, 2009a:3).

2.3 BREASTFEEDING

Breastfeeding is accepted as the best infant feeding option, and the WHO, Academy of Nutrition and Dietetics (AND) as well as the American Academy of Paediatrics (AAP) are some of the organisations who have issued position statements in support of

breastfeeding. Research has indicated that there are numerous benefits for both the mother and the breastfed infant (Erick, 2008:184). Breastmilk is seen as the gold-standard of infant feeding, and companies who produce breastmilk substitutes attempt to emulate it during development. It has the optimal composition of essential nutrients, does not place strain on the kidneys, is easily digestible, and meets the needs of the growing infant like no other available milk can (Brown & Isaacs, 2008:165).

2.3.1 PHYSIOLOGY OF LACTATION

Breastfeeding is a natural process which follows pregnancy. It can be viewed as an extension of the nourishment given by the mother to the infant after gestation and birth (Whitney & Rolfes, 2011:516). Alveoli are the functional units in the mammary glands. Each alveolus contains a duct in the centre and secretory cells in clusters around it. The small ducts eventually branch into six to ten large collecting ducts, which lead to the nipple. Secretory cells are surrounded by myoepithelial cells which can contract, resulting in breastmilk being ejected into the ducts (Brown, 2011:161).

Hormonal influences play an important role in the initiation and continuation of breastfeeding, and numerous hormones are involved during and after pregnancy. Prolactin is necessary for milk production, and the production will double with suckling. Oxytocin is the other hormone which will be released with the action of suckling or stimulation. The letdown of milk (ejection) from the glands to the ducts is the main role of this hormone. Colostrum, a thick and yellowish fluid, is the first milk that is produced and is often called the "first immunization" because it contains high levels of antibodies and anti-infective cells. Colostrum is high in protein, electrolytes and vitamin-A. At around two weeks postpartum, the colostrum would have gradually changed to mature milk, which can fully sustain the infant for approximately six months (Brown, 2011:161-164).

For the baby to suckle effectively and to prevent breast problems such as sore nipples and mastitis, it is important for the mother to know how to attach the infant to the breast, as well as the correct manner in which to position the infant.

The following signs must be observed to ensure that the infant is correctly attached:

- more of the areola is visible above the infant's top lip than below the lower lip;
- the infant's mouth is wide open;
- the infant's lower lip is curled outwards; and
- the infant's chin is touching or almost touching the breast (WHO, 2009a:13).

Positioning the infant for successful breastfeeding is also important. The following signs will be observed if the baby is correctly positioned:

- the infant's body should be straight, not bent or twisted;
- the infant should face the breast;
- the infant's body should be close to the mother's body; and
- the whole body of the infant should be supported, not just the head and neck (WHO, 2009a:15).

It is of the utmost importance that all breastfeeding mothers receive counselling regarding successful breastfeeding. This must take place during ante-natal visits as well as after birth. This will decrease breast problems and can give the parents a realistic idea about what to expect, as mothers should know how to breastfeed from the very first feed. Directly after birth, mothers should be encouraged to hold the baby with maximum skin-to-skin contact, and the initiation of breastfeeding should occur within one hour of birth. Unfortunately, a stressful labour and delivery can delay (more than 72 hours) lactation and increase infant suckling problems. Infants born by caesarean section and premature infants have the biggest risk for delayed lactation. These mothers should receive additional support and counselling on successful breastfeeding to prevent them from abandoning it, and opting for formula feeding (Jones & Spencer, 2007:246).

2.3.2 BENEFITS OF BREASTFEEDING TO THE INFANT

Breastfeeding confers both short-term and long-term benefits to infants. This results in healthy infants, as well as health benefits which extend into adult life.

2.3.2.1 SHORT-TERM BENEFITS

The protective effect of breastfeeding against infectious disease is supported by a large body of evidence. Upper- and lower respiratory tract infections, gastro-intestinal illnesses, urinary tract infections and otitis media are some of the main problems that breastfeeding can protect against. The immunological and antibacterial properties of breastmilk, together with the elimination of potential pathogens which may be introduced through formula feeding, provide the biological plausibility of protection (Allen & Hector, 2005:42). In epidemiology, 'biological plausibility' refers to the proposal of a causal association or relationship. According to Jackson & Nazar (2006:203), the new-born does have immune function, however it is immature. Breastmilk contains secretory immunoglobulin A which are antibodies that bind to potential pathogens, and in such a way prevent the attachment thereof to the infant's cells. Other factors contributing to the immunological action of colostrum and breastmilk, are the lymphocytes and leucocytes. The majority of the leucocytes are neutrophils and macrophages which can engulf and inactivate pathogens. Nonspecific factors include the enzyme, lysozyme, which inhibits the growth and proliferation of several bacterial species, and lactoferrin, a protein that binds iron and decreases the availability thereof for bacterial growth (Jackson & Nazar, 2006:203). The *bifidus* factor in breastmilk improves and support the growth of the probiotic bacteria, *Lactobacillus bifidus*. This beneficial bacterium stimulates antibody production and enhances the phagocytosis of antigens. Certain growth factors and hormones present in breastmilk will contribute to the maturation of the infant's gastro-intestinal tract, which protects the infant against pathogenic infections (Brown & Isaacs, 2008:165).

Breastfeeding is known to reduce morbidity and mortality risk in infants. A reduction in postnatal deaths from all causes, except congenital anomalies and malignancies, is associated with breastfeeding. The benefits of breastfeeding are not only limited to

resource poor communities. Even in the United States, where healthcare and sanitation is advanced, a definite relationship between breastfeeding and reduced morbidity in infants exists (Brown & Isaacs, 2008:166). Studies have shown that infants, who had received formula milks, were twice as likely to die from sudden infant death syndrome as breastfed infants. The risk for the development of allergies and asthma is also increased in the absence of breastfeeding (Allen & Hector, 2005:43).

2.3.2.2 LONG-TERM BENEFITS

In 2007, the WHO attempted to summarize the available evidence regarding the long-term effect of breastfeeding. Various systematic reviews and meta-analyses were consulted.

Regarding blood pressure, the updated meta-analyses show that there are protective effects of breastfeeding on both systolic and diastolic blood pressure. The protective effects are small, but significant. Lower sodium content in breastmilk than in formula milks was postulated as a contributing factor, but there is no consensus yet. The fatty acid content of breastmilk differs from those of most formula milks. Breastmilk contains long-chain fatty acids which are important structural components of the vascular endothelium. Evidence is available which shows that dietary supplementation of long-chain poly-unsaturated fatty acids can lower blood pressure (WHO, 2007a:11).

Several studies have shown that breastfeeding may lead to a favourable lipoprotein profile and has a protective effect against atherosclerosis and ischemic heart disease (Allen & Hector, 2005:43). Breastmilk contains higher levels of cholesterol than formula milks and the higher intake of cholesterol during infancy can down-regulate hepatic hydroxyl-methylglutaryl coenzyme A. This enzyme is the rate-limiting enzyme in cholesterol synthesis, and can therefore explain the lower levels of cholesterol in adults who were breastfed as infants (WHO, 2007a:20-22).

Even for a short period of breastfeeding, obesity risk is reduced. Prevention of obesity during childhood extends into adulthood, and is another long-term benefit of breastfeeding (Allen & Hector, 2005:43). Several biological mechanisms have been postulated in support

of this protective effect. Breastfed infants consume less protein and have lower energy metabolism than formula-fed infants. It has been observed that a higher protein intake during infancy is associated with an increased risk of obesity later in life. Formula feeding also leads to a greater insulin response which increases adipocytes and favours fat deposition. Lastly, some evidence suggests that breastfed infants will adapt to new foods such as vegetables more readily than their counterparts, which may decrease energy intake. The WHO concluded that breastfeeding provides a small protective effect against obesity. However, most of the studies were conducted in Western Europe and North America, and more research is needed to determine if the same results will be found in low and middle-income settings (WHO, 2007a:25-33).

Two main mechanisms by which breastfeeding can protect against type 2 diabetes mellitus are discussed in the WHO summary of evidence. Fasting glucose levels are inversely correlated to long-chain polyunsaturated fatty acids in the muscle cell membranes of skeletal muscle tissues. Breastmilk contains these long-chain fatty acids, while all formula milks do not. Changes in the skeletal muscle cell membranes can play a role in insulin resistance, hyperinsulinaemia and, over a period of time, beta-cell failure and type 2 diabetes mellitus. Another contributing factor might be the fact that formula-fed infants have higher post-prandial insulin and neurotensin concentrations which can lead to insulin resistance and type 2 diabetes mellitus. However, at this stage more studies are necessary to be able to draw substantiated conclusions (WHO, 2007a:34).

School achievement and intelligence levels are also positively associated with breastfeeding. The polyunsaturated fatty acids present in breastmilk are incorporated into neural cell membranes and important for cognitive development. The composition of breastmilk as well as the bonding which occurs during breastfeeding, contribute to intellectual development (WHO, 2007a:36).

Formula-fed infants might have an increased risk for type 1 diabetes mellitus, celiac disease, ulcerative colitis, Crohn's disease and childhood leukaemia. Limited evidence also exists for associations between formula feeding and other adverse effects such as dental occlusion and pyloric stenosis (Allen & Hector, 2005:44).

2.3.3 BENEFITS OF BREASTFEEDING TO THE MOTHER

Mothers who breastfeed gain hormonal, physical and psychosocial benefits. The act of breastfeeding stimulates oxytocin release which leads to uterine contractions and a faster return to normal size. These contractions will also help prevent excessive postpartum blood loss. Women may experience increased self-confidence and bonding with their infants (Brown and Isaacs, 2008:164). EBF can delay the return of ovulation and fertility. If a woman breastfeeds exclusively and frequently and amenorrhea is present, she has less than a two percent risk of falling pregnant in the first six months after giving birth, which helps with child spacing. EBF can also accelerate weight loss and a faster return to pre-pregnancy weight (WHO, 2009a:5). Breastfeeding is protective against premenopausal and probably postmenopausal breast cancer. Recently, evidence has indicated a protective effect against ovarian cancer and rheumatoid arthritis. Biological plausibility exists which suggests a protective effect against endometrial cancers and osteoporosis (Allen & Hector, 2005:44).

Breastfeeding is much more convenient and less expensive than providing formula milk to infants. Infants who are breastfed will have fewer episodes of infectious diseases, which save healthcare costs and reduce employee absence (Insel et al., 2010:538).

2.3.4 KNOWLEDGE, ATTITUDES AND PRACTICES

Today's modern lifestyle has unfavourably affected breastfeeding in many communities worldwide. Women's roles have changed, and more women are becoming breadwinners in the family which may affect infant feeding practices at home. Studies suggest that EBF up to the age of six months is not a common practice in Western countries as well as in Sub-Saharan Africa (Chopra et al., 2009:69). Chopra et al. (2009:70) conducted a study to investigate barriers to EBF in Eldoret, Kenya. They found that women perceived their breastmilk to be unsatisfying to the infants. The women would then add food to the infant's diet, resulting in mixed feeding. Women also explained that they did not think that their breasts were producing enough milk, which the authors state concurs with studies done in South Africa, Sri Lanka and Kenya. Mothers returning to work after three months of

maternity leave also gave mixed feedings since they were not at home with the infant for six months (Chopra et al., 2009:70).

Fjeld et al. (2008:1) investigated barriers to EBF in Zambia's rural and urban areas. Some of the mother's from rural areas mentioned that colostrum is dirty and feared it would make the infant sick. They expressed and discarded the colostrum. Pre-lacteal feeds (feeds given before breastmilk initiation) were given by the minority of rural mothers. The rationale for giving these foods was low milk production, and to wet the infant's mouth and throat. Although all of the mothers in the study were familiar with, and in support of EBF, few mothers practiced EBF. The main barrier was the perception that breastmilk alone is not enough for the infant, as well as the fear that the mother might get sick or die leaving the child unaccustomed to other milks. Most grandmothers who participated in the study responded negatively to the concept of EBF, and would recommend that their daughter/daughter-in-law add foods before the age of six months. Most mothers agreed that if the mother was very sick, most citing HIV, she should stop breastfeeding. Sore nipples and a subsequent pregnancy were also mentioned as reasons for early cessation of breastfeeding (Fjeld et al., 2008:1-12).

Sibeko (2005:31) investigated beliefs, attitudes and practices of breastfeeding mothers in a peri-urban community in South Africa. Not one of the 115 mothers reported EBF, and complimentary foods were given to 32.0% of infants by their first month of life. Ninety percent of the mothers cited inadequate milk production as the reason for adding foods or liquids to the infant's diet of breastmilk. Up to 56.0% of infants received traditional herbal preparations before the age of one month (Sibeko, 2005:31). Similar results were reported by Mamabolo et al. (2004:327) who researched the feeding practices of infants in the central region of the Limpopo Province in South Africa. It was found that 56.0% of mothers introduced supplementary feeds by the first month of life, and the most common foods given were mealie meal and sorghum porridges (Mamabolo et al., 2004:327).

Shah et al. (2005:33) assessed the breastfeeding knowledge of health workers in rural South Africa, and included doctors, nurses and community health workers. Significant discrepancies were found in knowledge when compared to WHO guidelines. Half of the

respondents would recommend solid foods before the age of six months in addition to breastmilk. Only approximately half of the health workers knew that breastfeeding should be given on demand. Regrettably, the most common advice given to mothers who complained of the infant crying or perceived to be thirsty or unsatisfied, was to supplement with other fluids or foods (Shah et al., 2005:33).

Inadequate breastfeeding knowledge and misconceptions lead to inappropriate practices commonly seen around the world. Comprehensive training of mothers, family members and health care workers is urgently required to correct these unsuitable practices.

2.3.5 BREASTFEEDING PROMOTION

Several global strategies with the aim of protecting and promoting breastfeeding have been developed:

2.3.5.1 BABY FRIENDLY HOSPITAL INITIATIVE

The promotion of breastfeeding is an on-going, essential endeavour. The Baby Friendly Hospital Initiative (BFHI) is a global effort which was launched in 1991 by the WHO and UNICEF. This initiative was introduced in response to the Innocenti Declaration on the protection, promotion and support of breastfeeding. The main aims are to implement practices which will promote, protect and support breastfeeding, as well as improving the role of maternity services to enable new mothers to breastfeed their infants. Health care facilities must comply with ten criteria to be certified Baby Friendly (WHO, 2009:1). More than 15 000 health care facilities in 134 countries have been awarded BFHI status after complying with the Global Criteria and passing external assessment. In areas where hospitals and facilities have been promoting the initiative, child health has improved and more mothers are breastfeeding their infants (UNICEF, 2011: online). Unfortunately, the implementation of the initiative is not always without problems. Marais et al. (2010:40) investigated the breastfeeding policies and practices in health care facilities in the Western Cape Province, South Africa. The overall score of the implementation of the Ten Steps was only average, and they concluded that appropriate and continuous training and better

referral systems to ensure the establishments of early breastfeeding, were necessary (Marais et al., 2010:40).

The foundation of the initiative is the Ten Steps to Successful Breastfeeding, which states that facilities providing maternity services and care for new-born infants should:

1. have a written breastfeeding policy that is routinely communicated to all health care staff;
2. train all health care staff in skills necessary to implement this policy;
3. inform all pregnant women about the management and benefits of breastfeeding;
4. help mothers initiate breastfeeding within half an hour of birth;
5. show mothers how to breastfeed and how to maintain lactation if separated from their infants;
6. give new-born infants no food or drink other than breastmilk, unless medically indicated;
7. practice rooming-in: mothers and infants to remain together at all times;
8. encourage breastfeeding on demand;
9. give no artificial teats or pacifiers to breastfeeding infants; and,
10. foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital (WHO, 2009b:32-38).

The South African government supports the BFHI as stated in the 2010 PMTCT Guidelines (NDoH, 2010:32).

2.3.5.2 INTERNATIONAL CODE OF MARKETING OF BREASTMILK SUBSTITUTES

The International Code of Marketing of Breastmilk Substitutes is a set of recommendations used to regulate the marketing of breastmilk substitutes, especially infant formula milks, as well as feeding bottles and teats. The code was adopted by the World Health Assembly in 1981 to assist in the protection and promotion of appropriate infant and young child feeding practices, especially the act of breastfeeding. In 1996 all of the member states affirmed their support of the code and subsequent suitable legislation and measures.

However in West Africa, few countries have adopted policies for the implementation of the code. Aguayo et al. (2003:1) investigated compliance with the code in West Africa. They concluded that manufacturers were indeed violating the code. A multicentre study showed that leading manufacturers were also violating the code in Thailand, Bangladesh, Poland and South Africa (Aguayo et al., 2003:1). More recently, Sokol et al. (2008:159) established that important progress has been made in the last several years in nations in West and Central Africa (Sokol et al., 2008:159). This is encouraging news as the code is an important tool that should be used to improve child survival. Some of the main aims of the code stipulate that breastmilk substitutes, bottles and teats should not be promoted to the public; healthcare facilities and health care workers should not play any role in the promotion of breastmilk substitutes; and pregnant women, new mothers or other family members should not receive free samples of these products (UNICEF, 2011:online).

2.3.5.3 GLOBAL STRATEGY FOR INFANT AND YOUNG CHILD FEEDING

The WHO and UNICEF have developed the global strategy for infant and young child feeding to ensure that world attention is focused on the fact that the feeding practices of infants and young children have a major impact on their health, nutritional status, development and growth. The importance of EBF is the main feature in the optimal feeding practice of infants up to the age of six months, and it is recommended that breastfeeding continues up to the age of two years and beyond. The importance of support from health care systems to mothers and the provision of accurate information are also highlighted. Breastfeeding should also be promoted to women who are in paid employment. Paid maternity leave, part-time work arrangements, on-site crèches, facilities for expressing and storing breastmilk and breastfeeding breaks are mentioned as factors to be considered (WHO, 2003:7-8).

The World Alliance for Breastfeeding Promotion (WABA) is a global network which advocates for the protection, promotion and support of breastfeeding an all countries around the world. It is based on the Innocenti Declaration and the Global Strategy for Infant and Young Child Feeding. WABA is in consultative status with UNICEF, and their vision is a

world where breastfeeding is the cultural norm (World Alliance for Breastfeeding Promotion, 2011: online).

2.3.6 ACCEPTABLE MEDICAL REASONS FOR THE USE OF BREASTMILK SUBSTITUTES

The advantages of breastfeeding are numerous and well-documented, and although almost all mothers can breastfeed successfully, a few health conditions in either the mother or infant may justify the temporary or permanent avoidance of breastfeeding. Infants who suffer from inborn errors of metabolism such as phenylketonuria or classic galactosemia should receive a specialized infant formula. Maternal HIV infection might be a contra-indication if the mother can meet the AFASS criteria for safe formula feeding (affordable, feasible, acceptable, sustainable and safe). Severe illness in the mother and the use of certain medications can lead to temporary avoidance of breastfeeding. Breast abscess, hepatitis, mastitis, tuberculosis and substance abuse are conditions in which breastfeeding can continue, although health problems for the infant may be of concern (WHO, 2009a:89-90)

2.4 BREASTMILK SUBSTITUTES

2.4.1 INFANT FORMULA

Until relatively recently, wet nurses were the only safe substitute to the infant's own mother's breastmilk in the history of mankind. Only after techniques for the chemical analysis of milks become available in the 19th century, could safe breastmilk substitutes be developed. The determination of the energy, macro- and micronutrients was also a necessary step for this advancement in infant feeding. Human breastmilk is used as a reference during the development of most infant formulas, and usually cow's milk is used as the protein source (Clemens et al., 2011: 18).

In 1867, the German chemist Justus von Liebig patented the first preparation, 'Soup for Infants', which consisted of a mixture of cooked wheat flour, cow's milk, malt flour and

potassium carbonate. At the end of the 19th century Heubner and Rubner developed the calorimetric method of infant feeding and enabled the practice of feeding infants according to their energy needs. In 1915 Gerstenberger and colleagues developed an infant formula milk with an adapted fat content to simulate that of human milk and signalled the modern era of nutritionally complete formula milks (Clemens et al., 2011: 19).

2.4.2 DIFFERENT TYPES OF FORMULAS

Breastfeeding is still considered as the optimal infant feeding milk available. However, many parents will, for various reasons, choose to give an adequate breastmilk substitute. There are a wide variety of infant formulas on the market and choosing an appropriate product can be intimidating. Most formulas can be classified into categories based on three parameters: protein composition, caloric density and carbohydrate source (O'Connor, 2009:565). ESPGHAN has developed certain standards regarding the nutritional composition of formula milks. All formula milks must meet these standards to ensure a proper nutritional composition. Manufacturers of formula milks are continually adapting the milks in an attempt to emulate breastmilk as accurately as possible. New discoveries of human milk components stimulate research, and ultimately the addition of these components to the formula milks, if they are found to be beneficial. Long-chain polyunsaturated fatty acids, pre-and probiotics and nucleotides are three of the most common components added to formula milks (Owens et al., 2012:25).

2.4.2.1 COW'S MILK-BASED FORMULAS

Standard cow's milk formulas can provide adequate nutrition to healthy, normal infants for the first six months of life. The carbohydrate source in these formulas is lactose, the same as in human milk. Lactose-free cow's milk-based formulas are also available for infants with lactose intolerance, and these formulas contain corn syrup solids as a carbohydrate source. Cow's milk-based formula milks contain whey and casein in differing ratios as the protein source (Joeckel & Phillips, 2009:356). All infants that are formula-fed should receive an iron-fortified formula to prevent iron deficiencies (O'Connor, 2009:565).

2.4.2.2 SOY FORMULAS

Soy protein formulas are lactose and cow's milk protein free. Recently, the AAP issued a guideline which states that soy formulas should only be used for infants with galactosemia or congenital lactase deficiency. Vegan families may also opt for soy formulas as they attempt to avoid all animal-derived products. Soy formulas have been surrounded by much controversy, especially regarding the high isoflavone (phytoestrogen) content and its possible effect on reproductive health. Pre-term or low-birth weight infants should not be fed soy formulas. Some authors recommend that the wide-spread use of soy formulas should be avoided, and that parents should rather be directed to cow's milk-based formulas or breastfeeding (O'Connor, 2009:568). Soy protein formulas have been prescribed to infants with documented cow's milk protein allergies. However, 10.0 – 14.0% of infants who are allergic to cow's milk will also be allergic to soy protein. Soy protein formulas have also not been proven useful in the management of infantile colic or fussiness (Bhatia & Greer, 2008:1065).

2.4.2.3 HYDROLYZED PROTEIN FORMULAS

Protein hydrolysate formulas contain proteins which have been altered. The whey and/or casein component is heat-treated and hydrolysed into peptide chains and free amino acids using enzymes. These formulas are used for infants with cow's milk protein sensitivity or allergy. Most of the hydrolysed formulas contain medium-chain triglyceride or long-chain fatty acids as a fat source for easier absorption. Hydrolysed formulas are more expensive and less palatable than standard formulas (Joeckel & Phillips, 2009:358). According to Hays & Wood (2005:810) who conducted a systematic review of data, hydrolyzed protein formulas are appropriate replacement feeds for allergy prevention in infants who have a risk for the development of allergies (Hays & Wood, 2005:810).

2.4.2.4 OTHER FORMULAS

A number of other types of formulas exist. Acidified formulas contain lactic acid or undergo biological fermentation to transform lactose into lactic acid. This can reduce the growth of

pathogens and prevent diarrhoea in infants. For premature infants, breastmilk is the best milk feed to support growth and development. However, if breastmilk is not an option, certain preterm formulas exist for this vulnerable group. For infants struggling with reflux, pre-thickened formulas have been developed which are thickened with cooked corn starch or locust bean gum and may reduce the incidence of reflux. Follow-on formula milks are also available for infants older than six months of age (Owens et al., 2012:25). A range of specialized formulas are available for specific conditions and problems and a well-informed physician and dietician can assist in the optimal feeding choice for the infant with special needs.

2.4.3 CURRENT TRENDS IN INFANT FORMULA DEVELOPMENT

As previously mentioned, breastmilk remains the gold-standard of infant feeding and it is because of this fact that manufacturers are continuously attempting to simulate breastmilk. Adding certain components to basic formula milk is becoming more popular. Pre-and probiotics are examples of these additives. Prebiotics are not digestible by humans and stimulate the growth of beneficial bacteria (probiotics) in the gastro-intestinal tract. Numerous oligosaccharides are present in breastmilk and have anti-infective and allergy preventative properties. Studies have shown that prebiotic supplementation can decrease infections in infants. Probiotics are being investigated for potential health benefits, but the long-term effects of supplementation are not yet known. The nitrogenous compounds, nucleotides, can have beneficial effects on the gastro-intestinal tract and immune system (Joeckel & Phillips, 2009:359). Arachidonic acid (AA) and docosahexanoic acid (DHA) are also commonly added. These fatty acids are found in breastmilk, but not in formula milks and are thought to be important for the cognitive development of the infant. However, clinical trials have been inconstant in proving this claim, and a recent Cochrane review concluded that supplementation of formulas with AA and DHA cannot be recommended based on the available evidence (O'Connor, 2009:567).

2.4.4 RISKS AND CONTROVERSIES

Breastfeeding is an effective intervention to prevent the unnecessary deaths of millions of infants and children worldwide. A pooled analysis by the WHO concluded that the absence of breastfeeding was associated with a 5.8 times increased risk of all-cause mortality in infants under the age of two months, and that the added risk remained higher into the second year of life (Sobel et al., 2011:1445). The benefits of breastfeeding are well-known, and when infants are given formula milk, many of these benefits are forfeited.

Foodborne illnesses can be especially harmful to infants and young children. UNICEF has reported that infants and children worldwide have developed problems which were linked to the improper preparation of infant formulas under unsanitary conditions where contaminated water was also used. *Enterobacter Sakazakii* has recently come under the spotlight as it was implicated in fatal infections in infants from different countries who were fed with contaminated formula milks (Herbold & Scott, 2008:451).

Manufacturers have an important responsibility to produce safe formula milks. China is the largest market for infant formula worldwide, and the recent contamination of infant formula with melamine caused a health crisis. Melamine was added to the milk powder to conceal the low protein content. At least 50 000 infants were admitted to hospitals with renal stones that caused the death of some infants (Qui et al., 2010:189). In 2010, Abbott labs recalled approximately five million tins of *Similac* infant formula in the United States due to the presence of a 'small common beetle', owing to the fact that infants may experience gastrointestinal discomfort, stomach pain and decreased appetite when this was ingested (Judd, 2010:online). These are two examples which stress the fact that it cannot simply be accepted that infant formulas are always safe.

The use of formula milk will always remain a controversial issue. In 2010, South African Health Minister, Doctor A Motsoaledi made a bold statement in which he proposed a ban on infant formula worldwide and that the advertising thereof should be discouraged. He said that it is known that breastfeeding is the best for infants, and that if there are exceptions, they should be dealt with ("Ban infant formula", 2010: online). Even though his

support for breastfeeding is evident and admirable, the complete worldwide ban of infant formulas is unrealistic and will most likely never occur.

2.5 ANIMAL MILK

Until the infant is one year old, unmodified cow's milk is not recommended as a replacement milk for breastmilk or an appropriate formula milk. It does not contain adequate micronutrients such as vitamin-C and iron, and the infant's immature kidneys can be stressed by plain cow's milk, due to the high protein, mineral and electrolyte content thereof (Sizer et al., 2011:528). In some infants, especially those under the age of six months, whole cow's milk can cause intestinal bleeding which can contribute to an iron deficiency. It is also not capable of adequately replacing iron losses. Cow's milk will also reduce the bioavailability of iron from other foods such as infant cereals as it has a high calcium content and a low vitamin-C content: both factors which inhibit iron absorption (De Bruyn et al., 2012:322).

Goat's milk can be considered as a potential hazard to the infant's safety as it is not subject to the same hygiene legislation as cow's milk and can be bought as unpasteurized. Nutritional adequacy is also a concern, as the levels of folic acid and vitamins-A, -D, -C and –B12 are low. It has an even higher renal solute load than cow's milk which stresses the kidneys. For these reasons, it is recommended that goat's milk should not be given to infants below the age of one year. It is believed by some that if an infant suffers from a cow's milk protein allergy, goat's milk can be given. However, cross-reactions between the similar proteins are possible and this is not an effective or recommended practice. Ewe's milk is also unsuitable for infants for the same reasons as goat's milk (Bentley et al., 2004:44).

2.6 APPROPRIATE COMPLIMENTARY FEEDING

For the first couple of months the immature stomach and intestines of the infant can only digest lactose, but not starches. This is one of the reasons why breastmilk or an appropriate

formula milk is the best source of energy and nutrients to support optimal growth and development (De Bruyn et al., 2012:323).

The WHO recommends EBF up to the age of six months. This guideline is especially important for infants in developing countries where food- and water-borne infections are more prevalent. If children are weaned on nutritionally inadequate foods, the risk of malnutrition increases (Langley-Evans, 2009:131). The AAP also recommends EBF up to the age of around six months. They do however recognize that some infants develop earlier and are ready for solid foods from the age of around four months. The physical readiness to accept solid foods must be assessed in each infant. Solid foods must be introduced to the infant's diet since there comes a time when breastmilk or formula milk alone will not be able to nutritionally sustain the growing infant's needs. Iron and vitamin-C are some of the most important nutrient needs to be considered during the weaning process. At about four to six months the rapidly growing body of the infant will require more iron than the body stores, breastmilk or infant formula milk can supply. In addition to breastmilk or iron-fortified formulas, infants can be given iron-fortified cereals and protein foods such as meat and legumes. Vitamin-C will increase iron absorption and foods rich in this vitamin must be included in the infant's diet. Stages of infant development and the recommended foods are described in table 2.1 (De Bruyn et al., 2012:324).

Table 2.1 Infant development and recommended foods to add (De Bruyn et al., 2012:324).

Age (months)	Feeding Skill	Foods to be introduced
0-4	Turns head toward any object that brushes cheek. Initially swallows using back of tongue; gradually begins to swallow using front of tongue as well. Strong reflex (extrusion) to push food out during first 2 to 3 months.	Feed breastmilk or infant formula.
4-6	Extrusion reflex diminishes, and the ability to swallow non-liquid foods develops. Indicates desire for food by opening mouth and leaning forward. Indicates satiety or disinterest by turning away	Begin iron-fortified cereal mixed with breastmilk, formula milk or water. Begin pureed meats and legumes, vegetables and fruits.

	and leaning back. Sits erect with support at 6 months. Begins chew action. Brigs hand to mouth. Grasps object with palm of hand.	
6-8	Able to self-feed finger foods. Develops pincher (finger to thumb) grasp. Begins to drink from cup.	Begin textured vegetables and fruits. Begin unsweetened, diluted fruit juices from cup.
8-10	Begins to hold own bottle. Reaches for and grabs food and soon. Sits unsupported.	Begin breads and cereals from the table. Begin yogurt. Begin pieces of soft cooked vegetables and fruit from the table. Gradually begin finely cut meats, fish, casseroles, cheese, eggs, and mashed legumes.
10-12	Begins to master soon but still spills some.	Add variety. Gradually increase portion sizes.

The prevention of the development of food allergies in infants has become a controversial issue during recent years. Traditionally, the introduction of allergenic foods such as wheat, fish, eggs and nuts were delayed in an attempt to prevent food allergies. Recently, studies have shown that there is no current convincing evidence that delaying the introduction of these foods beyond the age of four to six months has a significant protective effect. Further research is necessary to be able to recommend firm guidelines regarding food allergy prevention in infants (Greer et al., 2008:188). ESPGHAN recommends EBF for four to six months to prevent allergy development. They also recommend that high-risk infants should be fed with a hypoallergenic formula if they are not breastfed. The AAP recommends the avoidance of the introduction of allergenic foods before the age of four months, as well as after the age of seven months (Grimshaw et al., 2009:1411).

The WHO lists the following ten guidelines for the appropriate introduction of complimentary foods (WHO, 2009a:19):

- practise EBF from birth to six months of age, and introduce complimentary foods at six months of age (180 days) while continuing to breastfeed;
- continue frequent, on-demand breastfeeding until two years of age or beyond;
- practise responsive feeding, applying the principles of psychosocial care;
- practise good hygiene and proper food handling;
- start at six months of age with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breastfeeding;
- gradually increase food consistency and variety as the infant grows older, adapting to the infant's requirements and abilities;
- increase the number of times that the child is fed complementary food as the child gets older;
- feed a variety of nutrient-rich foods to ensure that all nutrient needs are met;
- use fortified complimentary foods or vitamin-mineral supplements for the infant as needed; and,
- increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, favourite foods. After illness, give food more often than usual and encourage the child to eat more (WHO, 2009a:19).

2.7 CONCLUSION

Adequate infant nutrition begins even before conception as the woman starts to prepare for pregnancy. Optimal prenatal care is an important factor in the health and nutrition of the infant. Rates of breastfeeding initiation have been improving during recent years, however, continued support and strategies for the promotion thereof should always remain a global goal. In addition to this, the reduction of poverty, poor education, disease burden and lack of women's empowerment will undoubtedly improve child health and nutrition (Bremmer & Wachs, 2010:50).

CHAPTER 3
HIV/AIDS

3.1 INTRODUCTION

Currently, no cure for HIV is available. However, the management of the HIV-infected patient has improved since the start of the pandemic. A decrease in morbidity and mortality can be ascribed to earlier interventions, novel therapies and the prevention of secondary infections (Goroll & Mulley, 2009:87).

For the purpose of this review, HIV prevalence, pathophysiology, diagnosis and signs and symptoms will briefly be reviewed. A more comprehensive overview of the relationship between HIV, nutrition and pregnancy will follow.

3.2 HIV PREVALENCE

According to the 2010 UNAIDS Global Report on the AIDS Epidemic, the growth of the HIV epidemic seems to have stabilized. The numbers of new infections as well as deaths related to AIDS have been declining since the 1990s. Since 1999 there has been a nineteen percent reduction in the amount of people who became newly infected with HIV; from 3.1 million people in 1999 to 2.6 million people in 2009. Between 2001 and 2009, the incidence in 22 sub-Saharan countries has fallen by more than 25.0%. Even though these figures are encouraging, the total number of people living with HIV continues to be overwhelming. In table 3.1 it can be seen that sub-Saharan Africa remains the area with the highest prevalence, with an estimated 22.5 million people infected. This translates to 68.0% of the global total, and these countries have more women living with HIV than men. The largest epidemics occur in Ethiopia, Nigeria, South Africa, Zambia and Zimbabwe (UNAIDS, 2010a:16-25).

Globally, a total of 33.3 million people are living with this incurable disease (UNAIDS, 2010a:16-25).

Table 3.1 **Regional figures on adults and children newly infected and living with HIV and AIDS-related deaths (UNAIDS, 2010a:20).**

		Adults and children living with HIV	Adults and children newly infected with HIV	% Adult prevalence (15–49 years)	AIDS-related deaths among adults and children
SUB-SAHARAN AFRICA	2009	**22.5 million** [20.9–24.2 million]	**1.8 million** [1.6–2.0 million]	**5.0** [4.7–5.2]	**1.3 million** [1.1–1.5 million]
	2001	**20.3 million** [18.9–21.7 million]	**2.2 million** [1.9–2.4 million]	**5.9** [5.6–6.1]	**1.4 million** [1.2–1.6 million]
MIDDLE EAST AND NORTH AFRICA	2009	**460 000** [400 000–530 000]	**75 000** [61 000–92 000]	**0.2** [0.2–0.3]	**24 000** [20 000–27 000]
	2001	**180 000** [150 000–210 000]	**36 000** [32 000–42 000]	**0.1** [0.1–0.1]	**8300** [6300–11 000]
SOUTH AND SOUTH-EAST ASIA	2009	**4.1 million** [3.7–4.6 million]	**270 000** [240 000–320 000]	**0.3** [0.3–0.3]	**260 000** [230 000–300 000]
	2001	**3.8 million** [3.5–4.2 million]	**380 000** [350 000–430 000]	**0.4** [0.3–0.4]	**230 000** [210 000–280 000]
EAST ASIA	2009	**770 000** [560 000–1.0 million]	**82 000** [48 000–140 000]	**0.1** [0.1–0.1]	**36 000** [25 000–50 000]
	2001	**350 000** [250 000–480 000]	**64 000** [47 000–88 000]	**<0.1** [<0.1–<0.1]	**15 000** [9400–28 000]
OCEANIA	2009	**57 000** [50 000–64 000]	**4500** [3400–6000]	**0.3** [0.2–0.3]	**1400** [<1000–2400]
	2001	**29 000** [23 000–35 000]	**4700** [3800–5600]	**0.2** [0.1–0.2]	**<1000** [<500–1100]
CENTRAL AND SOUTH AMERICA	2009	**1.4 million** [1.2–1.6 million]	**92 000** [70 000–120 000]	**0.5** [0.4–0.6]	**58 000** [43 000–70 000]
	2001	**1.1 million** [1.0–1.3 million]	**99 000** [85 000–120 000]	**0.5** [0.4–0.5]	**53 000** [44 000–65 000]
CARIBBEAN	2009	**240 000** [220 000–270 000]	**17 000** [13 000–21 000]	**1.0** [0.9–1.1]	**12 000** [8500–15 000]
	2001	**240 000** [210 000–270 000]	**20 000** [17 000–23 000]	**1.1** [1.0–1.2]	**19 000** [16 000–23 000]
EASTERN EUROPE AND CENTRAL ASIA	2009	**1.4 million** [1.3–1.6 million]	**130 000** [110 000–160 000]	**0.8** [0.7–0.9]	**76 000** [60 000–95 000]
	2001	**760 000** [670 000–890 000]	**240 000** [210 000–300 000]	**0.4** [0.4–0.5]	**18 000** [14 000–23 000]
WESTERN AND CENTRAL EUROPE	2009	**820 000** [720 000–910 000]	**31 000** [23 000–40 000]	**0.2** [0.2–0.2]	**8500** [6800–19 000]
	2001	**630 000** [570 000–700 000]	**31 000** [27 000–35 000]	**0.2** [0.2–0.2]	**7300** [5700–11 000]
NORTH AMERICA	2009	**1.5 million** [1.2–2.0 million]	**70 000** [44 000–130 000]	**0.5** [0.4–0.7]	**26 000** [22 000–44 000]
	2001	**1.2 million** [960 000–1.4 million]	**66 000** [54 000–81 000]	**0.4** [0.4–0.5]	**30 000** [26 000–35 000]
TOTAL	2009	**33.3 million** [31.4–35.3 million]	**2.6 million** [2.3–2.8 million]	**0.8** [0.7–0.8]	**1.8 million** [1.6–2.1 million]
	2001	**28.6 million** [27.1–30.3 million]	**3.1 million** [2.9–3.4 million]	**0.8** [0.7–0.8]	**1.8 million** [1.6–2.0 million]

South Africa's epidemic is the largest in the world with an estimated 5.6 million people living with HIV. Safer sex practices among young people seem to be slowing the incidence rate. A sharp decline in HIV incidence was recently noted in 18-year-olds, when it dropped from 1.8% in 2005 to 0.8% in 2008. In women between the ages of 15-34 years, incidence declined from 5.5% in 2003-2005 to 2.2% in 2005-2008 (UNAIDS, 2010a:28).

The South African Antenatal Sentinel HIV and Syphilis Survey is the largest survey of its kind in the world, and is executed annually in October. According to the most recent available survey results from 2011, the national HIV prevalence in the general population (15 – 49 years) was estimated at 17.3%. The estimated provincial prevalence in the general population for the year 2011 was as follows: KwaZulu-Natal = 24.7%; Mpumalanga = 24.1%; Free State = 19.6%; North West = 18.9%; Eastern Cape = 16.0%; Gauteng = 16.1%; Limpopo = 12.9%; Northern Cape = 9.2%; and, Western Cape = 4.8%. HIV prevalence among ante-natal women in South Africa in 2011 was estimated at 29.5%, and in the Free State it was estimated at 32.5% (NDoH, 2012:14).

3.3 PATHOPHYSIOLOGY

Progressive immunodeficiency, a clinical period of latency and opportunistic infections are the hallmarks of HIV infection. When treatment is not administered, it takes on average ten years for the HIV infection to progress to an AIDS defining opportunistic infection, after which survival averages one to two years. However, definite individual variability for these time intervals exists, and the use of prophylactic ARVs and ART have improved the overall prognosis considerably (Sax, 2010:2).

The main agents which protect against infections in the body are the T-helper lymphocytes (CD_4 cells). The HI virus invades these cells and causes a gradual depletion in cell quantity which ultimately leads to immunodeficiency. HIV infection follows four clinical stages: acute HIV infection, clinical latency, symptomatic HIV infection, and lastly, the progression of HIV to AIDS. When the CD_4 cell counts fall below 500 cells/mm^3, the individual will become increasingly more susceptible to signs and symptoms such as opportunistic infections, neoplasms, fever, chronic diarrhoea and weight loss (Dong & Imai, 2012:866).

HIV can be transmitted via blood, exchange of bodily fluids during sexual contact and through breastfeeding (Escott-Stump, 2008:763).

3.4 DIAGNOSIS

A diagnosis of HIV infection is usually made when a serology sample tests positive for HIV antibodies, but virus isolation and HIV antigen detection can also be used. The Centres for Disease Control (CDC) criteria for diagnosis for persons eighteen months and older, includes:

- a positive result on a screening test for HIV antibodies followed by a confirmatory test, or
- a positive result of a detectible quantity on any of the following HIV virologic tests: HIV nucleic acid detection, HIV p24 antigen test, and HIV isolation.

The CDC diagnosis of AIDS incorporates clinical presentations and the significance of CD_4 counts. The definition of AIDS requires the following:

- CD_4 count of less than 200 cells/mm^3 and laboratory evidence of HIV, or
- the presence of an AIDS-indicator disease and laboratory evidence of HIV infection (Goroll & Mulley, 2009:87).

In infants below the age of eighteen months, HIV DNA (deoxyribonucleic acid) polymerase chain reaction (PCR) is the preferred test to diagnose HIV. The test has a high sensitivity (95.0%) and specificity (97.0%) in infants between the ages of 1 – 36 months. Most infants will have detectible levels of HIV DNA by the age of two weeks, and infants should be tested during the first 48 hours after birth to detect the presence or absence of perinatal transmission (Green, 2012:408).

3.5 SIGNS AND SYMPTOMS

The majority of people who have become infected with HIV will develop symptoms early during the disease progression. Certain laboratory tests may also be abnormal in this period of acute HIV infection although these results are not diagnostic of infection. It is not known whether the symptoms in acute HIV infection are a result of the direct effects of the HIV, or the resultant release of cytokines when the immune system is activated. Table 3.2 lists common clinical and laboratory findings of acute HIV infection (Bell et al., 2011:64).

Table 3.2 Common signs and symptoms of acute HIV infection (Bell et al., 2011:64).

Common clinical findings	Common laboratory findings
Fever	Low white blood cell count
Sore throat	Low platelet count
Swollen glands	Elevated liver function tests
Rash	Low CD_4 count
Muscle aches	High viral count load
Joint pain	
Night sweats	
Stomach ache	
Vomiting	
Diarrhoea	
Headache	
Stiff neck	
Loss of appetite	
Weight loss	
Oral and genital ulcers	

Advanced HIV or AIDS manifests with more severe symptoms when patients become increasingly susceptible to infections and other complications such as pneumocystis pneumonia, cryptococcus, mycobacteria avium intracellulare, toxoplasmosis and cytomegalovirus. HIV negatively affects the heart, lungs, kidneys, brain, adrenal glands, nerves and all of the organ systems in the body (Bell et al., 2011:70). Malignancies related to AIDS commonly include Kaposi's sarcoma, Hodgkin's disease and non-Hodgkin's lymphoma (Escott-Stump, 2008:763).

3.6 ANTIRETROVIRAL THERAPY IN HIV/AIDS

ZDV was the first antiretroviral drug produced to manage HIV. Since the release of ZDV in 1987, four classes of ARVs have been developed, namely: nucleoside/nucleotide reverse transcriptase inhibitors (NRTIs), non-nucleoside reverse transcriptase inhibitors (NNRTIs), protease inhibitors (PIs) and fusion inhibitors (FIs). Combination treatment comprising of two NRTIs and one NNRTI or PI is known as HAART (Neofytos & Squires, 2008:689). The main goals of ART are the suppression of viral replication to undetectable levels, restoration and preservation of the immune system and an improvement in clinical outcome (Sax, 2010:16). Treatment should be considered when patients have a history of AIDS-defining diseases or a CD_4 count <350 cell/mm^3. CD_4 count will be disregarded in patients who are pregnant, have HIV-associated nephropathy, or have hepatitis B infection. If a patient has a CD_4 count $\geq$350 cell/mm^3 and has not had an AIDS-defining illness, the initiation of ART must be considered on a case-by-case basis (Goroll & Mulley, 2009:94).

Unfortunately, the use of ARVs is not without possible side-effects. Lipodystrophy, hepatotoxicity, metabolic disorders, macrocytic anaemia, pancreatitis, gastro-intestinal symptoms, dizziness, depression and nightmares can be experienced. Hyperglycaemia and hyperlipidaemia are often attributed to PIs, and severe skin allergic reactions can be caused by the use of Nevirapine in women with a high CD_4 count (Gross, 2011:312). A potential problem caused by the side-effects is non-adherence to the drug-regime which can lead to drug resistance (Dong & Imai, 2012:867). The newest South African Antiretroviral Treatment Guidelines were released in 2010 and outline the goals, objectives, procedures and regimes used in South Africa. The standardised national eligibility criteria for starting ART regimes for adults and adolescents is summarised in table 3.3 (DoH, 2010: 1-2).

Table 3.3 The standardised national eligibility criteria for starting ART regimes for adults and adolescents (DoH, 2010: 1-2).

Eligible to start ART
CD_4 count $\leq$ 200 cells/mm^3 irrespective of clinical stage **OR** CD_4 count $\leq$ 300 cells/mm^3 (In patients with Tuberculosis or HIV and pregnant women) **OR** WHO stage IV irrespective of CD_4 count **OR** Multidrug-resistant /extensively drug-resistant Tuberculosis irrespective of CD_4
Require fast-track (i.e. ART initiation within two weeks of being eligible)
Pregnant women eligible for lifelong ART **OR** Patients with very low CD_4 (<100 cells/mm^3) **OR** Stage four, CD_4 count not available yet **OR** Multidrug-resistant /extensively drug-resistant Tuberculosis
Not yet eligible for ART
Transfer to a wellness programme for regular follow-up and repeat CD_4 testing every six months Advise on how to avoid HIV transmission to sexual partners and children Initiate Isoniazid prophylaxis if asymptomatic for Tuberculosis Contraceptives and annual Pap smear

An essential factor to consider is the importance of dietary intake when using certain ARVs. Food-drug interactions can influence or decrease the efficacy of specific drugs. The timing of the use of ARVs needs to be carefully planned regarding meal times and certain types of foods and beverages (Dong & Imai, 2012:868).

The use of ARVs during pregnancy and breastfeeding will be discussed in more detail in a later section.

3.7 NUTRITIONAL STATUS AND HIV/AIDS

It is generally accepted that good nutrition plays an important role in the maintenance of the immune system. Wasting has been identified as the most visible sign of malnutrition in patients, particularly during the later stages of the disease. The cumulative effect of both the HIV infection and poor nutrition is especially damaging to the immune system of the patient (Houtzager, 2009:63).

3.7.1 FACTORS CONTRIBUTING TO MALNUTRITION

In this section, certain factors which may lead to malnutrition are discussed. This includes an inadequate dietary intake, nutrient losses, increased nutrient requirements as well as the nutrition-related side-effects of antiretroviral medications.

3.7.1.1 INADEQUATE DIETARY INTAKE

One of the main contributors to malnutrition in the HIV-infected patient is an inadequate oral intake of food and beverages. In infected children, this insufficient intake of nutrients may lead to growth failure and delayed development. The desire for food can decrease as a result of oral candidiasis or mouth and gastro-intestinal ulcerations which can make eating uncomfortable. Infections can result in reduced appetite, nausea, vomiting and diarrhoea (Houtzager, 2009:64). These factors can be exacerbated by the social and economic impact of the disease which leads to household food insecurity (Colecroft, 2008:109).

3.7.1.2 NUTRIENT LOSSES

Severe diarrhoea or HIV enteropathy leads to chronic malabsorption and weight loss (Houtzager, 2009:63). Secondary and opportunistic infections pose a significant problem to these patients. However, some patients experience symptoms even when an identifiable infection cannot be verified, and this condition is often referred to as 'idiopathic AIDS enteropathy'. If these patients undergo a bowel biopsy, mucosal anomalies can be observed. Shortened villi, an increase in the amount of inflammatory cells as well as

changes in the lymphocyte population are some of the changes that can be observed. It is believed that these changes are related to factors such as immune dysregulation, a problem with epithelial cell maturation, undetected infections, or the direct effect of HIV or a product thereof (Owens & Greenson, 2007: 71-72). Malabsorption of fats, fat-soluble vitamins and carbohydrates can occur at any stage of the disease, even in asymptomatic patients (Colecroft, 2008:109).

3.7.1.3 INCREASED NUTRIENT REQUIREMENTS

Nutrient losses and changes in metabolism increase the micro-and macronutrient requirements of the HIV-infected patient. During the asymptomatic stages, energy requirements increase by ten percent above the level of a similar HIV-uninfected person. In the symptomatic stage, the energy requirements can increase by up to 20.0-30.0% (Colecroft, 2008:109). According to Raiten et al. (2011:1673), energy intake for adults who are asymptomatic should be 110.0% of what is recommended for healthy adults. The same recommendation will likely be adequate for pregnant or lactating women. However, the authors acknowledge that some pregnant women might have higher requirements (Raiten et al., 2011:1673). Protein requirements increase by 10.0% during an opportunistic infection, while other comorbidities require individual protein intake adjustments. A multivitamin and-mineral supplement providing 100.0% of the recommended intake may be prescribed to ensure adequate intake. However, the use of megadosis micronutrients might be detrimental to health and is not recommended (Dong & Imai, 2012:868). A Cochrane review of over thirty trials was undertaken in order to clarify the issue of micronutrient supplementation for HIV-infected patients. No trials could demonstrate a decrease in disease progression after vitamin-A supplementation in adults, but it might have beneficial effects on children regarding all-cause mortality and morbidity. They also reported that no significant adverse effects of vitamin-A supplementation were observed. Zinc and selenium supplementation was also proven beneficial in some cases. Multiple micronutrient supplementations did reduce mortality and morbidity in infected pregnant women and their infants and early child growth improved. More studies are however necessary to establish the exact effects of micronutrient supplementation (Irlam et al., 2012:2). The WHO recommends that vitamin-A supplementation for HIV-infected women

should not be used as a strategy for the prevention of MTCT of HIV. Pregnant women should be encouraged to rely on a healthy diet to ensure adequate nutrient intakes (WHO, 2011: 1).

3.7.1.4 NUTRITION RELATED SIDE-EFFECTS OF ANTIRETROVIRALS

Common gastro-intestinal side-effects of ARVs include nausea, vomiting, dyspepsia, anorexia, abdominal pain, diarrhoea, dysphagia and taste alterations. These effects can compromise dietary intake and changes in the drug regimen might have to be considered (Katsilambros, 2010:150). Metabolic complications which can affect nutritional status and require attention include dyslipidaemia, altered glucose metabolism, lipodystrophy, altered bone metabolism, non-alcoholic hepatic steatosis, peripheral neuropathy and lactic acidosis (Pribram, 2011:177).

3.7.2 HIV ASSOCIATED WEIGHT LOSS/WASTING

The term 'wasting syndrome' describes unintentional weight loss (> 10.0% of usual body weight) in combination with diarrhoea, fatigue and fever for a period of more than one month. The loss of lean body mass is the primary concern, but fat mass is also lost as the disease progresses. Wasting is usually a sign that the HIV infection is progressing to AIDS (Katsilambros, 2010:151).

Three main factors are related to the HIV wasting syndrome. These include an inadequate nutrient intake, nutrient malabsorption and disturbances in metabolism. The main metabolic abnormalities have several aetiologies: the HIV itself, opportunistic infections, cytokine dysregulation, hormonal imbalances, as well as ART side-effects. Excessive cytokine activation, such as tumour necrosis factor alpha, interleukin-1 and -6, as well as interferon-gamma, leads to an increase in resting energy expenditure, proteolysis and hypercatabolism. Cytokines can also inhibit anabolism by causing growth hormone resistance and reducing the production of insulin-like growth factor-1 (Ogoina et al., 2010:2-3)

Although wasting or weight loss has traditionally been associated with HIV, obesity has also been noted. Since the advent of HAART, wasting has become less common and a number of recent studies have found that overweight is more prevalent than wasting in an HIV-infected population in Philadelphia, United States of America (USA) (Crum-Cianflone et al., 2008:925). A higher body weight and continuous weight gain are no longer believed to protect against HIV-related wasting and AIDS progression, and the aim of nutritional intervention should be maintaining a healthy body weight (Dong & Imai, 2012:868).

3.7.3 HIV-ASSOCIATED LIPODYSTROPHY SYNDROME (HALS)

A large percentage of patients (40.0-50.0%) on HAART show alterations in adipose tissue distribution in the body in association with metabolic complications. Adipose tissue changes include lipoatrophy of peripheral subcutaneous adipose tissues, visceral fat accumulation and lipomatosis. Systemic metabolic complications mainly include dyslipidaemia and insulin resistance. Hypertriglyceridemia, elevated total and LDL (low density lipoprotein) cholesterol, reduced HDL (high density lipoprotein) cholesterol, hyperinsulinemia and glucose intolerance can be witnessed in patients on HAART. As a result, patients exhibit an elevated risk for cardiovascular disease (Villarroya et al., 2010:392).

3.8 HIV AND PREGNANCY

In the first chapter, an overview of the problems related to HIV and pregnancy was given. In this section mother-to-child transmission will be discussed in more detail.

Women of childbearing age remain a population group with a high incidence and prevalence rate of HIV infection. Women who are both pregnant and HIV-infected are faced with an increased burden on their immune function as well as an increased risk for complications such as foetal loss, low birth weight, preterm delivery and intrauterine growth retardation. These women also have a higher nutritional risk as a result of increased energy and macro- and micronutrient needs due to the demands of both the pregnancy and the HIV infection itself. Malnutrition during pregnancy can also increase the risk of

transplacental in utero transmission of HIV since the integrity of the placental lining may be impaired. In general, HIV-infected women tend to gain less weight during pregnancy when compared to uninfected women. In addition, progressive weight loss and wasting also increase the risk for pregnancy and foetal complications. The weight gain goals of pregnant HIV-infected women are the same as for women in the HIV-uninfected population (Couch et al., 2008:162).

3.8.1 MOTHER-TO-CHILD TRANSMISSION

Most children who are HIV-infected contracted the virus from their mother, either in utero (transplacental passage), intrapartum (exposure of infant's skin and mucous membranes to maternal blood and vaginal secretions), or postpartum (breastfeeding). As mentioned in chapter 1, the overall transmission rates, in the absence of interventions, are between 25.0% – 45.0% in infants born to HIV-infected mothers in Africa. In industrial countries, the rates are lower at 10.0% - 30.0%. The transmission rate in utero is estimated at 5.0% - 10.0%, intrapartum at 10.0% - 20.0%, and during breastfeeding at 5.0% - 20.0%. HIV significantly contributes to the morbidity and mortality of infants and children in Africa, and is undermining the gains made in the recent improvement of child survival (Coovadia, 2010:201).

3.8.1.1 PREVENTION OF MOTHER-TO-CHILD TRANSMISSION

In 2010, the WHO published the PMTCT Strategic Vision of 2010-2015, which is a document promoting the move towards the elimination of paediatric HIV. This document defines the WHO's commitment to support the improvement of access to PMTCT services across the globe. According to the WHO, a comprehensive approach is necessary to prevent vertical transmission, which includes the following:

- primary prevention of HIV among women of childbearing age;
- preventing unintended pregnancies among women living with HIV;
- preventing HIV transmission from a mother living with HIV to her infant; and,

- providing appropriate treatment, care and support to mothers living with HIV and their children and families (WHO, 2010b:6).

Even though PMTCT programmes are invaluable in the fight against the spread of HIV, they do not always function without some negative aspects. A systematic review on 21 studies conducted by Both & Van Roosmalen (2010:1444) about the impact of PMTCT programmes on maternal health care in resource-poor settings, concluded that PMTCT programmes often miss the opportunity to have an overall positive effect on maternal healthcare. They tend to focus on the provision of a package of services to reduce MTCT, but do not always attempt to promote and finance the strengthening of existing maternal services. A problem of only semi-integration was also noted as a concern (Both & Van Roosmalen, 2010:1444). Horwood et al. (2010:992) evaluated PMTCT programmes in KwaZulu-Natal, South Africa. They determined that although there is high coverage of PMTCT interventions during pregnancy and delivery, follow-up of the infants and mothers was unsatisfactory. Problems with access to services after delivery included poor integration of PMTCT services into routine care, lack of clearly defined roles of health workers and poor record keeping (Horwood, 2010:992).

As discussed earlier, the main PMTCT measures include: ART during pregnancy, delivery and during breastfeeding; the promotion of EBF for the first six months of life, or in ideal circumstances, the use of appropriate formula milks; and, elective caesareans. The use of ARVs will be discussed in more detail in the following section.

3.8.1.2 ANTIRETROVIRAL THERAPY FOR PMTCT

HAART benefits maternal health and contributes significantly to the prevention of MTCT of HIV. Transmission rates as low as 1.0-2.0% have been established in well-resourced setting such as the United Kingdom and the United States of America; unfortunately progress has not been as marked in low-resource, high HIV prevalence settings as of yet. Observational trials have been successful in reducing MTCT when women use HAART throughout the breastfeeding period. Extended Nevirapine prophylaxis to breastfed infants has also proven effective in decreasing postnatal HIV transmission (McIntyre, 2010:51).

The WHO's 2010 version of the document entitled 'Antiretroviral drugs for treating pregnant women and preventing HIV infection in infants' was developed to provide international standards for the prevention of MTCT of HIV, especially in resource-poor settings. These recommendations have the potential to reduce MTCT to 5.0% and lower in breastfeeding populations from a background risk of 35.0%, and in non-breastfeeding populations to less than 2.0% from a background risk of 25.0%. The 2010 revised PMTCT recommendations are based on two key approaches: firstly, lifelong ART for infected women who need treatment for their own health, which will also reduce transmission, and, ARV prophylaxis to prevent vertical transmission during pregnancy, delivery and breastfeeding for women who do not need lifelong ART (WHO,2010c:11).

In South Africa, ART and ARV regimes that are used for pregnant women who are HIV-infected and their infants, are summarised in table 3.4 (NDoH, 2010:31).

Table 3.4: ART and ARV regimes that are used for women who are HIV-infected and pregnant and their infants (NDoH, 2010:31).

MATERNAL REGIMENS		
WOMAN	**REGIMEN**	**COMMENT**
Eligible for lifelong ART (i.e. CD4 ≤350 or WHO clinical stage three or four)	TDF + 3TC (Lamivudine) /FTC + NVP	Start lifelong ART within two weeks
Currently on lifelong ART	Continue ART	Substitute EFV with NVP if in first twelve weeks of pregnancy
Contraindication to TDF (renal disease)	AZT + 3TC + NVP	
Not eligible for ART (i.e.CD4 > 350 and WHO stage one or two)	AZT from fourteen weeks sdNVP + AZT 3 hourly in labour TDF + FTC single dose (immediately) after delivery	
Unbooked and presents in labour	sdNVP + AZT 3 hourly in labour TDF + FTC single dose after delivery	Assess maternal ART eligibility before discharge

MATERNAL REGIMENS		
INFANT	**REGIMEN**	**COMMENT**
Mother on lifelong ART	NVP at birth and then daily for six weeks irrespective of infant feeding choice	
Mother on PMTCT	NVP at birth and then daily for six weeks continued as long as any breastfeeding	If formula-fed, baby can stop NVP at six weeks
Mother did not get any ARV before or during delivery	NVP as soon as possible and daily for at least six weeks continued as long as any breastfeeding	Assess ART eligibility for the mother within two weeks
Unknown maternal status because infant orphaned or abandoned	Give NVP immediately Test infant with rapid HIV test. If positive continue NVP for six weeks. If negative discontinue NVP	Follow-up six week HIV DNA PCR

The benefits of using ARVs are clear: a decreased risk of vertical transmission as well as a reduced risk of HIV disease progression, morbidities and mortality. However, these benefits must be weighed against the risks. Drug toxicity and drug resistance are two of these potential concerns. ARV pharmacokinetics are influenced by different factors which complicate the prediction of possible toxicities, and the combination of drugs as well as duration of use will influence the risk (WHO,2010c:59). Potential side-effects of ARVs include anaemia, hypersensitivity, hepatic disorders, acute pancreatitis, osteopenia and osteoporosis, lactic acidosis, lipodystrophy and muscle damage in the new-born. In developing countries, ARV safety issues may be of a greater concern. Special factors and conditions that are different from those of developed countries must be considered, such as high prevalence of Tuberculosis, malaria and other infections, malnutrition, traditional medicine use and inadequate healthcare services (WHO, 2009c:4). In 2007, Thorne and Newell extensively investigated the potential short-term to medium-term adverse effects and toxicities of ARV exposure in utero and in the infant, including haematological, mitochondrial, teratogenic and carcinogenic effects. The conclusion was that ARV prophylaxis during PMTCT interventions far outweighed the potential risks involved.

However, long-term monitoring is needed as some risks might occur in later childhood (WHO, 2010c:59).

3.8.1.3 HIV AND PREGNANCY OUTCOMES

HIV infection during pregnancy may be associated with adverse pregnancy outcomes such as spontaneous abortion, still-birth, perinatal and infant mortality, intrauterine growth retardation, low-birth weight and chorioamnionitis. Infection with HIV can also reduce fertility and studies undertaken in Uganda have shown that HIV-infected women have lower pregnancy rates (Gray & McIntyre, 2007:951).

Pregnancy itself causes alterations in immune function and is associated with increased mortality and morbidity from viral infections. Pregnancy may also accelerate the natural progression from HIV to the development of AIDS-defining illnesses (Rosene-Montella & The American College of Physicians, 2008:665). There is however conflicting evidence in the literature on the possible effects of pregnancy on HIV progression. A literature review and meta-analysis of seven prospective cohort studies found that HIV does progress faster and mortality rates increase during pregnancy in a developing country setting. In developed countries, this effect could not be confirmed. Data from sub-Saharan Africa are also lacking (Van der Paal et al., 2007:920).

3.9 CONCLUSION

In recent years, HIV has affected the health of countless women of reproductive age. Women often find out what there HIV status is during routine testing in pregnancy. If a women's pregnancy is complicated by HIV, healthcare workers must be able to provide quick and accurate responses and solutions to problems or barriers to treatment. Each healthcare worker must remain knowledgeable on the topic of HIV as well as the effects thereof on the services that they must provide (Rosene-Montella & The American College of Physicians, 2008:664).

CHAPTER 4

EXPERIMENTAL PROCEDURE

4.1 INTRODUCTION

The following framework (figure 4.1) was compiled for the purpose of this study, to describe the experimental procedures for identifying the knowledge, attitudes and practices of HIV-infected women as well as healthcare personnel regarding infant feeding within the context of HIV at the maternity wards of Pelonomi Regional Hospital, Bloemfontein.

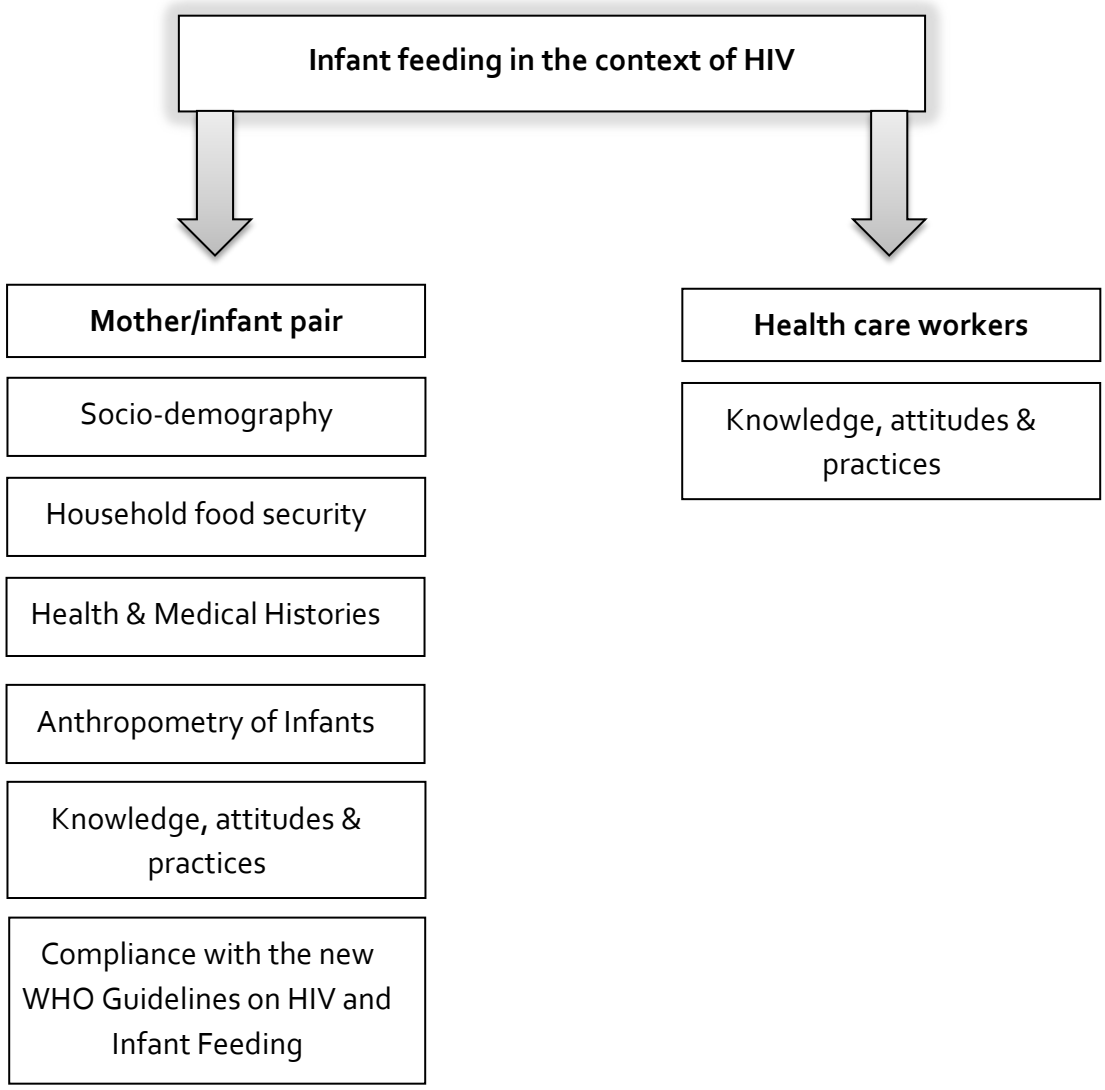

Figure 4.1 Framework to describe the experimental procedure.

4.2 METHODOLOGY

4.2.1 STUDY DESIGN

The study design comprised of a descriptive cross sectional study.

4.2.2 POPULATION AND SAMPLING

4.2.2.1 HEALTH CARE WORKERS

Health care workers active in the maternity wards at the only regional state hospital in Bloemfontein, Free State, namely Pelonomi, were included in the study. A total of 94 nurses/sisters work in the maternity wards. On average, fifteen interns, nine registrars and three consultants attend to the wards. Allied workers such as speech therapists, physiotherapists and dieticians visit patients when consulted – the number of allied workers could not be determined precisely but can be estimated at approximately eight. The total number of health care workers in the maternity wards was thus estimated at 129. A total of 64 health care workers elected to complete the questionnaire.

4.2.2.2 MOTHER/INFANT PAIRS

HIV-infected women in the post natal ward who had recently given birth, as well as their new-born infants, were studied. On average, 300 mothers give birth at Pelonomi per month. Of these mothers, approximately 70 mothers are HIV-infected. A convenience sample of 100 mother/infant pairs was selected. Data collection took place from November 2011 to August 2012.

4.2.2.3 INCLUSION CRITERIA

- Informed consent;
- HIV-infected women eighteen years and above with live infant/s; and,
- All health care workers in the maternity wards.

4.2.2.4 EXCLUSION CRITERIA

- Women with mental disabilities; and,
- Women who were medically unable to participate such as those with complications inhibiting them from speaking and interacting with comfort.

4.2.3 OPERATIONAL DEFINITIONS

For the purpose of this study, operational terms were defined as follows:

4.2.3.1 KNOWLEDGE, ATTITUDES AND PRACTICES OF THE HEALTH CARE WORKERS REGARDING INFANT FEEDING IN THE CONTEXT OF HIV

For the purpose of this study, knowledge of health care workers included testing knowledge on HIV and infant feeding; gauging attitude towards different aspects of HIV and infant feeding and exploring practices and recommendation to mothers.

4.2.3.2 SOCIO-DEMOGRAPHY OF MOTHER/INFANT PAIRS

For the purpose of this study, socio-demography included basic demographics of household members; structure of the house; household income; household amenities; and, access to water, sanitation and electricity.

The household density ratio (HDR) was also calculated. Overcrowding can possibly contribute to the spread of infectious diseases such as Tuberculosis and can indicate poor household conditions and poverty (Songpol et al., 2005:221). Each person $\geq$ 10 years old living in the same house counted as one equivalent person (EP). Persons < 10 years old counted as half an EP (Coetzee et al., 1988:354). Table 4.1 indicates the amount of sleeping rooms that are required for the amount of EPs in the same house:

Table 4.1 Sleeping rooms required for Equivalent Persons (EPs) in the same house (Coetzee et al., 1988:354).

Equivalent Persons (EPs)	Number of sleeping rooms required
≤ 2.5 EPs	1
≤ 3.5 EPs	2
<5.0 EPs	3
One further sleeping room is required for each extra 2.5 EPs	

The HDR was calculated as follows:

$$\frac{\text{Number (No.) of EPs in dwelling}}{\text{Ideal No. of EPs for No. of sleeping rooms}} \times 100$$

A value of over 100% indicated overcrowding (Coetzee et al., 1988:354).

4.2.3.3 ANTHROPOMETRIC MEASUREMENTS OF INFANTS

Anthropometric variables for infants included birth weight and birth length. When interpreting the measurements, the new 2006 WHO Growth Charts were used. Unlike the 1977 NCHS (National Center for Health Statistics)/CDC growth charts, the 2006 WHO growth charts are based on breastfed and overall appropriately fed infants. These infants were of different ethnic origins, unlike those of the NCHS growth charts, and were raised in optimal conditions. These growth references give an indication as to how a child should grow, rather than just how they are growing (WHO, 2009d:3).

i) WEIGHT FOR AGE

The birth weight was interpreted using the new 2006 WHO Child Growth Standards. Z-Scores were used to indicate weight status at birth and to categorize the infant's weight for age as normal (- 1 Standard Deviation (SD) to + 1 SD), mildly underweight (- 1.1 SD to - 2 SD), moderately underweight (-2.1 to -3 SD), and severely underweight (< -3 SD) (Shils, 2006:890).

ii) LENGTH FOR AGE

The length was interpreted using the new 2006 WHO Child Growth Standards. Z-Scores were used to indicate length status at birth and to categorize the infant's length as normal (- 1 SD to + 1 SD), mildly stunted (- 1.1 SD to - 2 SD), moderately stunted (-2.1 to -3 SD), and severely stunted (< -3 SD) (Shils, 2006:890).

iii) WEIGHT FOR LENGTH

The weight-for-length was interpreted using the new 2006 WHO Child Growth Standards. Z-Scores were used to indicate weight for length status at birth and to categorize the infant's weight-for-length as normal (- 1 SD to + 1 SD), mildly wasted (- 1.1 SD to - 2 SD), moderately wasted (-2.1 to -3 SD), and severely wasted (< -3 SD) (Shils, 2006:890).

4.2.3.4 HOUSEHOLD FOOD SECURITY OF MOTHER/INFANT PAIRS

For the purpose of this study, household food security included questions related to how much money was available per week to spend on food; main source of income; food production at home; hunger scale; and, coping strategies.

4.2.3.5 MEDICAL HISTORY AND REPORTED HEALTH OF MOTHER/INFANT PAIRS

For the purpose of this study, medical history and reported health of the mother included history of tobacco and alcohol use; medical history; symptoms and medications/alternative medications; stress levels, depression and emotional state. The medical history of the infant was also included. This included information about medical complications, medication and feeds. The patient files were consulted for information that was not known by the mother. This included: medications used in hospital; CD_4 count and haemoglobin level.

4.2.3.6 KNOWLEDGE, ATTITUDES AND PRACTICES RELATED TO HIV AND INFANT NUTRITION OF MOTHERS

For the purpose of this study, knowledge, attitudes and practices included testing knowledge on breastfeeding, replacement feeding, weaning, HIV and infant feeding; explored attitudes towards different infant feeding options and HIV; and, practices regarding infant feeding.

4.2.3.7 COMPLIANCE WITH THE 2010 WHO GUIDELINES ON HIV AND INFANT FEEDING OF MOTHER/INFANT PAIRS

For the purpose of this study, knowledge and practices were compared with the 2010 WHO Guidelines on HIV and Infant Feeding using the nine principles and seven recommendations as basis for questions.

4.2.4 TECHNIQUES USED

The following techniques were used to obtain the necessary information.

4.2.4.1 ANTHROPOMETRIC MEASUREMENTS OF INFANTS

Birth weight and birth length were obtained from patient files.

4.2.4.2 QUESTIONNAIRES

To determine knowledge, attitudes and practices of health care workers, self-administered questionnaires were completed by the health care workers themselves. All health care workers were able to read and write in English, but questionnaires in Afrikaans and Sotho were made available if requested. Since they had completed a tertiary education, it was assumed that they would not have any difficulties filling in the questionnaires unassisted.

Personal private structured interviews were used to obtain the necessary information from the mothers. The questionnaires that were used included the following (content in this order), and these questionnaires were adapted from those used in the Assuring Health for All (AHA-FS) study: socio-demography; household food security; and medical history and reported health. Knowledge, attitudes and practices regarding HIV and infant feeding were determined and the interview ended with questions probing compliance with the 2010 WHO Guidelines on HIV and Infant Feeding. It was important that the order was followed to avoid leading the respondent during the interview. All information collected from the mother/infant pairs was acquired during an interview conducted by the researcher. Some of the medical history information was obtained from the patient files. This included: hospital medications; CD_4 count and haemoglobin level. A summary of the questionnaires as well as the methods used to apply them, follows.

i) QUESTIONNAIRE (HEALTH CARE WORKERS):

a) Knowledge, attitudes and practices regarding HIV and infant feeding - self-administered questionnaire (Appendix A).

ii) QUESTIONNAIRES (MOTHER/INFANT PAIRS):

a) Socio-demography - personal private structured interview (Appendix B)

b) Anthropometry - all measurements of infants were obtained in the patient files (Appendix C)

c) House hold food security - personal private structured interview (Appendix D)

d) Medical history and reported health - personal private structured interview (Appendix E)

e) Knowledge, attitudes and practices of mothers regarding HIV and infant feeding - personal private structured interview (Appendix F)

f) Comparison of current practices and knowledge with 2010 WHO Guidelines for HIV and Infant Feeding - personal private structured interview (Appendix G)

The researcher conducted the interviews with the mothers because it could not be assumed that all of the mothers could read and write. If a researcher uses interviews to obtain information from respondents, a higher response rate is attained and all of the questions are answered (less missing information). Non-verbal cues as well as spontaneous answers assisted in guiding the interview in a more successful manner, especially when the participant was answering personal or sensitive questions.

4.2.5 VALIDITY AND RELIABILITY

Validity and reliability of questionnaires are discussed.

4.2.5.1 QUESTIONNAIRES

i) VALIDITY

Validity is the ability of a tool or instrument to measure that which it is supposed to measure. The measurement is not considered valid if the instrument repeatedly measures a characteristic in the same person or group higher or lower than it actually is (Monsen & Cheney, 2003:11). Validity was guaranteed by researching literature concerning HIV and infant nutrition. The questionnaires were based on relevant literature and questions were motivated by scientific evidence. The questionnaire which evaluated compliance with the new 2010 WHO Guidelines on HIV and Infant Feeding was developed by the researcher by formulating questions based on each guiding principle and recommendation.

ii) RELIABILITY

Reliability is the degree of correlation between sets of data when the measurement is done more than once on the same study participant or group, by the same or a different observer (Monsen & Cheney, 2003:11). The questionnaires were designed in such a way that they did

not ask leading questions. The order in which the questions were asked was also carefully considered to avoid influencing the mother's answers. Attempts were made to keep the questionnaires as short as possible to avoid fatigue of the respondent which could lead to unreliable data. If it was seen as needed, a break was taken between questionnaires in order for women to rest. In cases where respondents could not speak English or Afrikaans, a health care worker in the ward was asked to interpret. It was explained to the interpreter that she should convey the questions and answers verbatim. It was also indicated if an interpreter was used to conduct the interview. To ensure all of the questions are answered by the women, the researcher conducted the interviews with the women and filled in the questionnaires. The researcher did not wear a uniform and introduced herself only as a 'researcher'. Otherwise, it might have influenced the women's answers, as they might have felt intimidated and opted to provide answers that they thought the researcher wanted to hear or tried to impress the researcher. Mothers were also assured that they were not completing a 'test' and were encouraged to answer truthfully.

4.2.6 STATISTICAL ANALYSIS

Descriptive statistics, namely frequencies and percentages for categorical data and medians and percentiles for continuous data, were calculated. Associations between variables (for categorical (2x2 tables) and continuous data) were calculated and described by means of 95% confidence intervals for differences in medians or percentages.

All analyses were performed by the Department of Biostatistics at the University of the Free State.

4.2.7 PILOT STUDY

A pilot study was undertaken on a sample of five women that were similar to the target group and who met the inclusion criteria before the main survey in order to determine whether questions were easily understood. Questionnaires were also completed by five health care workers. The amount of time needed to complete each questionnaire was

determined. After the pilot study, no alterations to the questionnaires were made and the results obtained during the pilot study could be included in the main study results.

4.2.8 STUDY PROCEDURES

Approval for the study was obtained from the Ethics Committee of the Faculty of Health Sciences at the University of the Free State (ECUFS 140/2011), the Chief Executive Officer of Pelonomi Hospital as well as the matron of the maternity wards. Before any information was collected from the respondents, informed consent was obtained.

Before the start of the study, a pilot study was completed at Pelonomi maternity wards to test the feasibility of the study and understandability of the questionnaires.

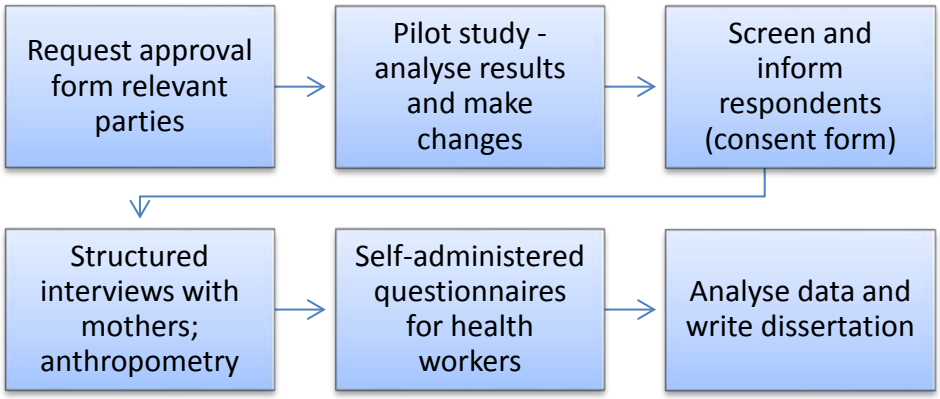

Figure 4.2 Data collection process.

The researcher coded all of the questionnaires and the Department of Biostatistics at the University of the Free State analysed the data.

4.2.8.1 HEALTH CARE WORKERS

While the researcher was at the maternity wards, the aim and importance of the study were explained to the healthcare workers who were present. They were asked for their assistance and participation, and the procedure that had to be followed to complete the questionnaire was explained.

The knowledge, attitudes and practices of health care workers regarding HIV and infant feeding was examined by self-administered questionnaires. Questionnaires were distributed to all the healthcare workers in the postnatal wards during arranged meetings with the researcher. No names were indicated to ensure confidentiality. Instructions were included as well as the telephone number of the researcher in case of any questions regarding the questionnaire. Each individual completed the questionnaire without assistance and returned it to an agreed location where the researcher collected all of the completed questionnaires. The individual returned the completed questionnaires no later than the end of his/her shift. The location was an accessible box specifically designated for the study. As an added incentive, a hamper of prizes was made available to be won in a lucky draw for those who returned their completed questionnaires. Healthcare workers filled in a separate form with their names and telephone numbers, and left it in a second box if they wanted to be considered for the lucky draw.

4.2.8.2 MOTHER/INFANT PAIRS

Mothers in the post-natal ward at Pelonomi, who met the inclusion criteria, were individually approached by the researcher and the study was explained to them. Respondents were given a brief description of the study; what would be required of them; the duration; and any benefits that the study might hold for the community at large. They received an information document and if they gave signed informed consent to participate, the researcher started collecting data. Efforts were made to create a private area for the interviews by closing the curtains surrounding the bed. If an unoccupied room was available and the participant was able to walk, it was used for conducting the interviews. Figure 4.2 illustrates the data collection process.

4.2.9 ETHICAL ASPECTS

Approval for the study was obtained from the Ethics Committee of the Faculty of Health Sciences at the University of the Free State (ECUVS 140/2011) and the necessary authorities.

An informed consent form (Appendix H) was signed and an information document (Appendix I) was given to respondents in the language of their choice. The forms were made available in English, Afrikaans and Sotho. Illiterate persons could make a cross in the presence of a witness on the consent form. All information was handled confidentially and respondents' privacy was respected at all times. Confidentiality of the information was maintained by using codes in data analysis and results.

Participation was voluntary and respondents were given freedom to withdraw from the study at any time. Respondents were informed that the results may be published. It was also made clear that participating in the study would have no cost implications for themselves and that they would not receive remuneration.

4.3 SUMMARY

The knowledge, attitudes and practices related to HIV and infant feeding of both health care workers and HIV-infected mothers were investigated. Health care workers completed a self-administered questionnaire and personal private structured interviews were utilised for the mothers. The following questionnaires were used for the mother/infant pairs: socio-demography, anthropometry (only for infants), household food security, reported health and medical history, comparison of current practices and knowledge with 2010 WHO Guidelines for HIV and Infant Feeding, and knowledge, attitudes and practices of mothers regarding HIV and infant feeding. A sample of 64 health care workers (who agreed to participate after all health care workers were invited) and 100 mother infant/pairs (who were available on the days of interviews) formed part of the study.

CHAPTER 5
RESULTS

5.1 INTRODUCTION

The results of this study are presented in two sections. The first section reports the results of the knowledge, attitudes and practices of the health care workers regarding HIV and infant feeding. The second section reports the knowledge, attitudes and practices of the mother/infant pairs.

5.2 HEALTH CARE WORKERS

Most of the health care workers in this study (73.4%) consisted of nursing personnel, while doctors and dieticians represented 20.3% and 6.3% of the sample respectively (table 5.1).

Table 5.1 Professional status of health care workers

Variable	n	%
Professional status (n = 64)		
Nursing personnel	47	73.4
Doctors	13	20.3
Dieticians	4	6.3

5.2.1 KNOWLEDGE REGARDING HIV AND INFANT FEEDING

The results related to the knowledge of the health care workers are presented in table 5.2. Only 14.1% of the health care workers considered themselves to be an expert on the issues of HIV and infant feeding, while most indicated that they felt they had moderate knowledge (40.6%).

Table 5.2 Knowledge of health care workers – Infant feeding and HIV

Variable	**n**	**%**
How knowledgeable do you believe you are with regard to infant feeding in the context of HIV? (n = 64)		
Very low knowledge	2	3.1

Low knowledge	3	4.7
Moderate knowledge	26	40.6
Very knowledgeable	24	37.5
Expert	9	14.1
In general, infants who are formula/replacement fed have a higher risk for falling ill (diarrhoea, pneumonia etc.) and dying, than infants who are breastfed? (n = 64)		
Yes	58	90.6
No	4	6.3
Don't know	2	3.1
How soon after birth should a new-born baby be put to the breast to breastfeed? (n = 64)		
30-60 minutes	48	75.0
2-3 hours	11	17.2
12 hours	2	3.1
24 hours	0	0.0
> 24 hours	1	1.6
Don't know	2	3.1
If a mother breastfeeds, at least how many times per 24 hours must she breastfeed during the first months of life? (n = 64)		
1-3 times	1	1.6
4-6 times	13	20.3
7-14 times	29	45.3
15-18 times	19	29.7
Don't know	2	3.1
Explain exclusive breastfeeding (n = 60)		
Mentions that only breastmilk should be given	42	70.0
Mentions that only breastmilk should be given AND to breastfeed on demand	5	8.3
Mentions that only breastmilk should be given AND that no pacifiers should be given	1	1.7
Mentions that only breastmilk should be given AND to breastfeed on demand AND that no pacifiers should be given	4	6.7
Unrelated or incorrect answer	8	13.3
Up to what age of the infant should an HIV-infected mother breastfeed exclusively? (n = 64)		
3 months	1	1.6
4 months	0	0.0
6 months	61	95.3
8 months	1	1.6
Don't know	1	1.6
Up to what age of the infant can the HIV-infected mother breastfeed her infant according to the newest 2010 WHO guidelines (exclusive plus non-exclusive breastfeeding)? (n = 64)		
3 months	2	3.1
4-6 months	1	1.6
6 months	11	17.2
8 months	2	3.1
Up to one year old	21	32.8
Up to one year old and then only stop once a nutritionally adequate diet without breastmilk can be provided	17	26.6
Don't know	10	15.6

What is the risk of HIV transmission through breastfeeding if the mother/infant receives ARVs and she breastfeeds according to the guidelines? (n = 64)		
Indicates a high risk	47	73.4
Indicated that the infant will be infected	2	3.1
Moderate risk	6	9.4
Unrelated or incorrect answer	7	10.9
Don't know	2	3.1
What is the risk of HIV transmission through breastfeeding if the mother/infant receives ARVs and she breastfeeds according to the guidelines? (n = 64)		
Indicates a low risk	45	70.3
Indicates no risk	13	20.3
Unrelated or incorrect answer	5	7.8
Don't know	1	1.6
When an HIV-infected mother is breastfeeding her infant and she gives anything else to the infant to drink or eat, it increases the risk of HIV passing to the baby via breastfeeding. (n = 64)		
True	57	89.1
False	5	7.8
Don't know	2	3.1

Most of the respondents (90.6%) correctly indicated that, in general, infants who are formula-fed have a higher risk for morbidity and mortality, whereas 6.3% reported that this statement is false. Seventy-five percent of health care workers correctly indicated that a new-born should be put to the breast to breastfeed within 30-60 minutes after birth. A smaller proportion (17.2%) believed that this time period should be 2-3 hours. When questioned regarding the frequency of breastfeeds in a 24 hour period, 45.3% correctly indicated that the mother should breastfeed 7-14 times a day. Most of the remaining respondents indicated 4-6 times (20.3%) or 15-18 times (29.7%).

When asked to explain what is meant by the term 'exclusive breastfeeding', 93.8% of respondents did attempt an answer, whereas 6.3% indicated that they did not know the answer. Although most of the answers (70.0%) were correct in the fact that EBF means that only breastmilk should be given, only 6.7% of respondents could comprehensively explain the concept, and 13.3% gave an incorrect or unrelated answer.

Some of the open-ended definitions for EBF included the following (verbatim):

- Giving either breastmilk alone without inter-changing or giving any other food during the process and duration of breastfeeding
- Means that baby should only be given breastmilk for six months. No any other feeds
- To give only breastmilk from birth to 1 year
- Nothing else including artificial teats, pacifiers, water, drinks or foods may be given for the first six months of life. EBF also includes " feeding on demand" , i.e. breastfeeding whenever and for how long the baby wants to
- Only breastmilk. Nothing else, no water, no food, no porridge, no tea. Only breastmilk
- Feeding breastmilk only on demand for as long as baby needs – not any substitutes e.g. giving baby water and other drinks other than breastmilk

It was apparent that the recommended time period of EBF was well-known to the health care workers, since 96.9% indicated that this should be done for six months. However, confusion existed when they were asked to indicate for which time period a mother can breastfeed exclusively plus non-exclusively according to the new 2010 WHO Guidelines on HIV and Infant Feeding. Only approximately one in four health care workers (26.6%) answered correctly that an HIV-infected mother can breastfeed up to the age of one year old and then only stop once a nutritionally adequate diet without breastmilk can be provided.

To assess the knowledge regarding the risk of transmission via breastfeeding, respondents explained what they believed the risks to be. Firstly, they explained what the risk of HIV transmission would be if the correct infant feeding guidelines were not followed, and secondly, when the correct guidelines were indeed followed. Overall, most (73.4%) correctly indicated an increased risk of transmission if the guidelines were not followed, vs. a lowered risk (70.3%) if the guidelines were followed. Almost one in five (20.3%) health care workers incorrectly indicated that there is no risk of transmission if the mother follows the guidelines.

Some of the open-ended explanations of transmission risk if the guidelines are not followed included the following (verbatim):

- The risk is higher as the viral load is at a risk of being higher and because she is not feeding properly , infection can occur

- The baby can become infected or gets HIV transmission through breastfeeding so the risk is high because the mother viral load is high
- The baby will get the HIV, very high risk
- If the mother is not adhering to the guidelines it increases the baby risk of transmission. It depends on the mothers CD4 count, if not using ARVs whether they will be on transmission or not. If CD4 count is higher, there are less risk of transmission if not using ARVs

Some of the open-ended explanations of transmission risk if the guidelines are followed included the following (verbatim):

- The risks are very less because they are both protecting themselves, e.g. the child/infant on NVP is being protected from getting the virus
- No risk if CD4 count is not low
- Decreased to 0.5 – 1%
- No risk – the baby will be excellent safe and healthy
- If the infant uses ARVs the risk is very low because the ARVs make CD4 count to go up

Regarding the issue of mixed feeding, most respondents (89.1%) could correctly answer that this practice increases risk of HIV transmission. This leaves a combined 10.9% of respondents who either disagree with this fact, or who did not know the answer to this question.

5.2.2 ATTITUDES REGARDING HIV AND INFANT FEEDING

The results related to the attitudes of the health care workers are presented in table 5.3

Table 5.3 Attitudes of health care workers – Infant feeding and HIV

Variable	n	%
What is your attitude towards HIV-infected women breastfeeding their infants? (n = 64)		
They should not breastfeed because there is a risk of HIV transmission	0	0.0
Breastmilk is an excellent feeding choice but the mothers must be counselled in correct breastfeeding practices and ARV use to minimize the risk of ARV transmission	62	96.9
Other (mostly positive towards breastfeeding)	2	3.1
What is your attitude towards HIV-infected women formula feeding their infants? (n = 64)		
It is the safest way to feed these infants because it ensures the infant stays HIV- and thus healthy?	7	10.9
It may only be promoted for women who meet the AFASS criteria – affordable, feasible, acceptable, sustainable and safe	49	76.6

Other (50% positive towards formula feeding, 50% negative toward formula feeding)	8	12.5
What is your opinion about HIV-infected women heat-treating their expressed breastmilk and feeding it to their infants? (n = 64)		
It is a good idea	29	45.3
It is a bad idea	8	12.5
It is a good idea but too much work and the women won't keep it up	19	29.7
Don't know	5	7.8
Other (mostly positive towards heat-treating breastmilk)	3	4.7
What is your opinion on the new guidelines which will promote breastfeeding together with the use of ARVs as the number one infant feeding option for HIV-infected women in South Africa? (n = 64)		
It will provide a reliable source of nutrition for the infants and will decrease infant malnutrition especially in impoverished communities	57	89.1
It is not the best feeding choice as there is a risk for HIV transmission – the distribution of free formula milk at clinics should be re-instated	4	6.3
Other (mostly positive towards new guidelines)	3	4.7

Almost all of the respondents (96.9%) indicated a positive attitude towards HIV-infected mothers who wanted to breastfeed their infants. However, when asked what their attitude was towards HIV-infected mothers who formula feed their infants, 12.3% indicated that this is the safest choice as it would ensure that the baby remains uninfected and thus healthy.

Most of the respondents thought that feeding heat-treated expressed breastmilk to HIV-exposed infants was a good idea (45.3%). The second largest proportion (29.7%) considered it a good idea, but indicated that most mothers would probably not be able to keep it up due to the amount of work involved.

Health care workers were asked their opinion on the new guidelines in South Africa which will promote breastfeeding as an infant feeding choice for infants of HIV-infected women. Most (82.8%) had a positive attitude towards this policy change, but 12.5% of respondents indicated that they would like to see the distribution of free formula milk reinstated in South Africa.

5.2.3 PRACTICES REGARDING HIV AND INFANT FEEDING

The questions related to the practices of the health care workers are presented in table 5.4.

Table 5.4 Practices of health care workers– Infant feeding and HIV

Variable	n	%
How often do you give advice to HIV-infected women regarding feeding of their infants?		
Never	0	0.0
Seldom	4	6.3
Often	12	18.8
Very regularly	28	43.8
Daily	20	31.3
How confident are you that you can successfully show a new mother how to correctly position and attach the baby to the breast for breastfeeding (according to the four signs of good positioning and the four signs of good attachment)?		
Not at all confident	0	0.0
Low confidence	3	4.7
Moderately confident	14	21.9
High confidence	24	37.5
Very high confidence	23	35.9
How confident are you in showing a new mother how to express her breastmilk?		
Not at all confident	0	0.0
Low confidence	7	10.9
Moderately confident	16	25.0
High confidence	23	35.9
Very high confidence	18	28.1

When asked how often they gave advice to HIV-infected women regarding HIV and infant feeding, a large percentage indicated that they do it very regularly (43.8%) or daily (31.3%).

When the respondents were questioned regarding their confidence to show a new mother how to breastfeed according to the correct positioning and attachment principles, most had a high level of confidence (37.5%) or a very high level of confidence (35.9%). The same held true when respondents were asked to state their confidence in showing a mother how to express breastmilk with the two most indicated answers being high confidence level (35.9%) and very high confidence level (28.1%).

5.3 MOTHER/INFANT PAIRS

The results of the mother/infant pairs are reported in the following order: socio-demography; household food security; reported health and medical histories; anthropometry of infants; knowledge, attitudes and practices regarding HIV and infant feeding; and, the WHO principles and recommendations related to infant feeding in the context of HIV.

5.3.1 SOCIO-DEMOGRAPHIC INFORMATION

On the day of the interview, the median age of the mothers was 31.0 years (18.3 - 43.6 years), and the median age of the infants was 1 day (0 - 22 days). Three of the 100 mothers had twins, and the total number of infants was thus 103. The age distributions of the mothers are presented in table 5.5.

Table 5.5 Socio-demographics – Median age distributions

Variable	Minimum	Median	Maximum
Median age of women (years) on interview date	18.3	31.0	43.6
Median age of first infant (days) on interview date (n = 100)	0	1	22
Median age of second infant (days) on interview date (n = 3)	0	1	11

General socio-demographic data related to race, marital status, level of education, language and employment status are presented in table 5.6.

Table 5.6 Socio-demographic information of mothers - General

Variable	n	%
Race of the family		
Black	94	94.0
White	0	0.0
Coloured	6	6.0
Other	0	0.0
Marital status of respondent		
Never married	54	54.0
Currently married	29	29.0
Living with partner	15	15.0
Widowed	1	1.0

Separated	1	1.0
Divorced	0	0.0
Other	0	0.0
Women aged 18 – 30 years	49	49.5
Women aged >30 years	50	50.5
Gender of first infant		
Male	43	43.0
Female	57	57.0
Gender of second infant		
Male	1	33.3
Female	2	66.7
Highest educational level of mother		
No formal education	7	7.0
Grade 1 - 7	11	11.0
Grade 8 - 10	32	32.0
Grade 11 - 12	44	44.0
Diploma/degree	6	6.0
First language of respondents		
Sotho	78	78.0
English	0	0.0
Afrikaans	7	7.0
Other (mostly Tswana or Xhosa)	15	15.0
Households caring for orphans	9	9.0
Employment status of respondent		
Housewife by choice	12	12.0
Unemployed	56	56.0
Self-employed	0	0.0
Fulltime wage earner	22	22.0
Other (mostly part time jobs)	10	10.0
Don't know	0	0.0
Employment status of husband/partner		
Retired by choice	0	0.0
Unemployed	23	23.0
Self-employed	2	2.0
Fulltime wage earner	49	49.0
Other (mostly part time jobs)	18	18.0
Not applicable, e.g. deceased	7	7.0
Don't know	1	1.0

Of all the infants, 42.7% were males and 57.3% were females. Ninety-four percent of the mothers were black, and 6.0% were coloured. Seven percent of the women had no formal schooling. Fifty-four percent of the women had never been married, and 29.0% were currently married. The highest level of education in the remaining women was categorized as follows: 11.3% only had primary school training, 34.4% fell in the grade 8-10 category,

47.3% fell in the grade 11-12 category, and 6.5% held a post high school qualification. Most of the women were Sotho speaking (78.0%) and unemployed (56.0%). Approximately half of the partners of the mothers were fulltime wage earners (49.0%) or also unemployed (23.0%).

Socio-demographic data related to housing are presented in table 5.7.

Table 5.7 Socio-demographic information of respondents - Housing

Variable	n	%
Type of dwelling		
Brick, concrete	84	84.0
Tin	16	16.0
Wood/plank	0	0.0
Traditional mud	0	0.0
Other	0	0.0
Median household density ratio		170.8
Household commodities		
Inside bathroom	28	28.0
Outside bathroom	73	73.0
Kitchen inside	62	62.0
Running water inside	46	46.0
Electricity	83	83.0
Refrigerator	70	70.0
Electric stove or hotplate	84	84.0
Paraffin stove or primus	43	43.0
Microwave	54	54.0
Kettle	80	80.0
Radio	83	83.0
Television	73	73.0
Usual source of drinking water		
Own tap	96	96.0
Communal tap	4	4.0
River/dam	0	0.0
Borehole/well	0	0.0
Other	0	0.0
Type of toilet used by household		
Flush	74	74.0
Pit	26	26.0
Bucket	0	0.0
VIP	0	0.0
Other	0	0.0
Fuel mostly used for cooking		
Electricity	82	82.0
Gas	1	1.0
Paraffin	16	16.0

Wood/coal	0	0.0
Open fire	1	1.0
Other	0	0.0

Formal housing (houses built with bricks) was the most frequent type of dwelling, with 84.0% living in such housing. Sixteen percent of the mothers lived in informal housing (houses built with tin). The household density ratio (HDR) which indicates crowding, revealed that 76.0% of the households experienced a degree of crowding. A calculated value of more than 100.0% indicates crowding, and the households in the population had a median value of 170.8% (37.5 % - 400.0%). Only 28.0% of the mothers had a bathroom inside their house, and 73.0% had a toilet outside. Less than half of the households (46.0%) had running water inside the house, while 83.0% had electricity. Seventy percent had a refrigerator and most had either an electric stove/hotplate (84.0%) or a paraffin stove/primus (43.0%). Slightly more than half of the households had a microwave oven (54.0%), and most had a kettle (80.0%), radio (83.0%) and television (73.0%).

Ninety-six percent of the mothers had their own tap for obtaining drinking water, while 74.0% of mothers had access to a flush toilet and 26.0% used a pit. Electricity was the most used fuel for cooking purposes (82.0%), while 16.0% used paraffin as a main fuel for cooking.

Socio-demographic data related to household income are presented in table 5.8.

Table 5.8 Socio-demographic information - Household income

Variable	n	%
Number of financial contributors in household		
0	5	5.1
1-2	83	83.8
3-4	9	9.1
5-6	2	2.0
Total income per month		
None	0	0.0
R100-R500	6	6.0
R501-R1000	16	16.0
R1001-R3000	27	27.0
R3001 -R5000	13	13.0
Over R5000	9	9.0
Don't know	29	29.0

Main source of income		
Wages and salaries from formal employment	52	52.0
Self-employment	2	2.0
Casual employment	13	13.0
Crop production	0	0.0
Sale of assets	0	0.0
Property renting	0	0.0
Old age pension or state grant	32	32.0
Domestic work	1	1.0
Other	0	0.0
Changes in income over the past 6 months		
More	5	5.0
Less	3	3.0
Same	92	92.0

Most of the households (83.8%) had one to two people contributing to the household income. Twenty-nine mothers indicated that they did not know what the total household income per month was. Of the mothers who did know, most indicated that the household income was R1000 – R3000 per month (27.0%), and 16.0% indicated that it was R500 – R1000. The main sources of income were wages and salary from formal employment (52.0%) (including their partners), and a state grant (32.0%). When the mothers were asked if this was more or less or the same income that they had over the past six months, most indicated that it was the same (92.0%).

5.3.2 HOUSEHOLD FOOD SECURITY

General household food security results are presented in table 5.9.

Table 5.9 Household food security

Variable	n	%
How much money is available to spend on food each week?		
R0-R50	2	2.0
R51-R100	15	15.0
R101-R150	13	13.0
R151-R200	15	15.0
R201-R250	6	6.0
R251-R300	3	3.0
R301-R350	5	5.0
R351-R400	1	1.0
Over R400	3	3.0
Don't know	37	37.0

Food production		
Households growing vegetables, crops or fruit	23	23.0
Households who own livestock	4	4.0
Who in the family is served first at meal time?		
Father/men in family	0	0.0
Mother/women in family	1	1.0
Children	0	0.0
All eat at the same time	95	95.0
Lives and eat alone	4	4.0

The amount of money that was available for buying food each week was mostly specified as between R0 – R200 (71.4%). Most of the mothers (77.0%) did not grow vegetables, crops or fruit. Likewise, 96.0% of the mothers' households did not own livestock. In most of the households (95.0%) all of the members were served meals at the same time.

The results related to the hunger scale are presented in table 5.10. The most used coping strategies during periods of food shortages are summarised in table 5.11.

Table 5.10 Household food security - Hunger scale

Variable	n	%
Does your household ever run out of money to buy food?		
Yes	66	66.0
No	34	34.0
Do you ever rely on a limited amount of food to feed your children?		
Yes	50	50.0
No	25	25.0
No children in household	25	25.0
Do you ever cut the size of meals because there isn't enough food in the house?		
Yes	64	64.0
No	36	36.0
Do you ever eat less than you should because there isn't enough money for food?		
Yes	66	66.0
No	34	34.0
Do your children ever eat less than you feel they should because there isn't enough money for food?		
Yes	47	47.0
No	28	28.0
No children in household	25	25.0

Do your children ever say they are hungry because there is not enough food in the house?		
Yes	46	46.0
No	29	29.0
No children in household	25	25.0
Do you ever cut the size of your children's meals because there isn't enough food in the house?		
Yes	48	48.0
No	27	27.0
No children in household	25	25.0
Do any of your children go to bed hungry because there isn't enough money to buy food?		
Yes	48	48.0
No	27	27.0
No children in household	25	25.0
Has the family ever experienced periods of food shortage?		
Yes	64	64.0
No	36	36.0

Table 5.11 Household food security - Coping strategies during periods of food shortage

Variable	n	%
Coping strategies		
Found additional sources of income	3	3.0
Asked family/neighbours for help (money/food)	48	48.0
Family members went to live elsewhere	9	9.0
Sold assets	0	0.0
Worked for payment in kind	4	4.0
Depended on charity or welfare	0	0.0
Borrowed money or food	12	12.0
Increased food production	1	1.0
Could not do anything	1	1.0
Other	1	1.0

Most of the mothers indicated an affirmative response to questions related to hunger in the household. It was common for food and money to be less available at times, and the sizes of meals for family members were not always considered to be adequate. Sixty-four percent of mothers reported that their households experience periods of food shortages, and the most commonly used coping strategy was to ask family members or neighbours for money or food (75.0%).

5.3.3 REPORTED HEALTH AND MEDICAL HISTORIES OF MOTHER/INFANT PAIRS

5.3.3.1 MOTHERS

Neither smoking, nor snuffing tobacco was prevalent, with respectively 97.0% and 86.0% of respondents reporting that they had never used these substances. Eighty-two percent indicated that they had never used alcohol, while 15.0% had formerly used alcohol. Two of the mothers used alcohol during their most recent pregnancy, and the median amount of units used per week, was five units. Eleven of the mothers used snuff during their most recent pregnancy, and the median amount of times that snuff was used per day, was two times. The results related to alcohol and tobacco use are presented in tables 5.12 and 5.13.

Table 5.12 Reported health and medical histories of women – Alcohol and tobacco use

Variable	n	%
History of smoking		
Never smoked	97	97.0
Currently smoked (during pregnancy)	1	1.0
Formerly smoked	2	2.0
History of snuffing		
Never used snuff	86	86.9
Currently used snuff (during pregnancy)	11	11.1
Formerly used snuff	2	2.0
History of alcohol use		
Never used alcohol	82	82.8
Currently used alcohol (during pregnancy)	2	2.0
Formerly used alcohol	15	15.2

Table 5.13 Reported health and medical histories of mothers – Alcohol and tobacco use: median values

Variable	Minimum	Median	Maximum
Median number of times snuff is used per day	1	2	10
Median age respondents started to use snuff (years)	9	14	37
Median units of alcohol consumed per weekend by women who used alcohol during pregnancy	4	5	6
Median age at which women who used alcohol during pregnancy started to use alcohol	14	21	28

Disabilities such as having difficulty walking, seeing, hearing, reading and speaking were not prevalent, with the most reported disability being difficulty with walking (2.0%). The most prevalent diagnoses other than HIV, were hypertension (26.0%), current or previous Tuberculosis (10.0%), pre-eclampsia (8.0%), constipation (4.0%) and pregnancy induced hypertension (3.0%). Family members mostly suffered from hypertension (42.0%), diabetes mellitus (27.0%), and lung diseases (15.0%). The reported diagnoses, symptoms and medications are summarized in table 5.14.

Table 5.14 Reported health and medical histories of mothers – Diagnoses, symptoms and medications

Variable	n	%
Current disability		
Trouble walking	2	2.0
Trouble seeing someone across the room (with glasses)	1	1.0
Trouble reading (with glasses)	1	1.0
Trouble speaking and being understood	1	1.0
Trouble hearing	1	1.0
Diagnoses of respondent (other than HIV)		
Diabetes	0	0.0
Hypertension	26	26.0
Stroke	0	0.0
Heart disease/angina/heart attack	3	3.0
Heart failure	0	0.0
Cancer	0	0.0
Liver disease	0	0.0
Lung diseases (excluding Tuberculosis (TB))	2	2.0
Tuberculosis (previous or current)	10	10.0
Epilepsy	0	0.0
Diagnoses of respondent's family		
Diabetes	27	27.0
Hypertension	42	42.0
Stroke	1	1.0
Heart disease/angina/heart attack	4	4.0
Heart failure	0	0.0
Cancer	5	5.0
Liver disease	0	0.0
Lung diseases (excluding TB)	8	8.0
Tuberculosis (previous or current)	7	7.0
Epilepsy	2	2.0
HIV/AIDS	4	4.0
General symptoms of respondent		
Chest pain or tightness with usual activity	16	16.0
Breathlessness with usual activity	26	26.0
Cough for at least two weeks	17	17.0
Wheezing or whistling in chest	9	9.0

Loose stools/diarrhoea for at least three days	18	18.0
Vomiting/nausea	10	10.0
Loss of appetite	36	36.0
Swelling of feet	4	4.0
Blood in urine	1	1.0
Involuntary weight loss >3kg	11	11.0
Skin rash	2	2.0
Joint pain	1	1.0
Sexually transmitted disease	0	0.0
Other medical problems		
Pre-eclampsia	8	8.0
Low HB	2	2.0
Atypical herpes	1	1.0
Urinary tract infection	2	2.0
Lower respiratory tract infection	1	1.0
Iron deficiency anaemia	1	1.0
Pregnancy induced	3	3.0
Cervicitis	1	1.0
Abruptia placenta	1	1.0
HELLP syndrome	1	1.0
Renal impairment	1	1.0
Pulmonary oedema	1	1.0
Deep vein thrombosis	1	1.0
Cellulitis	1	1.0
Heartburn	1	1.0
Constipation	4	4.0
Vaginal warts	1	1.0
Home use of chronic medications	94	94.0
Class of drugs		
Antiretroviral drugs	93	98.9
Hypertension medications	14	14.9
Aspirin	1	1.1
Asthma pump	2	2.1
Hospital medications (patient file)		
Pain medication	79	79.0
Antibiotics	63	63.0
Antiretroviral drugs	34	34.0
Hypertension medications	20	20.0
Micronutrients	24	24.0
Anticoagulants	56	56.0
Corticosteroids	5	5.0
Anti-emetics	40	40.0
Stomach acid reducers	38	38.0
Laxative	33	33.0
Oxytocin	47	47.0
Anti-anxiety	6	6.0
Dopamine agonist	5	5.0
Non-steroidal anti-inflammatory drugs	17	17.0
Selective beta-2 agonist	7	7.0
TB medication	4	4.0
Blood transfusion	1	1.0
Labour inducer	4	4.0
Anti-inflammatory drugs	2	2.0

Ninety-four percent of mothers indicated that they used chronic medication at home. The two home medications that were used most often, were ARVs (98.9%) and hypertension medication (14.9%). A variety of hospital medications were prescribed, and these mostly included pain medications (79.0%), antibiotics (63.0%) and anticoagulants (56.0%). The most prevalent general symptoms that mothers suffered from included loss of appetite (36.0%), breathlessness with usual activity (26.0%), diarrhoea/loose stools for more than three days (18.0%), coughing for at least two weeks (17.0%) and involuntary weight loss (11.0%).

Results related to the general reported health and medical histories of mothers are reported in table 5.15.

Table 5.15 Reported health and medical histories of mothers – General

Variable	n	%
Previous hospitalization		
Respondents hospitalized during the last year	3	3.0
Frequency of hospitalisations		
Once	3	100.0
Length of hospital stay		
2 days	1	33.3
3 days	1	33.3
4 days	1	33.3
Reason for hospitalization		
False labour	1	50.0
Pulmonary oedema	1	50.0
Delivery route		
Caesarean section	71	71.0
Normal vaginal delivery	29	29.0
Contraception		
Have used injectable contraceptives before	80	80.0
Have used male/female condom before	93	93.0
Parity and previous infant feeding practices:		
Number of live children given birth to		
1	31	31.3
2	38	38.4
3	23	23.2
4	5	5.1
5	2	2.0
Previous breastfeeding practices		
Respondents who breastfed previous children	59	85.5

Most of the mothers (72.0%) became aware of their HIV status in either 2011 or 2012, with the median number of years aware of HIV status being 1.0 year. Hospitalisations during the previous year were not common (3.0%). Caesarean sections were performed on 71.0% of the mothers, while 29.0% of the women had normal vaginal deliveries. Injectable contraceptives had been used by 80.0% of mothers in the past, and 93.0% had used condoms in their lifetime. A large percentage of mothers had given birth to a total of two live children (38.4%), 31.3% had one child, and 23.2% had three children. Eighty-five percent of mothers who already had children, had breastfed them. The median age that mothers started to give anything else other than breastmilk, was four months (table 5.16).

Table 5.16 Reported health and medical histories of mothers – Age of introduction of solid foods or liquids to previous children that were breastfed

Variable	Minimum	Median	Maximum
Median age (months)	1	4	12

CD4 counts were available for 80.0% of mothers, with a median value of 383 cells/mm^3 (27 – 1023 cells/mm^3). Recent haemoglobin values were available for 75.0% of the mothers. The median value was 11.4 g/dL (4.5 – 14.6 g/dL). The biochemical data of the mothers are presented in tables 5.17 and 5.18.

Table 5.17 Reported health and medical histories of mothers – CD4 counts

Variable	Minimum	Median	Maximum
CD4 count (cells/mm^3)	27	383	1023

Table 5.18 Reported health and medical histories of mothers – Haemoglobin

Variable	Minimum	Median	Maximum
Haemoglobin (g/dL)	4.5	11.4	14.6

Most of the mothers indicated that they were members of a church (90.0%) and 70.0% of them attended a service at least twice a month. According to the mothers, 35.0% had not experienced stress during the last two months, while 10.0% felt that they had experienced permanent stress. Only thirty-nine percent of mothers acknowledged that they knew

people who are HIV-infected, and these people were mostly family members (42.6%) or community members and friends (57.4%). The results related to the psychological well-being of the respondents are presented in table 5.19.

Table 5.19 Reported health and medical histories of mothers – Psychological well-being

Variable	n	%
Religion		
Member of a church	90	90.0
Attend services at least twice a month	70	77.8
Feelings of stress, anxiety or sleeping difficulties		
Never	35	35.0
A few periods of stress	51	51.0
Several periods of stress	4	4.0
Permanent stress	10	10.0
Feelings of sadness/depression for at least two weeks in a row	14	14.0
Respondents acquainted with people who are HIV-infected	39	39.0
Respondents acquainted with the following groups of HIV-infected people		
Her own children	0	0.0
Her grandchildren	0	0.0
Her spouse	0	0.0
Her family members	20	42.6
Her friends	11	23.4
People in her community	16	43.0

5.3.3.1 INFANTS

The median gestational age of the first, or only infant, of the mothers (n = 99), was 38 weeks (26 – 42 weeks). The median gestational age of the second infant of the mothers with twins (n = 3), was 37 weeks (33 – 38 weeks). The gestational age of one infant was not known. The gestational ages of the first and second infants are presented in tables 5.20 and 5.22.

Table 5.20 Reported health and medical histories of infant 1 – Gestational age

Variable	Minimum	Median	Maximum
Gestational age (weeks) (n = 99)	26.0	38.0	42.0

Table 5.21 Reported health and medical histories of infant 2 – Gestational age

Variable	Minimum	Median	Maximum
Gestational age (weeks) (n = 3)	33.0	37.0	38.0

In all of the infants with known gestational ages (n = 102), 26.4% were classified as premature according to the WHO classification. Seven of the 103 infants (6.8%) presented with foetal distress, and all of the infants received Nevirapine (table 5.22).

Table 5.22 Reported health and medical histories of all infants – Medical problems and medication

Variable	n	%
Medical problems		
Jaundice	0	0.0
Sepsis	0	0.0
Meconium aspiration	0	0.0
Prematurity	27	26.2
Cardiovascular	0	0.0
Pulmonary	1	0.0
Other (mostly foetal distress)	7	6.8
Medications		
Nevirapine	103	100.0

Regarding the feeding of the infants, the planned feeding option for 70.9% of the infants was to breastfeed, while the planned option for 29.1% of the infants was to be formula-fed. No respondent planned to mixed feed at this point. After birth, 63.1% of the infants received breastmilk from the mother, and 30.1% received formula milk. The rest of the infants had not received any feed at the time of the interview (table 5.23).

Table 5.23 Reported health and medical histories of all infants – Feeding

Variable	n	%
Planned feeding choice of mother		
Breastfeed	73	70.9
Formula feed	30	29.1
Mixed feed	0	0.0
Other	0	0.0
What was fed to the infant after birth		
Breastmilk (mother)	65	63.1
Breastmilk substitute	31	30.1
Breastmilk (milk bank)	1	1.0

Heat-treated breastmilk (mother)	0	0.0
Other (mostly nothing yet)	6	5.8
If it is not as planned, why did feeding mode change? (n = 9)		
Medical complication in infant	5	55.6
Medical complication in mother	2	22.2
Other (mostly low milk production)	2	22.2
Specify complication leading to change in feeding option (n = 7)		
Low milk production	3	42.9
Foetal distress	1	14.3
High risk premature	3	42.9

The results related to breastfeeding mothers are presented in table 5.24. Most of the mothers (60.0%) who planned to breastfeed started breastfeeding within an hour of giving birth. The main reasons for breastfeeding being delayed, included the mother not being awake (33.3%), low milk production (33.3%), high risk premature baby (25.0%) and the mother felt too dizzy (8.3%). The mothers reported a combined 26 breastfeeding problems, which included sore breasts (46.2%), low milk production (38.5%) and problems with attachment or positioning (11.0%).

Table 5.24 Reported health and medical histories of infants – Breastfeeding mothers

Variable	n	%
If breastfeeding, number of mothers who started within one hour of birth	60	83.3
If not, why? (n = 12)		
Mother not awake	4	33.3
Low milk production	4	33.3
High risk premature baby	3	25.0
Mother felt too dizzy	1	8.3
Breastfeeding problems (n = 26)		
Attachment	2	7.7
Positioning	1	3.8
Low milk production	10	38.5
Infant not able to suckle effectively	1	3.8
Other (mostly sore breasts)	12	46.2

5.3.4 ANTHROPOMETRY OF INFANTS

The results related to anthropometry of infants are presented separately for the premature (< 37 weeks gestation) and the full-term infants (≥ 37 weeks gestation). Since the

gestational age of one of the infants was unknown, the premature group comprised 27 infants (26.5%) and the full-term group comprised 75 infants (73.5%).

5.3.4.1 MEDIAN WEIGHT-FOR-AGE, LENGTH-FOR-AGE AND WEIGHT-FOR-LENGTH

Table 5.25 and table 5.26 summarise the median z-scores of weight-for-age, length-for-age and weight-for-length for the premature and full-term groups respectively. Differences in the n-values can be attributed to the fact that not all of the parameters were available for all of the infants.

Table 5.25 Median z-scores of weight-for-age, length-for-age and weight-for-length for the premature group

Variable	n	Minimum	Median	Maximum
Length-for-age	25	-9.5	-3.3	0.6
Weight-for-age	27	-6.1	-3.6	-0.9
Weight-for-length	9	-6.0	-1.7	0.2

Table 5.26 Median z-scores of weight-for-age, length -for-age and weight-for-length for the full-term group

Variable	n	Minimum	Median	Maximum
Length-for-age	70	-7.3	0.5	5.3
Weight-for-age	75	-3.3	-0.4	2.9
Weight-for-length	62	-5.3	-1.4	3.9

Median length-for-age was determined in 25 premature and 70 full-term infants. The median length-for-age z-score of the premature infants was -3.3 SD (-9.5 to 0.6 SD) while that of the full-term infants was 0.5 SD (-7.3 to 5.3 SD). This difference in length-for-age z-scores was statistically significant as indicated by the 95% confidence interval (CI) for the median z-score difference [-4.7 ; -2.3]. The median length-for-age z-score of the premature infants fell within the severe under-length at birth (< -3 SD), while that of the full-term infants was in the normal category (- 1 to + 1 SD).

Median weight-for-age was determined in 27 premature infants and 75 full-term infants. The median weight-for-age z-score of the premature infants was -3.6 SD (-6.1 to -0.9 SD)

while that of the full-term infants was -0.4 SD (-3.3 to 2.9 SD). This difference in weight-for age z-scores was statistically significant as indicated by the 95% CI for the median z-score difference [-3.6 ; -2.4]. The median weight-for-age z-score of the premature infants fell within the severely underweight at birth category (< -3 SD), while that of the full-term infants was in the normal category (- 1 to + 1 SD).

Median weight-for-length was determined in 9 premature infants and 62 full-term infants. The median weight-for-length z-score of the premature infants was -1.7 SD (-6.0 to 0.2 SD) while that of the full-term infants was -1.4 SD (-5.3 to 3.9 SD). Although this difference in weight-for-length z-scores was not statistically significant, the 95% CI for the median z-score difference does indicate a trend [-2.4 ; 0.4]. The median weight-for-length z-score of both the premature and full-term infants fell within the mildly wasted at birth category (< -1 SD).

5.3.5 KNOWLEDGE, ATTITUDES AND PRACTICES RELATED TO HIV AND INFANT FEEDING

General data related to infant feeding are summarized in table 5.27. Almost all of the mothers (94.0%) believed that there are advantages for the infant if the mother breastfeeds. The main advantages that were mentioned were that breastmilk is best for the infant (22.3%), that the infant will grow well (17.0%), it is healthy for the infant (12.5%) and that the infant will not get sick (10.7%). When the mothers were asked if there are advantages for the breastfeeding mother, 60.0% of the mothers agreed. However, most (70.0%) could not identify an advantage. Of the mothers who could name advantages, most indicated that it helps the mother to stay healthy (6.7%) and that it promotes bonding with the infant (5.0%). Most of the mothers thought that breastfed infants younger than six months old do not require additional solids or fluids and that breastmilk alone is enough for the infant. Of the mothers, 88.0% believed breastmilk to be the best infant feeding option for infants, while 11.0% thought that formula milk was the best. Twelve percent of the mothers indicated that their choice to either breastfeed or formula feed was influenced by mainly elders (41.7%) or health care personnel (41.7%). Most of the mothers decided on an infant feeding choice during early ante-natal visits (74.0%). Some confusion existed

when the mothers were asked if an infant should continue being fed if he/she fell ill, with 60.0% agreeing that feeding should continue, while 14.0% said that feeding should stop and 26.0% did not know.

Table 5.27 Knowledge, attitudes and practices – General infant feeding practices

Variable	n	%
Respondents who believe there are advantages for the baby who is breastfed	94	94.0
Mentioned advantages for infant (n = 112)		
Baby will grow well	19	17.0
It is healthy for baby	14	12.5
Baby won't get sick	12	10.7
It is nutrient rich	1	0.9
It is free	5	4.5
Best for baby	25	22.3
Gives power	7	6.3
A complete milk	5	4.5
Good - from the mother	5	4.5
Always fresh	3	2.7
With formula you may measure incorrectly	1	0.9
Bonding with baby	1	0.9
It is easy	1	0.9
Don't know	13	11.7
Respondents who believe there are advantages for the mother who breastfeeds	60	60.0
Mentioned advantages for mother (n = 60)		
Help me to lose weight	2	3.3
Cheaper	1	1.7
Help me to stay healthy	4	6.7
Helps my body to heal	2	3.3
Good for the mother's health	2	3.3
Bonding with baby	3	5.0
Uterus contracts	2	3.3
The doctor said it's good for me	1	1.7
Feels good to breastfeed	1	1.7
Don't know	42	70.0
Do you think that breastmilk is enough for a baby <6 months old, or does the baby need extra food or liquids?		
Breastmilk is enough	80	80.0
Baby needs extra food or liquids	20	20.0
Which do you think is best for a baby (0-6 months old)?		
Breastmilk	88	88.0
Formula milk	11	11.0
Cow's milk	0	0.0
Breastmilk together with other foods/liquids	0	0.0
Other	1	1.0

Did anyone influence your choice to breastfeed or formula feed or did you decide on your own?		
Influenced	12	12.0
Decided on own	88	88.0
If your choice was influenced, who/what mainly influenced you? (n = 12)		
Elders	5	41.7
Husband/partner	2	16.7
Friends	0	0.0
Sister / nurse / doctor	5	41.7
Media	0	0.0
When did you decide what you are going to feed your baby?		
During early ante-natal visits	74	74.0
During late ante-natal visits	22	22.0
Close to giving birth	3	3.0
After giving birth	1	1.0
Other	0	0.0
Should you continue to breastfeed or formula feed your baby if he/she has diarrhoea or is sick?		
Yes	60	60.0
No	14	14.0
Don't know	26	26.0

The median age at which the mothers planned to introduce other liquids to the diet of the infant was 6.0 months, and solids also at 6.0 months (tables 5.28 and 5.29).

Table 5.28 Knowledge, attitudes and practices – Age of introduction of liquids (months)

Variable	Minimum	Median	Maximum
At what age do you plan to first start giving your baby liquids like water, tea, juice and cow's milk?	2.0	6.0	12.0

Table 5.29 Knowledge, attitudes and practices – Age of introduction of solids (months)

Variable	Minimum	Median	Maximum
At what age do you plan to first start giving your baby solid foods like pap, vegetables, rice, fruit and meat?	3.0	6.0	24.0

The knowledge, attitudes and practices regarding infant feeding in the group of mothers who planned to breastfeed (n = 70) are presented in table 5.30. The main reasons for choosing to breastfeed were that it is best for the baby (61.4%), that it is free (20.0%) and that family members or healthcare personnel had advised them to breastfeed (11.4%).

Almost all (98.6%) of the mothers planned to breastfeed their infants during the day and night and indicated that infants can feed for however long they want (98.6%), while 15.9% of breastfeeding mothers planned to give the baby a dummy or pacifier.

Table 5.30 Knowledge, attitudes and practices – Mothers who planned to breastfeed

Variable	n	%
Main reason for choosing to breastfeed		
Family/nurse told you to breastfeed	8	11.4
It is best for the baby	43	61.4
It is free	14	20.0
Don't want the community to know you are HIV-infected	0	0.0
Other (mostly because she finds pleasure in breastfeeding)	5	7.1
Will you feed only during the day, or during the night when the baby wakes up as well?		
Day and night feeds	68	98.6
Only day feeds	1	1.4
Respondents who plan to give the baby teats, pacifiers or dummies	11	15.9
Do you plan to breastfeed your baby for as long as he wants, or make specific times in which he/she may breastfeed?		
Baby can suckle for as long as he/she wants	68	98.6
Baby can only suckle at specific times	1	1.4

The knowledge, attitudes and practices regarding infant feeding in the group of mothers who planned to formula feed (n = 30) are presented in table 5.31. The main reasons for formula feeding was to prevent the transmission of HIV to the infant (76.7%) and that the mother was going back to work (16.7%). Almost one out of four of the mothers (23.3%) planned to give only day feeds. When the mothers were asked how they would know how to prepare the formula milk as well as how much to prepare the option that was chosen most frequently was to read on the formula milk tin to find instructions (51.5%), while the second most frequently chosen option was that they would find out from healthcare personnel (27.3%). Ten percent indicated that they would not follow any specific guidelines when preparing formula milk feeds. Most of the mothers who planned to formula feed said that they would use a bottle and teat to feed their infants, while 20.0% would use a cup to cup feed. Almost half of the mothers would add water to powder (53.3%) while 46.7% would add powder to water when mixing the milk. Ninety percent of the mothers planned to wash the utensils used to formula feed after each feed, and indicated they would mostly

use warm water and soap (50.0%). Twenty percent would use boiling water, soap and disinfectant, while 10.0% would use salt to clean the bottles. Almost all of the mothers who planned to formula feed believed that they would always have enough milk to feed their infants (93.3%). If not, one mother indicated that she would give less milk and another mother did not know what she would do.

Table 5.31 Knowledge, attitudes and practices – Mothers who plan to formula feed

Variable	n	%
Main reason for choosing to formula feed		
It is best for the baby	1	3.3
Family/nurse told you to	1	3.3
Do not want to risk passing HIV to the baby	23	76.7
Only poor mothers breastfeed	0	0.0
Other (mostly because she is going back to work)	5	16.7
Will you feed only during the day, or during the night when the baby wakes up as well?		
Day and night feeds	23	76.7
Only day feeds	7	23.3
How will you mainly know how much milk to prepare for the baby? (n = 33)		
Read on tin	17	51.5
Hear from family or friend	3	9.1
Hear from clinic/hospital staff	9	27.3
Do not follow any specific guidelines	3	9.1
Other	1	3.0
How do you mainly plan to feed your new-born baby?		
Bottle and teat	23	76.7
Cup	6	20.0
Spoon	0	0.0
Other	1	3.3
Will you add water to powder, or powder to water?		
Water to powder	16	53.3
Powder to water	14	46.7
How often will you wash the bottle, teat, cup, spoon, jugs etc.?		
Every time you prepare milk	27	90.0
Once a day	2	6.7
Three times per week	0	0.0
Once a week	0	0.0
Other	1	3.3
What will you mainly use to wash the bottle, teat, cup, spoon, jugs etc.?		
Rinse with cold water	0	0.0
Cold water and soap	6	20.0
Warm water and soap	15	50.0
Boiling water, soap, disinfectant	6	20.0
Other (mainly salt)	3	10.0

Do you think you will always have enough formula milk when the baby is < 6 months old?		
Yes	28	93.3
No	2	6.7
If not, what will you do?		
Use less powder when mixing milk	0	0.0
Give less feeds during the day	1	50.0
Let the baby breastfeed	0	0.0
Give the baby other liquids or foods such as cow's milk	0	0.0
Other	1	50.0

The results related to knowledge, attitudes and practices regarding HIV infant feeding are presented in table 5.32. Only 57.0% of the mothers believed that HIV can pass to the infant via breastfeeding, 37.0% believed HIV cannot pass to the infant in this manner, and 6.0% did not know the answer. Eighty-five percent of the mothers thought that HIV-infected mothers can breastfeed their infants, and 10.0% thought that they could not. Most of the mothers believed that there is no chance that an infant will be infected with HIV via breastfeeding, while 31.0% thought there was a small chance, and 21.0% did not know the answer. Eighty percent of the mothers agreed that mixed feeding is not a safe infant feeding option. More than half of the mothers (57.0%) were aware of the provision of free formula milk to HIV-infected mothers at clinics and 50.0% of the mothers had a positive attitude towards the practice of providing free formula milk to HIV-infected mothers. Regarding the withdrawal of free formula milks at clinics, 49.5% knew about this fact, and 47.5% had a negative attitude towards the withdrawal of the free milk. Of the 75 mothers who indicated that they would or might formula feed at some point, 94.7% indicated that they would buy formula milk if they no longer had the option of receiving free formula milk at clinics.

Table 5.32 Knowledge, attitudes and practices – HIV and infant feeding

Variable	n	%
Is there a chance that HIV can pass through the breastmilk to the baby (on ARVs or not)?		
Yes	57	57.0
No	37	37.0
Don't know	6	6.0
Can an HIV-infected woman breastfeed her baby?		
Yes	85	85.0

No	10	10.0
Don't know	5	5.0
What is the chance that a baby will get HIV from the HIV-infected mother because of breastfeeding?		
No chance	33	33.0
Small chance	31	31.0
Good chance	6	6.0
Very large chance	9	9.0
Don't know	21	21.0
Between 0-6 months, is it safe to breastfeed and give other foods or liquids when the mother is HIV-infected?		
Yes	14	14.0
No	80	80.0
I don't know	6	6.0
Are you aware of the provision of free formula milk for babies of HIV-infected mothers at clinics for the first 6 months?		
Yes	57	57.0
No	43	43.0
What are your thoughts regarding the free provision of formula milk to HIV-infected mothers?		
Negative attitude	14	14.0
Neutral attitude	35	35.0
Positive attitude	50	50.0
Are you aware that there is a chance that the provision of free formula milk will end in the near future?		
Yes	49	49.5
No	50	50.5
What are your thoughts regarding the free provision of formula milk to HIV-infected mothers?		
Negative attitude	47	47.5
Neutral attitude	33	33.3
Positive attitude	19	19.2
What would you feed your baby if you no longer have the option of receiving free milk at the clinics (if formula feeding at some time)? (n = 75)		
Buy formula milk	71	94.7
Give animal milks	2	2.7
Breastfeed	1	1.3
Give breastmilk and other milks or foods	0	0.0
Other	1	1.3

The median age of the infant up to which an HIV-infected mother should give only breastmilk was indicated at 6.0 months. The median age of the infant up to which an HIV-infected mother can breastfeed was also indicated as 6.0 months (table 5.33).

Table 5.33 Knowledge, attitudes and practices – HIV and infant feeding (median values)

Variable	Minimum	Median	Maximum
If an HIV-infected mother chose to breastfeed, until what age must she only give breastmilk?	4.0	6.0	24.0
If a mother is HIV-infected, until what age can she breastfeed her baby?	3.0	6.0	24.0

The mothers' abilities to meet the AFASS criteria are presented in table 5.34. Almost all of the mothers had easy access to clean water (99.0%) and a clinic/hospital (97.9%), while 78.8% had access to soap, hot water and disinfectant. Only 39.4% had access to around R400 per month to buy enough formula milk.

Table 5.34 Knowledge, attitudes and practices of mothers – AFASS criteria

Variable	n	%
Which of the following do you have? (n = 99)		
Access to safe, clean water	98	99.0
Around R400 per month to buy formula milk	39	39.4
Soap, disinfectant and hot water to clean utensils and prepare formula	78	78.8
Ability to give formula milk for 0-6 months of baby's life	61	61.6
Support from your family to formula feed	52	52.5
Easy access to clinic/hospital in case baby gets sick	97	97.9

5.3.6 WHO PRINCIPLES AND RECOMMENDATIONS REGARDING HIV AND INFANT FEEDING

Questions and responses related to the WHO principles regarding HIV and infant feeding are presented in table 5.35. When mothers were asked to indicate which infant feeding option could cause a higher risk of the infant becoming ill or dying when the mother is HIV-infected vs. HIV-uninfected, responses did not differ much. Most of the mothers felt that infants who are fed with animal milks are at the highest risk, irrespective of the mother's HIV status. Only 3.0% of mothers felt that the breastfed infant of an HIV-infected or HIV uninfected mother had the highest morbidity and mortality risk. Around two-thirds of the mothers (64.0%) were more afraid of their infants becoming ill or dying when formula-fed than the risk of passing HIV to the infant via breastfeeding. Most of the mothers had easy

access to HIV testing during pregnancy (98.0%), and to ARV medications (96.0%), while 95.0% of the mothers reported that they had always taken their ARVs as prescribed during the pregnancy. Ninety-two percent of the mothers had received infant feeding counselling from a healthcare professional, while 8.0% had not.

Of the mothers who reported that they did receive infant feeding counselling (n = 92), 58.7% indicated that the healthcare worker did tell them that there is a chance that the infant can be infected via breastfeeding, while 26.1% said they did not, and 16.3% could not remember. Of the mothers who were told that their infants might become HIV-infected via breastfeeding (n = 54), most (67.9%) said that the healthcare worker told them that breastfeeding carries a small chance of transmission. The remaining mothers indicated that breastfeeding carries a big risk of transmission (20.8%), while 11.3% could not remember. Most of the mothers confirmed that the healthcare worker explained to them what the benefits of breastfeeding were (80.4%), that they should use ARVs to minimize the risk of transmission via breastfeeding (90.2%), and that an HIV-infected mother who breastfeeds should not practice mixed feeding (73.9%).

A number of mothers (28.3%) were not told that if they chose to formula feed and did it incorrectly, their infant had a high risk of morbidity and mortality, and it appeared as if the AFASS criteria were not adequately explained to the mothers in most cases. The two criteria that the mothers could mostly recall, were that they should have access to enough money to buy formula milk (63.0%) and safe water (43.5%). Most of the mothers received the counselling whilst being pregnant (94.6%), 88.0% understood all of the information, and 81.5% thought that the information was sufficient for them to be able to make an informed infant feeding decision.

Uncertainty existed when the mothers were asked if an HIV-infected woman could breastfeed when ARVs are not available, with approximately half (51.0%) indicating that they did not know, and 32.0% indicating that they could not. Half of the mothers who chose to breastfeed received an explanation regarding how to breastfeed correctly. Most of the mothers (64.0%) reported that they had not received an explanation of EBF entails, while 25.0% had. Mothers' definitions of EBF were incomplete. Twenty-four percent could

indicate that it meant that only breastmilk should be given. Mothers who chose formula feeding did not always receive counselling on how to prepare the milk, with less than half of them reporting that they had received counselling (46.7%). Almost all of the mothers (93.0%) would go to a clinic if they experienced any infant feeding problems. When they were asked what their feeding choice would have been if they were HIV-uninfected, most indicated breastfeeding (98.0%), with the main reasons for it being that it is best for their infants (68.0%), and that it is good for the infant or the healthiest choice (17.0%). Thirty percent of the mothers were told how to prevent HIV re-infection, with safe sex practices such as condom use being the most mentioned strategy (90.9%). Most of the mothers did believe that the type of foods and drinks that a person gives to an infant would influence their health (82.0%).

Table 5.35 WHO Principles regarding HIV and infant feeding

Variable	n	%
Which of the following babies has a higher chance of getting sick and dying when the mother is HIV-infected?		
Breastfed baby	3	3.0
Formula-fed baby	7	7.0
Baby fed with animal milks	83	83.0
I don't know	7	7.0
Which of the following babies has a higher chance of getting sick and dying when the mother is HIV un-infected?		
Breastfed baby	3	3.0
Formula-fed baby	10	10.0
Baby fed with animal milks	81	81.0
I don't know	6	6.0
Which of the following are you more afraid of?		
Passing HIV to your baby through breastmilk	36	36.0
Your baby getting sick very often and has a higher risk of dying when giving formula milk/animal milks	64	64.0
Did you have easy access to HIV testing when you were pregnant?		
Yes	98	98.0
No	2	2.0
Did you have easy access to ARVs when you were pregnant?		
Yes	96	96.0
No	4	4.0
Did you always take the ARVs as prescribed while pregnant?		
Yes	95	95.0
No	5	5.0

Did you receive counselling from a health care professional regarding what you should feed your baby?		
Yes	92	92.0
No	8	8.0
Cannot remember	0	0.0
If yes, please answer the following questions: (n =92)		
Did he/she tell you that there is a chance that your baby might get HIV via breastfeeding?		
Yes	54	58.7
No	24	26.1
Cannot remember	15	16.3
If yes, did he/she say it is a small chance or a big chance?		
Small chance	36	67.9
Big chance	11	20.8
Cannot remember	6	11.3
Did the health care worker tell you what the benefits of breastfeeding are?		
Yes	74	80.4
No	14	15.2
Cannot remember	4	4.4
Did the professional explain to you that if you breastfeed you and/or your baby must take ARVs to minimize the risk of HIV transmission through breastfeeding?		
Yes	83	90.2
No	7	7.6
Cannot remember	2	2.2
Did the professional tell you that if you breastfeed you should only give breastmilk for the first couple of months, nothing else?		
Yes	89	96.7
No	0	0.0
Cannot remember	3	3.3
Did the healthcare professional tell you that breastmilk protects the baby against infections, diarrhoea and death?		
Yes	68	73.9
No	14	15.22
Cannot remember	10	10.87
Did the health care professional tell you that your baby has a high risk of getting sick and dying if you formula feed incorrectly?		
Yes	57	62.0
No	26	28.3
Cannot remember	9	9.8
Which of the following did the professional tell you is important to be able to formula feed your baby safely?		
Access to safe, clean water	40	43.5
Around R400 per month to buy formula milk	58	63.0
Soap, disinfectant and hot water to clean utensils and prepare formula	17	18.5
Ability to give formula milk for 0-6 months of baby's life	7	7.6
Support from your family to formula feed	8	8.7

Easy access to clinic/hospital in case baby gets sick	10	10.9
When did you receive this counselling?		
While pregnant	87	94.6
After given birth	5	5.4
Did you understand all of the information?		
Yes	81	88.0
No	11	12.0
Was the information enough to make an informed decision that suits your situation?		
Yes	75	81.5
No	17	18.5
Can an HIV-infected mother still breastfeed even if ARVs are not available?		
Yes	17	17.0
No	32	32.0
Don't know	51	51.0
If you chose breastfeeding, did a professional explain how to breastfeed correctly?		
Yes	35	35.0
No	35	35.0
Cannot remember	0	0.0
Did the professional explain what exclusive breastfeeding is?		
Yes	25	25.0
No	64	64.0
Cannot remember	11	11.0
Define exclusive breastfeeding (tick off all which she mentions):		
Only breastmilk	24	24.0
No other fluids or solids	6	6.0
No pacifiers, teats or dummies	3	3.0
Other	0	0.0
If you chose formula feeding, did a professional explain how to formula feed correctly?		
Yes	14	46.7
No	16	53.3
Cannot remember	0	0.0
What should you do when you have problems with breastfeeding, formula feeding or weaning of your baby?		
Go to clinic	93	89.4
Go to doctor	5	4.8
Ask family/friends	1	1.0
Don't know	5	4.8
If you were HIV uninfected, what would you mainly feed your baby?		
Breastmilk	98	98.0
Formula milk	2	2.0
Animal milks	0	0.0
Other	0	0.0

Explain your choice		
Breastmilk is good for a baby	10	10.0
Breastmilk is the best	68	68.0
Formula milk is good for a baby	4	4.0
I am going back to work so I can't breastfeed	1	1.0
Breastmilk is the healthiest choice	7	7.0
Baby grows well on breastmilk	4	4.0
Breastmilk is free	2	2.0
Breastmilk is a complete milk	3	3.0
Won't get sick if breastfed	1	1.0
Were you told how to prevent HIV re-infection (of the mother) during pregnancy and after birth?		
Yes	30	30.0
No	39	39.0
Cannot remember	31	31.0
What were you told to do to prevent HIV re-infection (of the mother) during pregnancy and after birth?		
Safe sex practices	30	90.9
One partner	3	1.0
Does the type of foods and drinks that you give your baby influence his health?		
Yes	82	82.0
No	5	5.0
Don't know	13	13.0

Most mothers were correctly told that HIV-infected women who planned to breastfeed should give only breastmilk for a period of 6.0 months after birth, and the age they were told at which they should wean their infants, was also at 6.0 months (table 5.36).

Table 5.36 WHO Principles regarding HIV and infant feeding: median values

Variable	Minimum	Median	Maximum
Number of months mothers were told an HIV-infected breastfeeding woman should give only breastmilk	4.0	6.0	6.0
Age of the infant (months) that mothers were told to wean their infants	4.0	6.0	12.0

Results related to the WHO recommendations regarding HIV and infant feeding are presented in table 5.37. Most of the breastfeeding mothers (56.5%) indicated that they would buy formula milk for their infants when they stopped breastfeeding, while 23.2% would provide their infants with cow's milk. Mothers who chose to formula feed their

infants after birth were asked to explain the process of formula milk preparation. Most (40.0%) could only provide a partially complete explanation, 30.0% indicated that they did not know, while 16.7% could provide a correct explanation.

Half of the mothers who planned to formula feed would store unused formula milk in the fridge for the next feed, while 26.7% would let it stand outside the fridge and then give it to the infant at the next feed. Regarding heat-treated expressed breastmilk, most of the mothers (78.0%) were not aware of this option, and the mothers had mixed feelings about this practice. Most (37.0%) did not know what their attitude towards this practice was, probably because of the unfamiliarity thereof. One-quarter of the mothers thought it was a bad idea, 22.0% thought it was a good idea, and 13.0% thought it was a good idea but involved too much work. When the mothers were asked to indicate the best feeding choice for an already HIV-infected infant, most (78.0%) identified breastmilk as the best choice, while 9.0% thought that formula milk would be best, and 11.0% did not know.

Table 5.37 WHO Recommendations regarding HIV and infant feeding

Variable	n	%
When you stop giving breastmilk, what will you mainly give your baby to drink?		
Expressed, heat-treated breastmilk	0	0.0
Formula milk	39	56.5
Cow's milk	16	23.2
Other animal milk	0	0
No milk	6	8.7
Other (mostly do not know)	8	11.6
Explain all the steps involved in preparing formula milk (if formula feeding)		
Don't know	9	30.0
Incomplete or incorrect answer	4	13.3
Partially complete explanation	12	40.0
Complete or correct explanation	5	16.7
If the baby does not finish all of the milk, what will you mostly do with the leftover milk?		
Throw it away	5	16.7
Let it stand on the table, floor or outside and feed it to the baby during the next feed	8	26.7
Put it in the fridge and feed it to the baby during the next feed	15	50.0
Give it to older children to drink	1	3.3
Other	1	3.3

Are you aware that you can feed your baby expressed, heat-treated breastmilk (heat-treatment inactivates the HI virus)?		
Yes	22	22.0
No	78	78.0
What is your attitude towards heat-treating expressed breastmilk for your baby?		
It's a good idea	22	22.0
It's a bad idea	25	25.0
It's a good idea but too much work	13	13.0
Don't know	37	37.0
Other (mostly that it is not natural)	3	3.0
If the baby is HIV-infected, what is the best feeding choice?		
Breastmilk	78	78.0
Formula milk	9	9.0
Other animal milks	2	2.0
Don't know	11	11.0

The median age at which the mothers planned to stop giving both breastmilk and formula milk completely, was 6.0 months (table 5.38).

Table 5.38 WHO Recommendations regarding HIV and infant feeding: median values

Variable	Minimum	Median	Maximum
At what age (months) do you plan to stop giving breastmilk completely?	3.0	6.0	36.0
At what age (months) do you plan to stop giving formula milk completely?	4.0	9.0	36.0

5.4 ASSOCIATIONS BETWEEN VARIABLES

Associations between variables for the health care workers as well as mother/infant pairs were determined. To determine associations, 2x2 tables were constructed.

5.4.1 HEALTHCARE WORKERS

The following associations between variables were determined for the health care workers:

- Professional status and self-perceived knowledge regarding HIV and infant feeding

- Professional status and knowledge of the age up to which an HIV-infected mother can breastfeed according to the new 2010 WHO guidelines
- Professional status and attitude towards heat-treated expressed breastmilk
- Professional status and confidence in showing a mother how to breastfeed

5.4.1.1 ASSOCIATIONS BETWEEN PROFESSIONAL STATUS AND FACTORS RELATED TO HIV AND INFANT FEEDING

The professional status of the healthcare workers were grouped into the nursing personnel and a combination of the doctors and dieticians. The association between self-perceived knowledge and professional status is shown in table 5.39. No statistically significant association was found to indicate that one group felt more knowledgeable than the other (95% CI for the percentage difference [-37.8% ; 12.7%]). The association between professional status and knowledge of the age up to which an HIV-infected mother can breastfeed is indicated in table 5.40. There was no noteworthy difference between the groups, as no statistically significant association was found (95% CI for the percentage difference [24.0% ; 21.9%]).

Table 5.39 Association between professional status and self-perceived knowledge regarding HIV and infant feeding

Variables	n	Low knowledge	High knowledge
Nursing personnel	47	21 (44.7%)*	26 (55.3%)
Doctors & dieticians	17	10 (58.9%)*	7 (41.2%)

*CI [-37.8% ; 12.7%]

Table 5.40 Association between professional status and knowledge of age up to which a HIV-infected mother can breastfeed

Variables	n	Incorrect	Correct
Nursing personnel	47	34 (72.3%)*	13 (27.7%)
Doctors & dieticians	17	13 (76.5%)*	4 (23.5%)

*CI [-24.0% ; 21.9%]

A statistically significant difference (95% CI for the percentage difference [2.1% ; 49.1%]) was found between the percentage of nursing personnel and the percentage of

doctors/dieticians in relation to attitudes towards HIV-infected women who heat-treat expressed breastmilk for their infants. The nursing personnel were more accepting of this feeding choice (table 5.41).

The association between professional status and the confidence in showing a new mother how to breastfeed is shown in table 5.42. Although a statistically significant difference was not found between the groups, there appeared to be a trend indicating that a higher percentage of doctors/dieticians tended to have lower confidence in showing a mother how to breastfeed than the nurses (95% CI for the percentage difference [-44.5% ; 3.9%]).

Table 5.41 Association between professional status and attitude towards an HIV-infected woman who heat-treat expressed breastmilk

Variables	n	Feels it is a good idea	Other
Nursing personnel	47	25 (53.2%)*	22 (46.8 %)
Doctors & dieticians	17	4 (23.5%)*	13 (76.5%)

***CI [2.1% ; 49.1%]**

Table 5.42 Association between professional status and confidence in showing a mother how to breastfeed

Variables	n	Low confidence	High confidence
Nursing personnel	47	10 (21.3%)*	37 (78.7 %)
Doctors & dieticians	17	4 (41.2%)*	10 (58.8%)

*CI [-44.5% ; 3.9%]

5.4.2 MOTHER/INFANT PAIRS

The following associations between variables were determined for the mother/infant pairs:

- Age of mother and infant feeding choice
- Age of mother and knowledge that HIV can pass to infant via breastfeeding
- Age of mother and awareness of heat-treated expressed breastmilk
- Age of mother and fear of passing HIV to infant via breastfeeding vs. fear of increased risk of morbidity/mortality when formula feeding
- Educational level of mother and infant feeding choice

- Educational level of mother and knowledge that HIV can pass to infant via breastfeeding
- Educational level of mother and knowledge about heat-treated expressed breastmilk
- Educational level of mother and fear of passing HIV via breastfeeding vs. fear of morbidity/mortality when formula feeding
- CD_4 count of mother and infant feeding choice
- Haemoglobin level of mother and infant feeding choice
- Infant feeding choice and employment status of mother
- Infant feeding choice and access to flush toilet of mother
- Infant feeding choice and total income per month of mother
- Infant feeding choice and experience of food shortages of mother
- Associations between infant anthropometric variables

5.4.2.1 ASSOCIATIONS BETWEEN AGE OF THE MOTHER AND FACTORS RELATED TO HIV AND INFANT FEEDING

No statistically significant differences were found between the age of the mother and the infant feeding choice that she made (95% CI for the percentage difference [-13.0% ; 22.3%]), between the age of the mother and awareness of the option of heat-treating expressed breastmilk (95% CI for the percentage difference [-17.8% ; 14.7%]), or the age of the mother and the fear of passing HIV to her infant via breastfeeding (95% CI for the percentage difference [-22.5% ; 14.2%]), or the age of the mother and knowledge that HIV can pass to the infant via breastfeeding (table 5.43 – table 5.46).

Table 5.43 Association between age of mother and infant feeding choice

Variables	n	Breastfeeding	Formula feeding
≤ 30 years	47	34 (72.3%)*	13 (27.7 %)
> 30 years	52	35 (67.3%)*	17 (32.7%)

*CI [-13.0% ; 22.3%]

Table 5.44 Association between age of mother and knowledge that HIV can pass to infant via breastfeeding

Variables	n	Aware	Not aware
≤ 30 years	47	24 (51.1%)*	23 (48.9 %)
> 30 years	52	33 (63.5%)*	19 (36.5%)

*CI [-30.5% ; 6.9%]

Table 5.45 Association between age of mother and awareness of heat-treated expressed breastmilk

Variables	n	Aware	Not aware
≤ 30 years	47	10 (21.3%)*	37 (78.7 %)
> 30 years	52	12 (23.1%)*	40 (76.9%)

*CI [-17.8% ; 14.7%]

Table 5.46 Association between age of mother and fear of passing HIV to infant via breastfeeding vs. increased morbidity and mortality risk if formula feeding

Variables	n	Fear of HIV passing via BF	Fear of formula milk morbidity risk
≤ 30 years	47	16 (34.0%)*	31 (66.0 %)
> 30 years	52	20 (38.5%)*	32 (61.5%)

*CI [-22.5% ; 14.2%]

5.4.2.2 ASSOCIATIONS BETWEEN EDUCATIONAL LEVEL OF THE MOTHER AND FACTORS RELATED TO HIV AND INFANT FEEDING

No statistically significant association was found between the educational level of the mother and awareness of heat-treated expressed breastmilk (95% CI for the percentage difference [-24.6% ; 17.2%]), or the educational level of the mother and infant feeding choice (95% CI for the percentage difference [-6.2% ; 36.9%]) (tables 5.47 & 5.49).

A statistically significant association was found between the educational level of the mother and the knowledge that HIV can pass to her infant via breastfeeding (95% CI for the percentage difference [-50.8% ; -2.7%]).The more educated the respondent was, the more likely it was that she was aware of this fact. A statistically significant association was also found between the educational level of the mother and the fear of passing HIV to her infant vs. the increased risk of morbidity associated with formula feeding (95% CI for the

percentage difference [-44.8% ; -1.4%]). The higher the educational level of the respondent, the more she feared passing HIV to her infant via breastfeeding, and the less fear she had regarding the risks associated with formula feeding (tables 5.48 & 5.50).

Table 5.47 Association between educational level of mother and infant feeding choice

Variables	n	Breastfeeding	Formula feeding
≤ grade 7*	18	15 (83.3%)*	3 (16.7 %)
grade 8-10	32	23 (71.9%)	9 (28.1%)
≥ grade 11*	50	32 (64.0%)*	18 (36.0%)

*CI [-6.2% ; 36.9%]

Table 5.48 Association between educational level of mother and knowledge that HIV can pass to infant via breastfeeding

Variables	n	Aware	Not aware
≤ grade 7*	18	7 (38.9%)*	11 (61.1 %)
grade 8-10	32	16 (50.0%)	16 (50.0%)
≥ grade 11*	50	34 (68.0%)*	16 (32.0%)

***CI [-50.8% ; -2.7%]**

Table 5.49 Association between educational level of mother and awareness of heat-treated expressed breastmilk

Variables	n	Aware	Not aware
≤ grade 7*	18	3 (16.7%)*	15 (83.3 %)
grade 8-10	32	7 (21.9%)	25 (78.1%)
≥ grade 11*	50	132 (24.0%)*	38 (76.0%)

*CI [-24.6% ; 17.2%]

Table 5.50 Association between educational level of mother and fear of passing HIV to infant via breastfeeding vs. increased morbidity and mortality risk if formula feeding

Variables	n	Fear of HIV passing via BF	Fear of formula milk morbidity risk
≤ grade 7*	18	3 (16.7%)*	15 (83.3 %)
grade 8-10	32	11 (34.4%)	21 (65.6%)
≥ grade 11*	50	22 (44.0%)*	28 (56.0%)

***CI [-44.8% ; -1.4%]**

5.4.2.3 ASSOCIATIONS BETWEEN BIOCHEMISTRY OF THE MOTHER AND INFANT FEEDING CHOICE

No statistically significant difference was found between the percentage of mothers who had the lowest CD_4 counts, and the percentage of mothers who had the highest CD_4 counts (95% CI for the percentage difference [-35.1% ; 9.6%]) in relation to infant feeding choice (table 5.51). No statistically significant difference was found between the percentage of mothers who had the lowest haemoglobin levels, and the percentage who had the highest haemoglobin levels (95% CI for the percentage difference [-37.1% ; 3.2%]) in relation to infant feeding choice, however a trend was noticed which indicated that mothers with lower haemoglobin levels were more likely to breastfeed the infant (table 5.52).

Table 5.51 Association between CD_4 count (cells/mm^3) and infant feeding choice

Variables	n	Breastfeeding	Formula feeding
< 250*	26	15 (57.7%)*	11 (42.3 %)
250-350	13	10 (76.9%)	3 (23.1%)
≥ 351*	41	29 (70.7%)*	12 (29.3%)

*CI [-35.1% ; 9.6%]

Table 5.52 Association between haemoglobin level (g/dL) and infant feeding choice

Variables	n	Breastfeeding	Formula feeding
≥ 11	47	28 (59.6%)*	19 (40.4 %)
< 11	28	22 (78.6%)*	6 (21.4%)

*CI [-37.1% ; 3.2%]

5.4.2.4 ASSOCIATIONS BETWEEN SOCIO-DEMOGRAPHICS OF THE MOTHER AND INFANT FEEDING CHOICE

No statistically significant differences were found between the infant feeding choice of the mother and access to a flush toilet (95% CI for the percentage difference [-11.7% ; 25.5%]), household income (95% CI for the percentage difference [-20.7% ; 23.6%]) or the experience of food shortages by the household (95% CI for the percentage difference [-

17.9% ; 21.5%]). No statistically significant difference was found between infant feeding choice and the employment status of the mother (95% CI for the percentage difference [-7.8% ; 31.4%]) (tables 5.53 – 5.56).

Table 5.53 Association between infant feeding choice and employment status

Variables	n	Unemployed	Employed
Breastfeeding	70	50 (71.4%)*	20 (28.6 %)
Formula feeding	30	18 (60.0%)*	12 (40.0%)

*CI [-7.8% ; 31.4%]

Table 5.54 Association between infant feeding choice and access to flush toilet

Variables	n	Access	No access
Breastfeeding	70	53 (75.7%)*	17 (24.3 %)
Formula feeding	30	21 (70.0%)*	9 (30.0%)

*CI [-11.7% ; 25.5%]

Table 5.55 Association between infant feeding choice and total household income per month

Variables	n	< R1000	R1000 – R3000	> R3000
Breastfeeding	50	16 (32.0%)*	21 (42.0 %)	13 (26.0%)
Formula feeding	21	6 (28.6%)*	6 (28.6%)	9 (42.9%)

*CI [-20.7% ; 23.6%]

Table 5.56 Association between infant feeding choice and experience of food shortages

Variables	n	Experienced	Have not experienced
Breastfeeding	70	45 (64.3%)*	25 (35.7 %)
Formula feeding	30	21 (63.3%)*	11 (36.7%)

*CI [-17.9% ; 21.5%]

5.4.2.5 ASSOCIATIONS BETWEEN INFANT ANTHROPOMETRIC VARIABLES

(i) PREMATURE VS. FULL-TERM INFANTS

Due to the fact that anthropometric parameters of premature and full-term infants are expected to be different, the weight-for-age, length-for-age and weight-for-length of these children are tabulated separately. Premature infants were compared to full-term infants regarding median weight-for-age, length-for-age and weight-for-length (table 5.57, table 5.58 and table 5.59 respectively). As expected, there was a statistically significant difference between the weight-for-age z-scores (< -2 SD) of the premature and full-term infants with a 95% CI for the percentage difference of [47.0% ; 80.7%]. There was a statistically significant difference between the length-for-age z-scores (< -2 SD) of the premature and full-term infants with a 95% CI for the percentage difference of [34.2% ; 71.6%]. A statistically significant difference was not found between the weight-for-length z-scores (< -2 SD) of the premature and full-term infants with a 95% CI for the percentage difference of [-17.8% ; 41.3%].

Table 5.57 Comparison of median z-scores of weight-for-age categories between premature and full-term infants

Variable		<-3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Premature infants (n = 27)	n	17*	3*	6	1	0	0	0
	%	63.0	11.1	22.2	3.7	0.0	0.0	0.0
Full-term infants (n = 75)	n	2*	3*	13	52	4	1	0
	%	2.7	4.0	17.3	69.3	5.3	1.3	0.0

*** CI [47.0% ; 80.7%]**

Table 5.58 Comparison of median z-scores of length-for-age categories between premature and full-term infants

Variable		< -3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Premature infants (n = 25)	n	15*	3*	60	17	0	0	0
	%	60.0	12.0	0.0	28.0	0.0	0.0	0.0
Full-term infants (n = 70)	n	6*	5*	8	52	12	9	5
	%	8.6	7.1	11.4	35.7	17.2	12.9	7.1

***CI [34.2% ; 71.6%]**

Table 5.59 Comparison of median z-scores of weight-for-length categories between premature and full-term infants

Variable		< -3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Premature infants (n = 9)	n	2*	2*	3	2	0	0	0
	%	22.2	22.2	33.3	22.2	0.0	0.0	0.0
Full-term infants (n = 62)	n	12*	9*	15	19	4	2	1
	%	19.4	14.5	24.2	30.7	6.5	3.2	1.6

***CI [-17.8% ; 41.3%]**

(ii) PREMATURE MALES VS. PREMATURE FEMALES

Premature male infants and premature female infants were compared regarding weight-for-age, length-for-age and weight-for-length (table 5.60, table 5.61 and table 5.62 respectively).

Table 5.60 Comparison of median z-scores of weight-for-age categories between premature male and female infants

Variable		<-3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Male infants (n = 13)	n	7*	2*	4	0	0	0	0
	%	53.9	15.4	30.8	0.0	0.0	0.0	0.0
Female infants (n = 14)	n	10*	1*	2	1	0	0	0
	%	71.4	7.1	14.3	7.1	0.0	0.0	0.0

*CI [-39.6% ; 22.5%]

Table 5.61 Comparison of median z-scores of length-for-age categories between premature male and female infants

Variable		<-3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Male infants (n = 12)	n	6*	2*	0	4	0	0	0
	%	50.0	16.7	0.0	33.3	0.0	0.0	0.0
Female infants (n = 13)	n	9*	1*	0	3	0	0	0
	%	69.2	7.7	0.0	23.1	0.0	0.0	0.0

*CI [-41.6% ; 23.2%]

Table 5.62 Comparison of median z-scores of weight-for-length categories between premature male and female infants

Variable		<-3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Male infants (n = 6)	n	2*	2*	1	1	0	0	0
	%	33.3	33.3	16.7	16.7	0.0	0.0	0.0
Female infants (n = 3)	n	0*	0*	2	1	0	0	0
	%	0.0	0.0	66.7	33.3	0.0	0.0	0.0

*CI [-0.4% ; 90.3%]

Of the 27 premature infants, 13 were male and 14 were female. Nine of the males had a weight-for-age < -2 SD from the reference WHO median, while 11 girls fell in this category. No statistically significant difference was found between the percentage of underweight males and females with a with a 95% CI for the percentage difference of [-39.6% ; 22.5%].

Of 25 premature infants, length-for-age z-scores were calculated for 12 male and 13 female infants. Eight of the males had a length-for-age < -2 SD from the reference WHO median, while 10 girls fell in this category. No statistically significant difference was found between the percentage of under length males and females with a with a 95% CI for the percentage difference of [-41.6% ; 23.2%].

Of 9 premature infants, weight-for-length z-scores were calculated for 6 male and 3 female infants. Four of the males had a length-for-age < -2 SD from the reference WHO median, while zero girls fell in this category. No statistically significant difference was found between the percentage of underweight for length males and females with a with a 95% CI for the percentage difference of [-0.4% ; 90.3%], however a trend was noticed which indicated that the males were more likely to have a lower weight-for-length. The low number of children in this category implies that the results should be interpreted with caution.

(iii) FULL-TERM MALES VS. FULL-TERM FEMALES

Full-term male infants and full-term female infants were compared regarding weight-for-age, length-for-age and weight-for-length (table 5.63, table 5.64 and table 5.65 respectively).

Table 5.63 Comparison of median z-scores of weight-for-age categories between full-term male and female infants

Variable		< -3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Male infant (n = 31)	n	0*	0*	4	25	2	0	0
	%	0.0	0.0	12.9	80.7	6.5	0.0	0.0
Female infants (n = 44)	n	6*	5*	8	52	12	9	0
	%	8.6	7.1	11.4	35.7	17.2	12.9	0.0

*CI [-24.0% ; 1.4%]

Table 5.64 Comparison of median z-scores of length-for-age categories between full-term male and female infants

Variable		< -3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Male infant (n = 27)	n	2*	0*	1	14	6	3	1
	%	7.4	0.0	3.7	51.9	22.2	11.1	3.7
Female infants (n = 43)	n	4*	5*	7	11	6	6	4
	%	9.3	11.6	16.3	25.6	14.0	14.0	9.3

*CI [-28.8% ; 5.1%]

Table 5.65 Comparison of median z-scores of weight-for-length categories between full-term male and female infants

Variable		< -3	-3 to -2.1	-2 to -1.1	-1 to +1	1.1 to +2	2.1 to +3	> +3
Male infant (n = 25)	n	4	2	6	10	2	1	0
	%	16.0	8.0	24.0	40.0	8.0	4.0	0.0
Female infants (n = 37)	n	8	7	9	9	2	1	1
	%	21.6	18.9	24.3	24.3	5.4	2.7	2.7

*CI [-36.8% ; 7.5%]

Of the 75 full-term infants, 31 were male and 44 were female. None of the males had a weight-for-age < -2 SD from the reference WHO median, while 5 girls fell in this category. No statistically significant difference was found between the percentage of underweight

males and females with a with a 95% CI for the percentage difference of [-24.0% ; 1.4%], however a trend was noticed which indicated that females were more likely to weigh less.

Of the 75 of the full-term infants, length-for-age z-scores were calculated for 27 male and 43 female infants. Two of the males had a length-for-age < -2 SD from the reference WHO median, while 9 girls fell in this category. No statistically significant difference was found between the percentage of under length males and females with a with a 95% CI for the percentage difference of [-28.8% ; 5.1%].

Of the 62 of the full-term infants, weight-for-length z-scores were calculated for 25 male and 37 female infants. Six of the males had a length-for-age < -2 SD from the reference WHO median, while 15 girls fell in this category. No statistically significant difference was found between the percentage of underweight for length males and females with a with a 95% CI for the percentage difference of [-36.8% ; 7.5%].

(IV) DIFFERENCES IN ANTHROPOMETRY OF FULL-TERM AND PREMATURE INFANTS

Of the 102 infants with a known gestational age, 44 were male and 58 were female. Of the 44 boys, 13 were premature and 31 were full-term. Nine of the premature boys had a weight-for-age <-2 SD from the WHO median, while no full-term boys fell in this category. The 95% CI for the percentage difference indicates that this was a statistically significant difference [17.9% ; 52.2%]. Eleven of the premature females had a weight-for-age < -2 SD from the WHO median, while 5 full-term females fell in this category. The 95% CI for the percentage difference indicates that this was a statistically significant difference [16.0% ; 53.0%].

Eight of the premature boys had a length-for-age <-2 SD from the WHO median, while two full-term boys fell in this category. The 95% CI for the percentage difference indicates that this was a statistically significant difference [2.8% ; 44.9%]. Ten of the premature females had a length-for-age < -2 SD from the WHO median, while 9 full-term females fell in this

category. The 95% CI for the percentage difference indicates that this was a statistically significant difference [7.9% ; 47.3%].

Four of the premature boys had a weight-for-length <-2 SD from the WHO median, while six full-term boys fell in this category. The 95% CI for the percentage difference indicates that this was a statistically significant difference [7.4% ; 64.1%]. None of the premature females had a weight-for-length < -2 SD from the WHO median, while 15 full-term females fell in this category. The 95% CI for the percentage difference indicates that this was not a statistically significant difference [-36.2% ; 7.0%].

CHAPTER 6
DISCUSSION OF RESULTS

6.1 INTRODUCTION

The discussion of this study is presented in two sections. The first section will discuss the knowledge, attitudes and practices of the health care workers regarding HIV and infant feeding. The second section will discuss the results related to the mother/infant pairs.

6.2 LIMITATIONS OF STUDY

Initially it was anticipated that a larger percentage of mothers in the postnatal wards could be interviewed. However, not all mothers opted to partake in the study, or other factors such as the fact that some mothers had given birth very recently and they were not yet comfortable enough for an interview, interfered with this process. Despite this, the number of mother/infant pairs included was sufficient to make meaningful conclusions related to infant feeding in the context of HIV.

It was also initially planned to collect anthropometric data from the mothers. After the completion of the collection of anthropometric measurements from a small number of mothers, it became apparent that it would not be feasible to collect this information from all of the mothers. The process was extremely time consuming and respondent fatigue was high. In some cases mothers were connected to equipment that made it difficult for them to get out of bed for measurements to be taken. However, information related to the anthropometry of mothers did not affect the main aim of the study, which was to focus on infant feeding practices and anthropometry would have provided background information only.

Obtaining the birth weight and birth length of infants by the researcher was found to be unpractical due to the fact that it was very time consuming and infants were not always with mothers when interviews were being conducted. For this reason, this information was

retrieved from patient files, and thus it cannot be assumed that all infants were weighed and measured according to recommended guidelines published in the literature. Although health care workers should be trained in the correct procedures to follow when weighing and measuring infants, this limitation is acknowledged.

The women mostly did not use English or Afrikaans as a first language, which could have interfered with obtaining the most accurate information possible. However, all but one woman felt that they could be interviewed with ease by the researcher without the need of a translator.

6.3 HEALTH CARE WORKERS

6.3.1 KNOWLEDGE REGARDING HIV AND INFANT FEEDING

The importance of health care workers' assistance for mothers regarding infant feeding choices is highlighted in the literature. It is expected that health care workers should be experts on this issue, especially those working in maternity wards. However, only 14.1% of health care workers included in the current study considered themselves to be experts regarding issues related to infant feeding in the context of HIV. Shah et al. (2005:36) conducted a rapid assessment of the breastfeeding knowledge of health care workers in an area with a high HIV prevalence, namely a rural area in KwaZulu-Natal in South Africa. A convenience sample of 71 health care workers, with a similar distribution of physicians and members of the nursing personnel as the study done at Pelonomi, was included. The authors found significant discrepancies in breastfeeding knowledge compared to the WHO recommendations. In the study done in KwaZulu-Natal, 77.0% of the health care workers knew that an infant should be put to the breast to breastfeed within approximately 30 minutes after birth (Shah et al., 2005:36). This compares well with the results obtained in the Pelonomi study, where 75.0% of health care workers provided the correct answer. Edmond et al. (2005:380) reiterated the importance of the early initiation of breastfeeding when they concluded that 22.0% of neonatal deaths could be prevented if breastfeeding started within the first hour after birth (Edmond et al., 2005:380).

The WHO promotes EBF for the first six months of life; this means that the mother must provide only breastmilk, that she must breastfeed on demand and that no teats or pacifiers should be given to the infant (WHO, online: 2012). When respondents in the current study were asked to explain what is meant by EBF, 93.4% did attempt an answer, but only 6.7% could comprehensively explain the concept as defined by the WHO. Seventy percent correctly indicated that only breastmilk should be given, but this explanation was considered inadequate. Piwoz et al. (2006:4) experienced contrasting findings when health care workers were interviewed in Malawi. Eighteen out of nineteen healthcare workers correctly defined EBF (Piwoz et al., 2006:4), however the criteria used for the definition were not indicated and it could have differed from those used in the Pelonomi study. As previously discussed, EBF is a crucial aspect of ensuring the health of infants as well as reducing the risk of postnatal HIV transmission. The comprehension of what EBF entails should be central to the mother's knowledge on HIV and infant feeding. If the health care workers themselves are unsure of what it means, it is unlikely that it will be correctly conveyed to mothers.

Practically all of the respondents (96.9%) were aware of the fact that EBF should continue to the age of six months. In a Cochrane review regarding the optimal duration of EBF, it was concluded that when an infant is exclusively breastfed for six months, the risk of infections is reduced, infants show no growth faltering, and the mother is more likely to experience lactation amenorrhea which assists in child-spacing. It is because of these factors that the WHO started to recommend six months of EBF, rather than the three to four months that was previously recommended (Kramer & Kakuma, 2002:11). The WHO mentions another advantage of this practice, namely that mothers tend to lose weight while exclusively breastfeeding. This would be beneficial for overweight women, but might be disadvantageous for underweight women. However, the WHO states that this can be avoided if it is ensured that these women have access to an adequate diet (WHO, 2001:10). A contrasting finding was made by researchers from Cote d'Ivoire, where health care workers would advise the HIV-infected breastfeeding mother to wean at the age of four months. Their motivation for this recommendation was to decrease the duration of breastfeeding and thereby to decrease the risk of postnatal transmission. They also supported this with the assumption that infants at this age would be ready for the

introduction of complimentary foods (Becquet et al., 2005:104). It was already stated in the 2003 WHO document "Global Strategy for Infant and Young Child Feeding", that infants should be breastfed exclusively for the first six months of life (WHO, 2003:7). In the KwaZulu study, Shah et al. (2005:36) also found that the majority of health care workers were prone to recommend giving water, formula or solid foods to breastfed infants under the age of six months (Shah et al., 2005:36).

Although the optimal duration of EBF was very well known to the respondents in the current study (96.6% correctly indicated that it should be done for six months), a much smaller proportion could accurately indicate the answer to the follow-up question which was based on the newest 2010 WHO Guidelines on HIV and Infant Feeding. When health care workers were asked to specify up to what age an HIV-exposed infant could be breastfed, a large percentage (32.8%) incorrectly answered up to the age of one year, and 17.2% incorrectly indicated up to six months of age. The previous recommendation that existed in this regard was for EBF to take place "during the first months of life" and then to be discontinued as soon as is feasible (WHO, 2003a:9). The newest guidelines state that mothers should breastfeed exclusively for six months (with infant ARV prophylaxis), then introduce appropriate complementary foods and continue to breastfeed for the first twelve months of life. It is important to note that after this period, breastfeeding should only cease once a nutritionally adequate diet without breastmilk can be provided (WHO, 2010:31). The well-known Beastfeeding, Antiretrovirals and Nutrition (BAN) study from Malawi provided much of the evidence in support of this WHO recommendation, when they concluded that continued and prolonged breastfeeding with ARV prophylaxis could improve infant survival (Jamieson et al., 2012:2449). In total, 26.6% of the respondents could correctly answer the question related to the period of exclusive plus non-exclusive breastfeeding. One of the possible causes for the confusion is the emphasis that has always been placed on the avoidance of mixed feeding. The newest guidelines allow for mixed feeding to take place after the age of six months – however, ARV prophylaxis should be used following standard protocols to decrease the risk of HIV transmission. This was decided after it had been made clear that early cessation of breastfeeding is not conducive to the good health of the infant.

Most of the participants in the current study (90.6%) could correctly indicate that, in general, infants who are formula-fed have a higher risk for morbidity and mortality, whereas 6.3% indicated this as false. In the general population of a developing country, an exclusively breastfed infant is fourteen times less likely to die from diarrhoea and approximately three times less likely to die from respiratory diseases and other infections, than a non-breastfed infant (Choudhary, 2006:418). Unhygienic preparation of infant formula is one of the main reasons for infection, diarrhoea and malnutrition. Veldman & Brink (2004:41) investigated the microbiological safety of 200 infant feeding bottles in Mangaung, Bloemfontein, by collecting formula milk samples. Of the samples, 84.5% were classified as unfit for human consumption due to high bacteria counts. A disappointing finding was the fact that most of the care-givers who prepared bottle feeds fit for human consumption had been trained by a family member, while most of those who prepared unfit feeds had been trained by health care professionals at clinics (Veldman & Brink, 2004:41). This emphasizes the need for adequate training of staff in assuring that correct and sufficient information reaches the mother.

As part of the current study, respondents' knowledge regarding the risks of postnatal transmission was also determined. The risk of MTCT ranges between 20.0% - 45.0% without intervention, and the risk of postnatal transmission through breastfeeding can be decreased to 5.0% or less when specific intervention strategies such as ARV use and correct breastfeeding practices are implemented (WHO, 2010b:6). Most of the respondents (73.4%) correctly indicated a higher risk of transmission if ARVs are not used and if the mother does not breastfeed according to the guidelines. Similarly, 70.3% indicated a low risk of infection if guidelines are indeed followed. A significant proportion of the health care workers (20.3%) thought that there will be no risk of transmission if the mother uses ARVs and practices breastfeeding according to the guidelines. This is unfortunately not true, and it is unethical to communicate this to patients. Although the risk will be lowered significantly, breastfeeding will not be completely risk-free. It is not clear whether the health care workers indicated no risk of transmission to promote breastfeeding in their patients, or whether they truly believe the risk to be zero percent.

6.3.2 ATTITUDES REGARDING HIV AND INFANT FEEDING

Overall, health care workers included in the current study did not have negative attitudes towards HIV-infected mothers who breastfeed, with 96.9% agreeing that breastmilk is an excellent feeding choice for their infants. Not one health care worker indicated that these mothers should not breastfeed because there is a risk of HIV transmission. This is in contrast to a recent study done in Ethiopia where health care workers were found to have negative attitudes towards HIV-infected mothers who plan to breastfeed and they would also defend their promotion of formula feeding. Many counsellors even felt great satisfaction if the mothers that they had counselled would then abstain from breastfeeding, as this would 'save the child from HIV infection' (Koricho et al., 2010:3-8). In Malawi, Piwoz et al. (2006:1) found contrasting results. All of the (18) health care workers who were interviewed in their study would encourage HIV-infected mothers to breastfeed exclusively rather than formula feed. They cited poverty as the main reason for not encouraging the use of formula milk. In Malawi, high levels of malnutrition are prevalent and all of the health care workers were concerned about the early cessation of breastfeeding and the possibility of malnutrition after cessation (Piwoz et al., 2006:1).

Regardless of the overwhelming support for breastfeeding, 12.3% of the respondents in the current study indicated that formula feeding is the safest feeding choice as it would ensure that the infant remained uninfected. They chose this option above the option which indicated that formula feeding may only be promoted in women who can do so in safe manner (using the AFASS criteria as a guideline). This perhaps highlights a degree of ignorance regarding the significance of these very important criteria designed to protect the infant.

Heat-treated expressed breastmilk has been proposed as a feeding option for HIV-infected mothers since, if done correctly, HIV will be inactivated. However, there is insufficient and scarce programmatic data available that can demonstrate the acceptability and sustainability of heat-treated expressed breastmilk at a large scale in the community (WHO, 2010:38). Almost half (45.3%) of the health care workers in the current study believed that this feeding strategy is a good idea for these mothers. The second largest

proportion of respondents (29.7%) agreed with the WHO recommendation that, although it might be a useful option, most mothers won't be able to sustain this practice because of the amount of work involved in each feed. Some respondents (12.5%) believed that this option is a bad idea – this might be due to a degree of scepticism in the effectiveness of this practice to kill the virus, or that they feel the limitations outweigh the possible advantages.

Most of the respondents included in the current study (82.1%) supported the new South African guidelines which promotes breastfeeding together with ARVs as the main feeding option for HIV-exposed infants. They agreed that it will provide a reliable source of nutrition for infants in impoverished communities. Even though the previous free distribution of formula milks has resulted in numerous problems in PMTCT programmes in developing countries, 12.5% of health care workers regarded this as a good option for mothers and would like to see it made available at the clinics again.

6.3.3 PRACTICES REGARDING HIV AND INFANT FEEDING

The health care workers in the maternity wards regularly provided infant feeding advice to HIV-infected mothers. Not one of the health care workers indicated that they 'never' gave advice, and only 6.3% indicated that they 'seldom' gave advice. Most respondents indicated that they give advice regularly or daily (75.1%). Few of the respondents (31.6%) in the study done by Piwoz et al. (2006:4) indicated that they had experience in counselling mothers on HIV and infant feeding, and most of them believed that the mother should breastfeed exclusively (Piwoz et al., 2006:4). The Shah et al. (2005:35) study done in KwaZulu-Natal also noted that the majority of health care workers gave advice on a regular basis (Shah et al., 2005:35). The fact that most health care workers do indeed spend a significant amount of time counselling mothers and have to advise them on infant feeding, only emphasizes the importance of them being very well informed regarding the related issues. They should be able to easily show a mother how to breastfeed and express breastmilk correctly, but only 35.9% and 28.1% respectively felt a very high confidence level in doing so.

In summary, the health care workers had only an average knowledge related to infant feeding in the context of HIV, with gaps of knowledge noted with some basic concepts and

practices related to the issue. It did however seem as though they were accepting of HIV-infected mothers who breastfeed and they acknowledged the fact that correct breastfeeding practices would be a safer option than formula feeding for many of these women.

6.4 MOTHER AND INFANT PAIRS

6.4.1 SOCIO-DEMOGRAPHIC BACKGROUND AND HOUSEHOLD FOOD SECURITY

According to Statistics South Africa (StatsSA), the Free State province is home to 5.5% of the total population of South Africa (StatsSA, 2011:online), and HIV prevalence among ante-natal women in South Africa in 2010 was estimated at 30.2%, while in the Free State, it was estimated at 30.6% (NDoH, 2011:8-55). The mean age of the mothers was higher than expected, at 31.0 years old and most were Sotho speaking. The ethnic background of the mothers followed the same trend as that is found in South Africa, with 94.0% of the mothers being African and 6.0% being Coloured. Africans comprise 79.5% of the total population of South Africa, while Coloureds comprise 9.0% (StatsSA, 2011: online). The marital status data of the mothers corresponded closely with the national averages. In the Pelonomi study 54.0% of the mothers were never married, and 29.0% were married. In South Africa, 54.3% of women aged 15-49 years have never been married, while 27.9% of women are married (DoH, 2004:24).

The educational level of the mothers appeared to be above the average for the Free State as determined in the 2003 SADHS. Eighty-two percent of the mothers had an educational level higher than grade eight, while in the Free State in 2003 only 47.2% of the female population had achieved this level (DoH, 2004:17).

Wouters et al. (2010:392) determined the socio-demographics of the population accessing public-sector ART treatment in the Free State districts in 2006 (75.4% were female) and found that 80.7% of the patients did not work for payment in kind (Wouters et al., 2010:392). In the Pelonomi study, 68.0% of the mothers did not work for payment, which indicates a slightly better earning potential in this group.

Most of the mothers (84.0%) lived in formal housing which compared well with the respondents in the study by Wouters et al. (2010:392) in the Free State, where 77.7% of ART patients lived in formal housing. The median HDR value of mothers in the Pelonomi study was 170.8% and indicated that crowding was a problem in the mothers' households, as a value of greater than 100% indicates crowding. Crowding may lead to an increased risk of household food insecurity and the spread of communicable diseases – both of which can impact nutritional status negatively. The following basic household commodities compared closely with the data from the 2003 SADHS: electricity and running water in the house, access to own tap, access to flush toilet, ownership of a refrigerator, radio and television, as well as the fact that electricity is mostly used for cooking purposes (DoH, 2004:21-23).

Most of the mothers did not know what the total income of their household per month was. Those who did know, mostly indicated that it was less than R3000 (69.0%), and 32.0% of the households relied on social grants as their main source of income. Grants generally do not provide a large sum of money, as in 2012 a child grant provided R280.00 and an old age/disability grant provided R1200.00 per month. The 2008 South African Social Attitudes Survey (SASAS) investigated, among others, the status of household food security in South Africa (Labadarios et al., 2011:893). The same eight questions were asked in the Pelonomi study to ascertain food security in the mothers' households. Although the Pelonomi respondents indicated more affirmative responses to these questions than that found in SASAS, the data might be exaggerated since mothers frequently asked if they would now qualify for food-based assistance after the questions were asked. However, the problem of household food insecurity cannot be ignored, as 64.0% of the mothers indicated that their household had experienced periods of food shortages in the past. The assistance that family and friends can offer in times of need was emphasized in this study when it was noted that the most used coping strategy (48.0%) was to approach family/friends for help.

In summary, socio-demographic information indicates that the mothers included in this study were mostly Black, relatively poor, unemployed, and had a low level of education. Access to basic household amenities was common. Households infrequently produced their own food stuffs, and periods of food shortages did occur in many of the households.

6.4.2 REPORTED HEALTH AND MEDICAL HISTORIES OF MOTHER/INFANT PAIRS

Although tobacco and alcohol use was not prevalent among the mothers (82.8% had never used alcohol), it may be that mothers had adapted their smoking and alcohol habits during pregnancy and were reporting these. In South Africa, alcohol use and abuse are common, with 14.0% of the population suffering from alcoholism or chronic abuse. South Africa also has one of the highest rates of foetal alcohol syndrome in the world (Pache & Myers, 2012:338). This suggests that alcohol use might be higher than what was reported.

The two most prevalent diagnoses of the mothers, other than HIV, were hypertension (26.0%) and present or recent Tuberculosis (10.0%). No diabetes diagnoses were noted, as these cases would most likely be referred to a tertiary hospital for more intensive management. It is well reported that ARV therapy increases the risk for diabetes, dyslipidemia and myocardial infarction. Interestingly, more recent data suggest that HIV infection itself is associated with an increased risk for cardiovascular disease (Levitt et al., 2011:1692). Life-expectancy of HIV-infected patients is increasing due to the up scaling of ARV therapy, which may lead to more patients living long enough to be able to suffer from chronic diseases such as cardiovascular disease. Initially, however, ARV administration may be associated with side effects that may results in initial weight loss, before weight gain begins. The HIV-infected patient must therefore be treated in a holistic manner, and care should not solely be focused on HIV treatment, but also on the prevention of chronic diseases of lifestyle.

The prevalence of hypertension among HIV-infected mothers in this study (26.0%) was almost identical to that of a Brazilian study (25.6%), that reported that 14.8% of the Brazilian respondents were on anti-hypertensive medication (de Arruda et al., 2010:282) while 14.9% of the Pelonomi respondents used these medications to control hypertension at home. The mothers' family members had high rates of hypertension (42.0%) and diabetes (27.0%). The burden of non-communicable diseases is increasing worldwide, and regions such as those in Africa are expected to show a 20.0% increase in cases by the year 2020. Non-communicable diseases, especially cardiovascular disease and diabetes, contributed to 63.0% of deaths worldwide in 2008. Most of these deaths (80.0%) occurred

in low/middle income countries (WHO, 2010d:9). The extra burden placed on a household by members suffering from such diseases, threatens the income earning potential of these members and might hinder support that they can provide to HIV-infected members of the household. The importance of also keeping these members as healthy as possible should not be neglected.

Symptoms such as loss of appetite (36.0%), nausea (10.0%) and swelling of feet (4.0%) may be attributed to the pregnancy itself. Chest pain (16.0%), breathlessness (26.0%) and coughing for more than two weeks (17.0%) were common and might indicate respiratory infections at the time data was collected. The problem of diarrhoea for more than three days (18.0%) as well as involuntary weight loss (11.0%) are two common symptoms of HIV/AIDS and can have pronounced negative effects on health and nutritional status.

A variety of medications were prescribed in hospital. Almost all of the mothers used ARVs at home (98.9%), however ARVs were only prescribed to 34.0% of mothers while in hospital. The reason for this is that ARVs brought from home are not noted in the prescription list. According to Doherty et al. (2006:90), most HIV-infected women in South Africa will find out that they are infected during pregnancy, as testing is done routinely during this period. The median years that mothers were aware of their status (1 year) corresponded with this fact (Doherty et al., 2006:90).

Previous hospitalizations among the mothers were not common, which could indicate that HIV disease progression may not be as advanced in most mothers. Most of the mothers (71.0%) delivered their infants via caesarean section. It has been shown that it is during the period of labour and actual delivery that HIV is mainly transmitted intrapartum, rather than during the pregnancy. Caesarean sections can reduce the risk of HIV transmission to the infant by approximately 50.0% (De Vries & Peek, 2008:677). According to Islam et al. (2010:40), this advantage of reduced risk of MTCT must be weighed against relevant factors such as increased costs associated with an elective caesarean, as well as the increased risk of complications for these women. The authors further suggest that a planned normal vaginal delivery could be a safe option if ARVs are used, the mother receives optimal intrapartum care, viral load is low and if ARV prophylaxis for infants is used

(Islam et al, 2010:40). The possible promotion of planned vaginal deliveries in eligible women rather than elective caesareans should not be dismissed, as this delivery strategy has major cost and risk implications.

Most of the mothers had used injectable contraceptives before, and almost all of them had used either male or female condoms in the past. Inconsistencies in condom use seemed to play a role in their current HIV status. For about one-third of the mothers, the current pregnancy was their first one, and for 61.0% it was either their second or third infant. In mothers who had previously given birth, breastfeeding rates of those infants were fairly high (85.5%), indicating an established acceptance of this infant feeding mode. The median age at which these mothers introduced liquids or solids to the previously born infant's diet, was four months (1 – 12 months). As previously mentioned, the optimal age of weaning is at six months, especially in resource-poor environments.

Almost half (46.6%) of the mothers with available recent CD4 counts, had a value less than 350 cells/mm^3. According to the 2010 South African PMTCT Guidelines, pregnant women with a CD4 count less than 350 cells/mm^3 should receive lifelong ARV therapy for her own health and for that of the infant (DoH, 2010:25). The mothers' median value was 383 cells/mm^3 (27 – 1023 cells/mm^3). This median value falls in the "mild immunosuppression" stage according to the WHO immunological staging (WHO, 2005:8). Most mothers with available recent haemoglobin counts (62.7%) fell in the non-anemia category for pregnant women (> 11 g/dL) according to the WHO staging for anemia. Slightly more than one in every three mothers (37.3%) had a mild to severe anemia, with the entire group having a median haemoglobin level of 11.4 g/dL (4.5 – 14.6 g/dL) (WHO, 2011a:3). This prevalence was slightly lower than in a recent study done in Nigeria, where anemia prevalence among pregnant women was 49.3%. Anemia is the most common hematological anomaly encountered in HIV-infected patients, and has been identified as a risk factor for earlier mortality in patients with AIDS (Oladeinde et al., 2011:548).

The psychological well-being of the mothers was briefly assessed. Fifty-five percent of mothers reported a few or several periods of stress/anxiety in recent times. On a more positive note, 35.0% reported no feelings of stress/anxiety, which was a higher rate than

what might have been expected. However, 10.0% of mothers indicated that they experienced permanent stress, and 14.0% felt depressed for at least two weeks in a row. Pappin et al. (2012:244) investigated factors related to anxiety and depression amongst patients enrolled in a public sector ARV treatment programme in the Free State, South Africa, and found that the prevalence of symptoms of anxiety and depression were respectively 30.6% and 25.4%. They concluded that severe side-effects of ARVs, avoidant coping behaviours and stigma related to HIV were the main risk factors in the development of anxiety and depression. The importance of resource allocation to screen for mental health problems in these patients was highlighted, as well as interventions such as support groups, ARV side-effect management and strategies to reduce stigma (Pappin et al., 2012:244). Almost all of the mothers (90.0%) in the current study are members of churches which can serve as supportive centres for the households.

The median gestational age of the infants was 38 weeks (26 – 42 weeks), and the main medical problem was prematurity (26.2%), as defined by the WHO. A study in a high HIV prevalence area in KwaZulu-Natal, South Africa, found the prevalence of premature births to HIV-infected women at 21.4%. In this study, the researchers found no association between maternal HIV infection and the risk of premature delivery (Ndirangu et al., 2012:1846). This contrasts with a study done by Schulte et al. (2007:900) in the United States of America. They found an association between premature birth and a history of maternal drug abuse, symptomatic maternal HIV disease, either no ARV therapy or HAART which included protease inhibitors, black race and infant HIV infection (Schulte et al., 2007:900). Studies continue to report inconsistent associations related to maternal HIV infection and premature delivery (Ndirangu et al., 2012:1847).

Most of the mothers planned to breastfeed (70.9%) their infants while 29.1% opted for formula feeding. This correlates with a recent Zambian study, where 26.0% of the HIV-infected mothers chose to formula feed their infants (Chisenga et al., 2011:148). In a similar study in the Democratic Republic of the Congo, 79.2% of HIV-infected mothers also planned to breastfeed their infants (Maman et al., 2011:259). It appeared as if more mothers started choosing the option of breastfeeding after it was made known that the South African Department of Health withdrew the provision of free formula milk to HIV-

infected mothers on 01 December 2011. Formula milk would then only be issued under special circumstances if accompanied by a prescription of a Medical Practitioner. EBF together with the use of ARVs was the strategy that would be promoted from 1 December 2011. This strategy promotes good nutrition for these infants, especially in resource-poor settings. In resource-rich settings, such as the USA, the recommendation is to avoid all breastfeeding to basically eliminate the risk of postnatal transmission (Jackson et al., 2009:221). This highlights the differences in infant feeding recommendations related to economic disparities between different households and countries.

If the feeding mode changed from what was planned before the delivery, it was mothers who wanted to breastfeed, but could not because of high risk prematurity (three infants), foetal distress (one infant) or low milk production (three infants). Most of the breastfeeding mothers (83.3%) did start to breastfeed within an hour of giving birth, and problems which prevented this were mostly that the mother was not awake yet or had low milk production. During the first few days after delivery, milk production starts slowly but increases considerably between 36 – 92 hours. However, some mothers experience a delayed onset of milk production, also known as delayed onset of lactogenesis. Prevalence of delayed onset of lactogenesis is high in urban areas of developing countries, and factors such as premature delivery, caesarean sections, stress during labour, maternal overweight and flat nipples increase the risk of delayed onset of lactogenesis. Infants who lose more than 10.0% body weight after birth is also considered a risk factor for delayed onset of lactogenesis since effective suckling is inhibited by the smaller, weaker infants. It has been shown that mothers who experience early breastfeeding problems are more likely to cease breastfeeding than other mothers, which underscores the importance of the prevention of early breastfeeding problems (Matias et al., 2009:121). Maternal HIV infection itself increases the risk for complications such as those mentioned above, therefore it is important that special attention is paid to breastfeeding mothers in the early days before and after delivery. The breastfeeding mothers reported a total of 26 breastfeeding problems, which mainly included low milk production (ten mothers) and sore breasts (twelve mothers). Good lactation management is imperative to encourage successful breastfeeding and to decrease risk of HIV transmission to the infant.

In summary, the data related to the reported health and medical histories of the mothers reveal that the use of alcohol and tobacco was not high before or during pregnancy. Hypertension was the main diagnosis apart from HIV in the mothers and was very common in the families of the mothers. Mothers experienced symptoms such as diarrhoea and appetite loss, and these symptoms can have major impacts on the nutritional status of a person, especially in concert with an HIV infection. Anaemia and a low CD_4 count were both common in the mothers, while prematurity was a problem in the infants. The feeding choice for most of the infants was breastfeeding; however, some of the mothers had already started to experience breastfeeding problems very shortly after giving birth.

6.4.3 ANTHROPOMETRY OF INFANTS

The median z-scores for the length-for-age, weight-for-age and weight-for-length parameters in the premature group (n = 27) were all well below the WHO median references. This is to be expected from premature infants. The median z-scores for the length-for-age parameter in the full-term group (n = 75) was in the normal category, while the weight-for-age and weight-for-length parameters in the full-term group were slightly below the WHO median references. Numerous studies based in Africa have shown small but substantial differences between infants born to HIV-infected women and HIV uninfected women, with shorter gestation, stage of disease progression of the mother, intrauterine growth retardation and the use of alcohol or drugs being the main contributing factors of a low birth weight (Lisam & Lisam, 2009:442).

6.4.4 KNOWLEDGE, ATTITUDES AND PRACTICES RELATED TO GENERAL INFANT FEEDING

Almost all of the mothers knew that there are benefits to an infant if a mother breastfeeds. Most mentioned that it is best for the infant, it promotes health and growth of the infant, and that the infant will not get sick. Most of the mothers also chose breastmilk as the best feeding option for infants younger than six months old, and that breastmilk alone is sufficient for the infant during this period. It seems as if the health messages promoting the

benefits of breastfeeding to the infant were internalized by the community and that the acceptance of breastfeeding by previous generations have been passed on.

Sixty percent of the mothers did believe that there are benefits to a mother if she breastfeeds, however very few could mention even a single benefit. Messages promoting breastfeeding generally focus on the advantages for the infant only, subsequently fewer mothers are aware of the benefits for their own health. Most of the mothers' infant feeding choices were not influenced by another person or the media, and they made their decision during ante-natal visits. The earlier the woman decides on an infant feeding mode and plans accordingly, the higher the likelihood of it being successful.

Almost half of the mothers either did not know if they should or would continue feeding their infant if he or she fell ill. Misconceptions and cultural beliefs regarding feeding during periods of illness can lead to severe malnutrition and mortality, therefore it is important that these mothers know how to manage the health of their infants during periods of illness.

The median age of the infants at which the mothers planned to introduce liquids and solids, was six months. Risk of infections decreases when infants are exclusively breastfed for six months, which is especially important for infants in resource-poor settings. However, evidence from developed countries has come to light which indicates that the earlier introduction of solid foods might reduce atopy and asthma. Krawinkel (2011:241) poses the question of whether EBF duration recommendations should be adjusted based on socio-economic situations to balance the risk of malnutrition and risk of atopic disease (Krawinkel, 2011:241). In resource-poor countries the risk of malnutrition will most probably outweigh allergic risks. Nevertheless, this issue is expected to become more controversial as more data become available, and the South African DoH should be able to comment and provide guidelines to assist in decision making.

The main reasons for choosing breastfeeding by the breastfeeding mothers were that it is best for the baby and that it is free. Almost all of the mothers planned to breastfeed during the day and night and indicated that the baby can suckle for how long he/she wants.

Eighty-four percent of the breastfeeding mothers planned to not give their infant a pacifier. These three factors are named by the WHO as factors required for EBF. In a study in Denmark, Kronborg & Vaeth (2009:40) found that pacifier use had an independent negative effect on breastfeeding duration. Other studies have also found that pacifier use has a significant association with ineffective breastfeeding techniques (Kronborg & Vaeth, 2009:40). The use of pacifiers is therefore discouraged for breastfeeding mothers, and HIV-infected breastfeeding mothers especially should not employ any practices which might increase their risk for breastfeeding complications.

The main reason for choosing to formula feed by the remaining mothers was that they did not want to risk passing HIV to their infants. The fear that a mother has of infecting her child is understandable and for numerous mothers around the world, it is this fear that persuades them to formula feed, even if they cannot necessarily do so in a safe manner. Most of the mothers indicated that they would either read on the label of the tin or ask health care personnel for guidance on the preparation of the milk, but 9.1% of the mothers indicated that they would not follow any specific guidelines when preparing the milk and deciding on how much to prepare. Only one in five mothers would use a cup to feed their infants, which is considered more hygienic and safer than a bottle and teat. More than half of the mothers would incorrectly add water to powder, and only 20.0% would wash the utensils with boiling water, soap and disinfectant. A few mothers (10.0%) said that they would use salt and water to wash the bottles, a practice which by itself is not adequate. Encouragingly, almost all of the mothers planned to wash the utensils and bottles every time they prepared a feed and they believed that they would have enough formula milk for six months, while only two mothers were not sure of this. Following the instructions and guidelines for preparing formula milk is central to ensuring the good health of the infant. The HIV status of the infants is not known yet, but a small percentage are likely to be infected during pregnancy and labour. It is even more important for HIV-infected infants and children to receive optimal nutritional and medical care to prevent morbidity and early mortality.

In summary, knowledge, attitudes and practices related to general infant feeding indicate that most mothers had a positive attitude towards breastfeeding and they planned to wean

at the correct age of six months. Not all of the mothers knew that infants should still be fed if they are sick, and almost one in five mothers planned to use pacifiers which can decrease the likelihood of successful breastfeeding. Most of the mothers who chose to formula feed did so to prevent HIV transmission via breastfeeding, but basic knowledge regarding safe formula feeding was lacking.

6.4.5 KNOWLEDGE, ATTITUDES AND PRACTICES RELATED TO INFANT FEEDING IN THE CONTEXT OF HIV

Fifty-seven percent of the mothers knew that there is a chance that HIV can pass to the infant via breastfeeding. Nacro et al. (2010:183) reported that 28.0% of their study population in Burkina Faso was aware of this mode of MTCT (Nacro et al.,2010:183). Even though the respondents in the Pelonomi study were more knowledgeable than the Burkina Faso study population, it is unacceptable that an HIV-infected mother is not informed of this fact. Even though the risk can be significantly minimized when following the proper guidelines, there always remains a risk of postnatally infecting the infant. Even though this ignorance might have encouraged more mothers to choose breastfeeding, which might have suited their situation better than formula feeding, they should still be informed regarding this important fact. It must be ensured that HIV-infected mothers understand all of the benefits and risks of both breastfeeding and formula feeding before a choice is made. Nevertheless, 85.0% of mothers agreed that an HIV-infected mother can indeed breastfeed, and most mothers knew that mixed feeding is not safe in the first six months. Most mothers thought that the provision of free formula milk at clinics was beneficial, and the withdrawal thereof was seen in a negative light. The policy change regarding the withdrawal of free formula milk at clinics took place during data collection.

The median age until which an HIV-infected mother should breastfeed exclusively was correctly reported as six months. The mothers were not aware of the age up to which an HIV-infected mother can breastfeed (exclusively plus non-exclusively) as they also indicated a median age of six months for this question. The 2010 WHO guidelines state that HIV-infected mothers who do not meet the AFASS criteria should breastfeed exclusively for six months, introduce complimentary foods, and then breastfeed up to one year old. They

should then only stop once a nutritionally adequate diet without breastmilk can be provided. Investigators in the PEPI-Malawi trial concluded that weaning is associated with acute and late negative health effects of HIV-exposed infants; therefore they support the WHO recommendation of prolonged breastfeeding for up to twelve months and beyond (Taha et al., 2011:394). It was evident that the mothers included in the current study were not yet aware of this new guideline, and efforts should be made to educate both the health care professionals and HIV-infected women of this change.

In summary, more than half of the mothers were not aware of breastfeeding as a transmission mode for HIV, and most of them thought that an HIV-infected mother can indeed breastfeed. They were mostly aware of the fact that mixed feeding should be avoided. They were mostly not aware of the fact that an HIV-infected mother can breastfeed for up to one year and beyond one year if it is needed.

6.4.6 WHO PRINCIPLES AND RECOMMENDATIONS REGARDING HIV AND INFANT FEEDING

Mothers regarded animal milks as the least healthy infant feeding choice for young infants irrespective of a mother's HIV status, and approximately two-thirds of the mothers were more afraid of the increased morbidity and mortality risk associated with formula feeding than the risk of transmitting HIV to her infant via breastfeeding. Close to all of the mothers did have easy access to HIV testing and ARVs while pregnant, and always used their ARVs as prescribed. These very important aspects of a country's PMTCT programme seemed to be implemented well and adhered to by the mothers.

It is crucial that all HIV-infected women receive infant feeding counselling before their children are born, but eight of the mothers reported that they had never received this counselling. Continuous follow-up counselling sessions are the cornerstones of successful infant feeding and to ensure the health of the infant. It is therefore unacceptable that even a single HIV-infected mother does not receive comprehensive counselling. Close to 60.0 % of the mothers who did receive counselling reported that the health care worker did indicate to them that HIV can be transmitted via breastfeeding, and they mostly (67.9%)

told the mothers that it would be a small chance of transmission. One in five mothers was told that the risk of transmission was high. Desclaux & Alfieri (2009:826) investigated infant feeding counselling for HIV-infected women in Burkino Faso, Cambodia and Cameroon. Most of the women who were interviewed in all three countries did not show a high level of comprehension regarding certain issues. When the researchers observed these counselling sessions, it was found that the health care workers oversimplified the health messages and did not include sufficient precise information. For instance, the explanation that the health care workers gave regarding HIV transmission risks via breastfeeding were given without using figures to statistically explain the risks that are involved (Desclaux & Alfieri, 2009:826). HIV-infected women have a right to unbiased, scientifically based information in order for them to make informed decisions.

Not all of the mothers were informed that breastfeeding is beneficial (80.4%) or that it protects the infant against illness (73.9%). Only 62.0% of the mothers were informed that the infant is at high risk of morbidity and mortality if formula feeding is not done correctly. The mothers could mostly only report on two out of the five AFASS criteria that they were informed about, namely that they were told that they should have access to safe water (43.5%) and enough money to buy milk (63.0%). These are some of the main issues that HIV-infected women should be well informed about. Most of the mothers (88.0%) felt that they did understand the counselling that they had received, and that they had received sufficient information to make a decision that would suit their situation (81.5%). However, it might be a case of "you don't know what you don't know", suggesting that even if the mothers felt that they had in fact received enough information, they might not even be aware of all of the information which they had not received. Buskens & Jaffe (2008:339) explored the experiences and views of both health care workers who counsel HIV-infected women, and the mothers themselves in South Africa, Swaziland and Namibia. Many of the mothers felt that more in depth counselling as well as several counselling sessions would have been helpful. Later, some mothers expressed regret regarding the infant feeding choice that she had hastily made (Buskens & Jaffe, 2008:339).

A large percentage of mothers were not informed about the fact that HIV-infected mothers can still breastfeed if ARVs are not available. Even though this is not a desirable practice,

one of the 2010 WHO principles states: "When antiretroviral drugs are not (immediately) available, breastfeeding may still provide infants born to HIV-infected mothers with a greater chance of HIV-free survival". However, mothers should be counselled on good breastfeeding practices to decrease risk of transmission (WHO, 2010:4).

Only half of the breastfeeding mothers were counselled on how to breastfeed correctly, such as how to position and attach the infant – the foundation of successful breastfeeding. Only one in four mothers reported that they were told what EBF is, and these mothers mainly knew that this meant that only breastmilk should be given – an incomplete explanation of EBF. However, the mothers might have been counselled in their home language, and the English translation of the term could therefore have been unknown to them. Approximately half of the mothers who chose formula feeding were not informed of the correct way in which formula milk must be prepared and provided. This can lead to unnecessary morbidity and mortality related to infections and malnutrition. When the mothers were asked which feeding option they would have chosen if they were HIV uninfected, 98.0% said that they would have chosen breastfeeding, mainly because it is best for the infant. This provides a basis on which breastfeeding promotion in HIV-infected women can be built, especially if they are well informed of the fact that the risk of transmission via breastfeeding can drastically be reduced if they follow the correct guidelines. Mothers did not receive adequate counselling on the prevention of HIV re-infection, with only 30.0% indicating that they were informed about this issue. HIV-infected women must know that they are vulnerable to other HIV strains and sexually transmitted diseases if they do not practice safe sex (WHO, 2013: online).

Most breastfeeding mothers specified that they would buy formula milk when they stop breastfeeding their infants (56.5%), or give cow's milk (23.2%). Since the median age at which the mothers planned to stop breastfeeding was six months, the provision of cow's milk is acceptable, although not optimal. Expressed, heat-treated breastmilk was not a feeding option for any of the mothers at any age of the infant.

Mothers who had planned to formula feed could mostly only provide a partially complete explanation of the correct preparation method thereof (40.0%), or did not know at all

(30.0%). Approximately one out of four mothers would use leftover milk to feed to their infants at a later feed, after it had not been properly stored and kept at a low temperature. These are factors which threaten the health of formula-fed infants. Lastly, mothers were questioned regarding expressed, heat-treated breastmilk. Few mothers were aware of this option, and most were unsure how they felt about it. This feeding mode was evidently quite foreign to this study population. Even if this infant feeding option is generally not one that is chosen by many HIV-infected mothers, these mothers still have a right to be informed about all of the possible feeding methods.

In summary, according to the mother's responses, it appears as if the counselling that they had received was not adequate and comprehensive. Many important principles were either not explained or not explained and reinforced in such a way that it would be remembered. The mothers did not choose expressed heat-treated breastmilk as a feasible infant feeding option.

6.5 ASSOCIATIONS BETWEEN VARIABLES

Associations between variables in the healthcare workers group as well as for the mother/infant pairs are discussed.

6.5.1 HEALTH CARE WORKERS

Professional status showed the following associations with factors related to infant feeding gin the context of HIV:

6.5.1.1 ASSOCIATIONS BETWEEN PROFESSIONAL STATUS AND FACTORS RELATED TO INFANT FEEDING IN THE CONTEXT OF HIV

No significant association was found between the professional status of the health care worker and their self-perceived knowledge of HIV and infant feeding. It might have been assumed that the nursing personnel would feel more knowledgeable since they work with HIV-infected women more closely on a daily basis, but this was not the case. Buskens &

Jaffe (2008:339) found that pregnant women complained of health care workers providing unclear information and conflicting messages (Buskens & Jaffe, 2008:339). No association was found between the professional status of the health care workers and knowledge of the age up to which an HIV-infected mother can breastfeed (exclusively and non-exclusively). Generally only a small percentage could indicate the correct answer, and as this is a major change in guidelines, all health care workers should be made aware of the new WHO guidelines. There was a trend towards the nursing personnel being more confident in showing a mother how to breastfeed, although the ideal would be that all health care workers know exactly how to counsel a mother in this regard. All health care workers should feel confident in their knowledge and ability to properly counsel a mother on infant feeding, otherwise it cannot be expected that the counselling will be successful.

The nursing personnel showed significantly more acceptance of the infant feeding option of heat-treated expressed breastmilk than the doctors/dietician group. Perhaps the nurses understand the challenges that mothers face regarding safe formula feeding better than other health care workers since they become more closely involved them. If other health care workers also grasp the problems that may arise when a mother wants to formula feed, or a breastfeeding mother who experiences problems with breastfeeding, they might view heat-treated expressed breastmilk in a different light. However, it must be remembered that the WHO stated that it cannot promote this strategy for all HIV-infected mothers who opted for breastfeeding as a result of scarce data to support the acceptability and feasibility thereof (WHO, 2010:38).

6.5.2 MOTHER/INFANT PAIRS

The various associations related to the mother/infant pairs are discussed.

6.5.1.1 ASSOCIATIONS BETWEEN AGE OF THE MOTHER AND FACTORS RELATED TO HIV AND INFANT FEEDING

Age did not play a significant role in the decision of whether to formula-fed or breastfeed. Age of the mother was also not related to the awareness of heat-treated expressed

breastmilk, or the fear of transmitting HIV via breastfeeding versus (vs.) fear of morbidity when formula feeding. The only factor where an age-related trend was found, was with the knowledge that HIV can be transmitted via breastfeeding. Older mothers were more likely to be aware of this fact than the younger group. In an ideal setting, all mothers irrespective of age, will be sufficiently informed about the mechanisms of MTCT. Conversely, Mohamed et al. (2011:143) found that in Gezira state, Sudan, respondents in the younger age group had more knowledge of HIV/AIDS than the respondents in the older age group (Mohamed et al.,2011:143)

6.5.1.2 ASSOCIATIONS BETWEEN EDUCATIONAL LEVEL OF THE MOTHER AND FACTORS RELATED TO HIV AND INFANT FEEDING

A higher educational level did not increase the likelihood that mothers would be more aware of the option of heat-treated expressed breastmilk. A statistically significant association was found between a higher educational level of mothers and knowledge that HIV can be transmitted via breastfeeding. Such an association was also found between a higher educational level and an increased fear of transmitting HIV via breastfeeding vs. morbidity risks of formula feeding. Belachew & Jirra (2007:45) also found a significant association between the educational level of mothers and an increased knowledge related to HIV and infant feeding in an Ethiopian study (Belachew & Jirra, 2007:45).

6.5.1.3 ASSOCIATIONS BETWEEN BIOCHEMISTRY OF THE MOTHER AND INFANT FEEDING CHOICE

No statistically significant difference was found between mothers who had the lowest CD_4 counts, and mothers who had the highest CD_4 counts in relation to infant feeding choice. A trend was observed which indicated that mothers with the lowest haemoglobin levels were more likely to choose breastfeeding as an infant feeding option. Tournoud et al. (2008:311) demonstrated that a low haemoglobin level is a significant predictor of postpartum transmission risk (Tournoud et al., 2008:311).

6.5.1.4 ASSOCIATIONS BETWEEN SOCIO-DEMOGRAPHICS OF THE MOTHER AND INFANT FEEDING CHOICE

No statistically significant associations were found between the infant feeding choice the mother had made and her access to a flush toilet (a flush toilet being an indicator of better sanitation and a more hygienic living environment). Contrary to what could be expected, the mothers' employment status and experiences of food shortages and household income were not associated with the infant feeding choice made.

6.5.1.5 ASSOCIATIONS BETWEEN INFANT ANTHROPOMETRIC VARIABLES

Statistically significant differences were found between the premature group and the full-term group regarding weight-for-age, length-for-age and weight-for-length z-scores (< - 2 SD). This is to be expected since premature infants are generally smaller than full-term infants.

No statistically significant differences were found between the males and females in the premature group regarding weight-for-age, length-for-age or weight-for length z-scores (< - 2SD). However, a trend was noticed which indicated that the males were more likely to have a lower weight-for-length. The low number of children in this category implies that the results should be interpreted with caution.

No statistically significant differences were found between the males and females in the full-term group regarding weight-for-age, length-for-age or weight-for length, however a trend was noticed which suggested that female infants were shorter and weighed less than male infants. This corresponded with a study done by Brahmbhatt et al. (2009:620) in Uganda where the researchers found that low birth weight was seen more often in female than in male infants born to HIV-infected mothers (Brahmbhatt et al., 2009:620).

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

At the completion of this study, certain conclusions can be made to summarize the main findings. Recommendations were constructed in an attempt to provide some perspectives which may assist in improving the infant feeding aspect of the South African PMTCT programme.

7.2 CONCLUSIONS

The following conclusions evolved from the study:

7.2.1 HEALTH CARE WORKERS

7.2.1.1 KNOWLEDGE, ATTITUDES AND PRACTICES RELATED TO HIV AND INFANT FEEDING

- Most health care workers in the maternity wards counselled HIV-infected mothers regarding infant feeding very regularly or daily;
- Only half of the health care workers considered themselves to be very knowledgeable regarding the issues of HIV and infant feeding;
- Health care workers had a positive attitude towards HIV-infected mothers who breastfeed according to the guidelines, and most agreed that the AFASS criteria must be met if a mother wants to formula feed;
- Most knew that, in general, formula feeding increases morbidity and mortality risk;
- Most knew that an infant must be put to the breast to breastfeed very soon after birth and that an infant must be breastfed numerous times a day;
- Health care workers had mixed responses to the idea of heat-treated expressed breastmilk, although the minority had a negative attitude towards it;

- Overall, health care workers did not consider themselves as highly confident in showing a mother how to breastfeed or express breastmilk correctly;
- The minority of health care workers could comprehensively explain the concept of 'exclusive breastfeeding';
- Almost all of the health care workers knew up to what age of the infant an HIV-infected mother should breastfeed;
- Much confusion existed regarding the age up to which an HIV-infected mother can breastfeed (exclusive plus non-exclusive) according to the new 2010 WHO guidelines;
- Most indicated that the risk of postnatal HIV transmission is low if the guidelines are followed, however a relatively large percentage indicated, incorrectly, that there is no risk of postnatal transmission if the guidelines are followed;
- Although most were aware of the increased risk of postnatal transmission associated with mixed feeding, an unacceptable percentage of health care workers did not agree with this fact; and,
- Most of the health care workers had a positive attitude towards South Africa promoting breastfeeding with ARVs as the main feeding option for infants of HIV-infected mothers.

These conclusions seem to indicate that health care workers at the maternity wards of Pelonomi were mostly aware of the basic facts regarding HIV and infant feeding. There are however areas where improvement is needed, especially regarding the new WHO guidelines and the training of practical skills such as the correct method of breastmilk expression.

7.2.2 MOTHER AND INFANT PAIRS

7.2.2.1 SOCIO-DEMOGRAPHY AND HOUSEHOLD FOOD SECURITY

- Most of the mothers were Black, unmarried, had some high school level education, were Sotho-speaking and unemployed;

- Most of the mothers came from households living in brick houses, with electricity, and access to tap water, although a smaller percentage had a toilet inside the house;
- Of the mothers who knew what the household's total income was per month, most indicated that it was R1000-R3000;
- Most household have R0-R200 available for food per week;
- Vegetable gardens and ownership of livestock were not common; and,
- Most of the mothers indicated that household food insecurity and food shortages are experienced by their households, and the main coping strategy was to ask family and friends for assistance.

Although most mothers lived in brick houses with access to electricity and tap water, a large percentage of mothers indicated that food and money shortages do occur in their households.

7.2.2.2 REPORTED HEALTH AND MEDICAL HISTORIES OF MOTHER AND INFANT PAIRS AND ANTHROPOMETRY OF INFANTS

- Few mothers used tobacco or alcohol before or during pregnancy;
- Hypertension was a diagnosis in a quarter of the mothers and was a diagnosis in almost half of the mothers' families;
- The most prevalent symptoms that the mothers experienced recently were chest pain and breathlessness, loose stools, nausea, loss of appetite and involuntary weight loss;
- Previous hospitalizations were not common, and almost three quarters of mothers delivered their most recent infant via caesarean section;
- The current pregnancy was most mothers' second or third child, and most of the mothers who already had children, breastfed them;
- These mothers started weaning their previous infants at a median age of four months;

- Half of the mothers had CD4 counts > 350 cells/mm^3, while one third of the mothers' CD4 count was < 250 cells/mm^3;
- Almost two out of every five mothers had a haemoglobin level <11.0 g/dL, which indicates an anemia;
- Most of the mothers were religious and experienced a few recent periods of stress;
- Infants had a median gestational age of 38 weeks, and a quarter of infants were classified as premature infants;
- Most mothers planned to breastfeed (70.9%) while fewer planned to formula feed (29.1%);
- If the infant feeding mode changed after birth, it was mostly due to low milk production, or the infant being a high risk premature infant or experienced foetal distress;
- Most breastfeeding mothers started to breastfeed within the hour after delivery, and the two most prevalent breastfeeding problems were low milk production and sore breasts; and,
- The median length-for-age of the full-term infants fell in the normal z-score category, the median weight-for-age and weight-for-length z-scores fell in the 'at risk' category.

Previous hospitalizations of the mothers were not common although some of them experienced symptoms such as chest pain, diarrhoea and nausea. Hypertension was also a common diagnosis in both the mothers and their family members. A large percentage of mothers had a relatively low CD4 count and haemoglobin level, indications of HIV disease progression and anaemia respectively. A large percentage of infants were classified as premature, and most mothers planned to breastfeed, most probably deterred from formula milks as a result of the high costs involved. Low milk production, whether it was only perceived or real, was one of the main breastfeeding problems that was experienced. Some mothers also experienced sore breasts. These are problems which must receive immediate intervention in order to promote good breastfeeding practices, reduce HIV transmission risk and to ensure the health of the infant and mother.

7.2.2.3 KNOWLEDGE, ATTITUDES AND PRACTICES RELATED TO GENERAL INFANT FEEDING

- Most mothers knew that breastfeeding is beneficial for the baby, but few knew what benefits it holds for a mother;
- Most mothers thought that breastmilk alone is sufficient for the first few months and that breastmilk is best for a baby;
- Slightly more than half of the mothers knew that a sick infant should still be fed, even if he/she has diarrhoea;
- Most mothers planned to wean at six months;
- Sixteen percent of breastfeeding mothers planned to give the infant a pacifier which is known to interfere with breastfeeding;
- The main reason why formula feeding mothers avoided breastfeeding, was to prevent postnatal HIV transmission;
- Mothers who planned to formula feed their infants chose the option of asking a family member or friend for advice (9.1%) or not follow any specific guidelines (9.1%) when preparing the formula milk; and,
- Most would feed formula milk with a bottle and teat; approximately half of them would incorrectly add water to formula milk powder, and only 20.0% would use hot water, soap and disinfectant to wash the bottles.

Generally, mothers had a positive attitude towards breastfeeding and correctly planned to wean at six months. They did however lack knowledge regarding correct formula feeding practices and what to feed infants when they are ill. When mothers decided to formula feed it was mainly done in an attempt to prevent HIV transmission via breastfeeding.

7.2.2.4 KNOWLEDGE, ATTITUDES AND PRACTICES RELATED TO HIV AND INFANT FEEDING

- Slightly more than half of the mothers knew that HIV can be transmitted via breastfeeding;

- Most thought that that an HIV-infected mother can indeed breastfeed;
- Most knew that mixed feeding is not a safe practice;
- Most had a positive or neutral attitude towards the provision of free formula milk to infants of HIV-infected mothers;
- Most had a negative or neutral attitude towards the withdrawal of free formula milk provision at clinics;
- The median age up to which an HIV-infected mother must breastfeed exclusively was (correctly) indicated as six months;
- The median age up to which an HIV-infected mother can breastfeed exclusively and non-exclusively was (incorrectly) indicated as six months; and,
- The AFASS criteria which were met by most mothers were access to safe water and a clinic, as well as access to soap and disinfectant to clean utensils and bottles/cups.

A large percentage of mothers were not aware of the fact that HIV can be transmitted to an infant via breastfeeding, even when ARVs are used. This might be a result of misunderstanding of what health care workers explain to them, or as a result of inappropriate counselling. Mothers did not have a positive attitude towards the withdrawal of free formula milks at clinics. They knew that HIV-infected breastfeeding mothers should give only breastmilk for six months, but were not aware of the new WHO guidelines regarding the age up to which such an infant can be breastfed. Generally, AFASS criteria were not adequately met by most mothers, and subsequently a large percentage of mothers correctly opted for breastfeeding.

7.2.2.5 WHO PRINCIPLES REGARDING HIV AND INFANT FEEDING

- Most mothers believed that cow's milk is the most unsafe feed for young infants irrespective of the mother's HIV status;
- Almost all of the mothers had access to HIV testing and ARVs while pregnant and took their ARVs as prescribed;
- Most of the mothers did receive infant feeding counselling, but eight mothers had not;

- Approximately a quarter of the mothers reported that the health care worker providing infant feeding counselling did not tell them that HIV can be transmitted via breastfeeding;
- Most mothers were told that breastfeeding is beneficial, that ARVs must be used and that a mother must avoid mixed feeding;
- Only 62.0% of the mothers were told that formula feeding increases risk of morbidity and mortality if done incorrectly;
- AFASS criteria were not comprehensively explained to the mothers;
- Only half of the mothers were shown how to either breastfeed or formula feed, depending on their choice;
- Mothers could not adequately explain the concept of EBF; and,
- Prevention of HIV re-infection methods were not adequately explained to the mothers.

A mothers' HIV status did not influence the mothers' (correct) opinions that animal milks are not appropriate as an infant feeding choice for young infants. Most were tested for HIV, prescribed ARVs and had received infant feeding counselling while pregnant. However, a few had not received counselling. Appropriate infant feeding counselling could have prepared these mothers adequately for the choices that they then had to face after their infants were born. Most mothers were generally not adequately trained regarding infant feeding issues.

7.2.2.6 WHO RECOMMENDATIONS REGARDING HIV AND INFANT FEEDING

- Not one mother chose expressed heat-treated breastmilk as a feeding choice at any time of the infant's life'
- Most mothers who chose to formula feed did not have adequate knowledge on the correct preparation thereof;
- A quarter of mothers would store unused prepared formula milk in an unsafe manner;

- Few mothers were aware of the option of expressed heat-treated breastmilk, and they had mixed feelings towards the practice; and,
- The median age at which mothers plan to stop giving breastmilk is six months, and if they planned to give formula milk at some time, the median age at which they plan to stop is nine months.

Mothers who chose to formula feed could generally not comprehensively explain how to do so correctly. They were also either uninformed or distrustful of expressed heat-treated breastmilk as an infant feeding option.

6.4 ASSOCIATIONS BETWEEN VARIABLES

The following conclusions related to associations between variables evolved from the study:

6.4.1 HEALTH CARE WORKERS

- The only significant association between variables was that the doctors/dieticians were less accepting of HIV-infected mothers heat-treating their expressed breastmilk as an infant feeding option than the nursing personnel; and,
- A trend existed indicating that the doctors/dieticians had lower confidence in showing a mother how to breastfeed than the nurses.

6.4.2 MOTHER/INFANT PAIRS

- It appeared that the age of the mothers had no major influence on the factors related to HIV and infant feeding, although a trend was noticed which indicated that the older women were more aware of the fact that HIV can be transmitted via breastfeeding;
- A statistically significant association was found between a higher educational level of the mothers and knowledge that HIV can be transmitted via breastfeeding;

- A statistically significant association was found between a higher educational level of the mothers and an increased fear of transmitting HIV to her infant via breastfeeding rather than the increased risks associated with formula feeding;
- A trend was observed which indicated that mothers with lower haemoglobin levels were more likely to breastfeed than to formula feed the infant;
- Statistically significant differences were found between the premature group and the full-term group regarding weight-for-age, length-for-age and weight-for-length z-scores;
- A trend was noticed which indicated that the premature males were more likely to have a lower weight-for-length z-score than the premature females; and,
- A trend was noticed which suggested that full-term females were shorter and weighed less than the full-term males.

Nursing personnel were more accepting of heat-treated expressed breastmilk as an infant feeding option for HIV-exposed infants, and were more confident in certain practical aspects of breastfeeding than the doctors/dieticians group. Age of the mothers did not have a major influence on the factors related to HIV and infant feeding, although the level of education of the mothers did have some influence on knowledge of postnatal HIV transmission. Premature males were smaller than premature females, while full-term females were smaller than full-term males.

7.3 RECOMMENDATIONS

Providing scientifically based, unbiased information is fundamental during infant feeding counselling sessions and public health education to ensure the success of PMTCT programmes in any setting. The health care workers should be adequately trained and also feel very well-informed and confident in their knowledge in order for the correct information to be passed on to the community. If women then feel confident in their acquired knowledge, they will be self-empowered and can take better control over their unique situations.

7.3.1 RECOMMENDATIONS FOR POLICY

Sagoe-Moses et al. (2012:6284) proposed that a comprehensive communication strategy be implemented involving all the different parties about the best available infant feeding practices as well as regarding the use of ARVs. They made four major recommendations which can assist a country during the design and implementation of PMTCT services:

1. The design and subsequent implementation of a communication strategy to improve and correct knowledge and misperceptions of health care workers regarding HIV and infant feeding, as well as to reiterate the potential benefits of breastfeeding and ARV use;
2. Position HIV-free survival of infants and improved maternal care as primary goals of treatment interventions;
3. Support the improvement of infant feeding in the general population and inform mothers about changes in infant feeding practices and the benefits thereof; and,
4. Parallel strategies to inform policy makers, opinion leaders, health care workers and the community members should be developed (Sagoe-Moses et al., 2012:6284).

Since the WHO promotes the recommendation that a country must choose and support one infant feeding strategy, the authors of an article entitled "Implications for the new WHO guidelines on HIV and infant feeding for child survival in South Africa", urged the government to do away with the two "equivalent" feeding options which they suggest had contributed to misunderstandings of both the health care workers and the community members (Doherty et al., 2011:64). Later in the same year that the article was published, the South African government did in fact decide to promote breastfeeding with the use of ARVs as the main infant feeding option for infants of HIV-infected mothers. This guideline change is an important and encouraging step forward, but if the health care workers are not yet comprehensively trained on the different issues, it has the potential to be less successful than anticipated. Since there is always a risk of HIV transmission via breastfeeding even if the guidelines are followed, a mother who is uniformed about the risk of transmission may feel betrayed and angry if her child does contract the virus postnatally.

This may lead to distrust of health care workers and the government in general, and provides another argument for the importance of good quality counselling.

Maternal well-being and health are not to be neglected amidst the struggle of preventing MTCT of HIV. A systematic review by Both & Van Roosmalen (2010:1448) concluded that PMTCT programmes could have a more positive effect on maternal health care if PMTCT programmes become more integrated into current maternal health care services. They support their argument by succinctly stating the following: "This requires PMTCT programmes to turn their vertical view of HIV prevention and treatment into a horizontal focus on maternal health care." The authors determined that further research into the impact of PMTCT programmes on maternal health care services is necessary (Both & Van Roosmalen, 2010:1448).

Certain basic factors should be present in a PMTCT programme regarding infant feeding, and there are areas that can be improved in the South African PMTCT programme. Health care workers often complain about having limited time and resources to adequately counsel their patients. The planning for the appointment of more health care workers should have priority in the planning of the budget for health care in South Africa. If policy makers are made aware of the importance and impact of good quality counselling, it is hoped that more resources will be allocated in support of this.

7.3.2 RECOMMENDATIONS FOR PRACTICE

Goga & Jackson (2010:66) have adapted a tool which summarizes key messages to promote safe infant feeding and improve HIV-free survival (table 7.1) (Goga & Jackson, 2010:66). This tool can assist health care workers during counselling and care and can be used as a simple method to ensure that all of the important steps are taken to promote appropriate infant feeding practices.

Table 7.1 Key messages to promote safe infant feeding and improve HIV-free survival (Goga & Jackson, 2010:66)

Support	Action
S	Screen all women for HIV Send off CD_4 cell counts on all HIV-positive women Screen all HIV-positive women for the six WHO criteria (or a country's adaptation thereof) to identify those women who may be able to 'fall out' of the breastfeeding group
U	Understand the mother's personal and socio-cultural context
P	Promote exclusive or predominant breastfeeding if all the six criteria are not met Plus, start postnatal prophylactic regimes to minimize postnatal HIV transmission
P	Promote exclusive breastfeeding if all criteria are not met
O	Organise supplies: • Of prophylactics ARVs • Of co-trimoxazole for infants from six weeks • Of formula milk if mothers meet the six criteria and choose to formula feed*
R	Review mothers and infants in the first three days postnatally , in the first two weeks postnatally and monthly thereafter Review mother's and infant's health and infant feeding practice technique regardless of feeding choice Review adherence to ARV regimes
T	Treat all mothers and children with ART according to updated recommendations

* Since December 2011, these women would have to procure formula milk without assistance from the South African government

The mothers' adherence to the postnatal PMTCT programme is of paramount importance to ensure the best possible outcomes of the treatment and the feeding option that was chosen. Nassali et al. (2009:1124) determined the adherence to a postnatal PMTCT programme in Uganda. They concluded that the mothers' perceived benefits of the programme, ease of access to the programme and the support of a partner were important motivators for adherence, and even then only a third of the women adhered. The investigators found that mothers who previously attended postnatal care were four times more likely to adhere to the programme recommendations (Nassali et al., 2009:1124).

These motivators should not be neglected by the South African DoH when planning and revising the PMTCT programme.

The design of updated, interesting, interactive educational materials could also contribute to the successful implementation of PMTC programmes and should urgently receive attention. It must be ensured that each woman is empowered during counselling sessions, and that durable educational materials can be sent home with her. No woman must ever be uncertain about issues related to infant feeding. Women must be reminded about the benefits of attending ante-natal visits and follow-up counselling sessions and it must be ensured that these sessions are enjoyable and worthwhile for the women. In addition, educational messages to the general public regarding the importance of infant feeding counselling and factors related to infant feeding in the context of HIV, must be designed. Different channels of media should be utilized to increase the infant feeding knowledge of the different communities. Developing these culturally sensitive counselling tools using an integrated approach is also key to optimizing counselling sessions. These tools should be evidence-based and preferably developed after qualitative participatory research. This will enable policy makers to ascertain which perceived and non-perceived barriers there are regarding successful counselling and infant feeding practices. Leshabari et al. (2006:6) developed evidence-based counselling tools to improve infant feeding in the context of HIV for HIV-infected mothers in Tanzania. A few of the problems which contributed to the need and implementation of their study was the fact that mothers felt that they did not understand the issues regarding breastfeeding and formula feeding and that EBF was difficult to practice. Mothers could not remember what was said during counselling sessions, and the formula feeding mothers were not confident in the correct preparation of formula milk. None of the mothers received information documents to take home either, and health care workers were demotivated by their counselling experiences. They gave 'strong advice' on which feeding option to choose, they did not create a supportive environment, practical guidance was absent, and the counselling sessions were much too brief (Leshabari et al.,2006:6). Such educational counselling tools are extremely important to assist during counselling and to send home with the mother in order for her to refresh her memory after the counselling sessions. The tools must be attractive, economical, culturally specific and easy to understand in order for them to be as effective as possible.

Piwoz et al. (2007:1250) called attention to the importance of counselling together with the use of print and video materials, as this significantly decreased postnatal transmission risk in a study in Zimbabwe (Piwoz et al., 2007:1250).

7.3.3 RECOMMENDATIONS FOR TRAINING OF HEALTHCARE WORKERS

Sagoe-Moses et al. (2012:6285) has reiterated that the competence of health care workers should be aligned with the newest guidelines and argues for capacity building and training of health care professionals at their place of work. The curricula at the institutions need to be revised and appropriate changes made (Sagoe-Moses et al., 2012:6285). A strategy that might be considered is to develop a core curriculum of material that all health care workers should be trained in, with the addition of materials that are suited for the local environment to improve acceptability and success of the training programme.

Health care workers should be trained not only in facts and information, but also in counselling skills which will increase trust and encourage honesty in the health care worker/patient relationship. Since the issues of HIV and infant feeding are complex and numerous, the appointment of specific health care personnel who are charged with the training and supervision of other healthcare workers in a district, might be considered. This will increase the knowledge and confidence of health care workers, and they will not feel isolated in this fight against the spread of HIV. If they then encounter a problem that they are not sure about, they may contact this person for assistance. This will also increase the probability that accurate information will be conveyed to the patients. Another vital aspect is the importance of consistent messages being sent to health care workers and HIV-infected women in South Africa. Discrepancies lead to confusion, which can ultimately disadvantage mothers and infants in the community. Training materials might have to be designed centrally and distributed to all of the provinces to attain this goal.

If healthcare workers can be trained adequately and their confidence in their knowledge and skills improves, the first step in a successful PMTCT programme will be established.

7.3.4 RECOMMENDATIONS FOR FUTURE RESEARCH

In terms of infant feeding, the most pertinent issue that needs to be researched is the efficacy of the 2010 WHO Guidelines on HIV and Infant Feeding. The impact of these guidelines on the HIV-free survival and mortality rates of infants born to HIV-infected women need to be further investigated. The most practical and efficient health care system approaches should be identified to improve infant feeding in the context of HIV. This will ensure that good quality services are consistently provided which will then ultimately benefit the infant and the community at large. Even though the use of heat-treated expressed breastmilk has not been shown to be universally acceptable and feasible, the WHO still recommends that further research be done at scale to investigate it as a strategy to reduce the transmission of HIV via breastmilk (WHO, 2010:40).

Related to this study, it would be of value to determine if mothers that participated in this study would have answered the questionnaires in a detailed and more explicit manner if they were interviewed in their home language. The quality of counselling and services that the ante-natal clinics which women in this community attend, should also be investigated in an attempt to determine where those areas that need improvement are. The development of training materials for both health care workers and community members should be considered a priority, as well as the subsequent monitoring of the effectiveness thereof.

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APPENDIX A # KNOWLEDGE, ATTITUDES AND PRACTICES OF HEALTH CARE WORKERS

Please fill in the following (anonymous) questionnaire on your **own without consulting textbooks, journals etc.** Your co-operation is extremely valuable in assisting to create better training for health care workers with regards to HIV and Infant Nutrition (filling in the questionnaire will take ± 5 minutes). By completing this questionnaire, you are giving your consent for the data to be used and published. If you wish to answer this questionnaire in Afrikaans or Sotho, please ask the researcher, Liska Jv Rensburg.

		1-3

For office use only

1	**What is your professional status, e.g. nurse, sister, doctor, dietician etc.?** _____	4-5

Please answer the following questions by encircling the correct answer, for example:

Pregnant women should receive comprehensive counselling to help them decide what to feed their new-born infants.

(1.) True
2. False

2	**How often do you give advice to HIV infected women regarding feeding their infants?** 1. Never 2. Seldom 3. Often 4. Very regularly 5. Daily	6
3	**How knowledgeable do you believe you are with regards to infant feeding within the context of HIV?** 1. Very low knowledge 2. Low knowledge 3. Moderate knowledge 4. Very knowledgeable 5. Expert	7
4	**What is your attitude towards HIV infected women breastfeeding their infants? (choose only one)** 1. They should not breastfeed because there is a risk of HIV transmission 2. Breastmilk is an excellent feeding choice but the mothers must be counselled in correct breastfeeding practices and ARV use to minimize the risk of transmission 3. Other – please comment: _____ _____ _____	8
5	**What is your attitude towards HIV infected women formula feeding their infants? (choose only one)** 1. It is the safest way to feed these infants because it ensures the infant stays HIV- and thus healthy 2. It may only be promoted for women who meets the AFASS criteria – affordable, feasible, acceptable, sustainable and safe 3. Other – please comment _____ _____	9

6	**In general, infants who are formula/replacement fed have higher risks for getting sick (diarrhoea, pneunomia etc.) and dying than infants who are breastfed.** 1. True 2. False 3. Don't know	☐ 10
7	**How confident are you that you can successfully show a new mother how to correctly position and attach the baby to the breast for breastfeeding (according to the 4 signs of good positioning and the 4 signs of good attachment)?** 1. Not at all confident 2. Low confidence 3. Moderately confident 4. High confidence 5. Very high confidence	☐ 11
	How soon after birth should a new-born baby be put on the breast to breastfeed? 1. 30-60mins 2. 2-3 hours 3. 12hours 4. 24hours 5. >24 hours 6. Don't know	☐ 12
8	**If a mother breastfeeds, at least how many times per 24 hours must she breastfeed during the first months of life?** 1. 1 - 3 times 2. 4 - 6 times 3. 7 - 14 times 4. 15 - 18 times 5. Don't know	☐ 13
9	**How confident are you in showing a new mother how to express her breastmilk?** 1. Not at all confident 2. Low confidence 3. Moderately confident 4. High confidence 5. Very high confidence	☐ 14
10	**What is your opinion about HIV infected women heat treating their expressed breastmilk and feeding it to their baby? (choose only one)** 1. It's a good idea 2. It's a bad idea 3. It's a good idea but it's too much work and a lot of women won't keep it up 4. Don't know 5. Other, please comment: _____ _____	☐ 15
11	**Explain 'exclusive breastfeeding'?** 1. _____ _____ _____ _____ 2. Don't know	☐ 16

12 **Up to what age of the infant should a HIV infected mother breastfeed EXCLUSIVELY?** [ ] 17

1. 3 months
2. 4 months
3. 6 months
4. 8 months
5. Don't know

13 **Up to what age of the infant can the HIV infected mother breastfeed her infant according to the newest 2010 WHO guidelines (exclusive PLUS non-exclusive breastfeeding)?** [ ] 18

1. 3 months
2. 4-6 months
3. 6 months
4. 8 months
5. Up to one year old
6. Up to one year old and then only stop when an adequate diet without breastmilk can be provided
7. Don't know

14 **What is the risk of HIV transmission through breastfeeding if the mother/infant DO NOT use ARVs and she does not breastfeed according to the guidelines?** [ ][ ] 19-20

_____

_____

_____

_____

_____

_____

15 **What is the risk of HIV transmission through breastfeeding if the mother/infant receive ARVs and she breastfeeds according to the guidelines?** [ ][ ] 21-22

_____

_____

_____

_____

_____

16 **When a HIV infected mother is breastfeeding her infant and she gives anything else to the infant to drink or eat, it increases the risk of HIV passing to the baby through breastmilk.** [ ] 23

1. True
2. False
3. Don't know

17 **What is your opinion on the new guidelines which will promote breastfeeding together with the use of ARVs as the number one feeding option for HIV infected women in South Africa? (choose one)** [ ] 24

1. It will provide a reliable source of nutrition for the infants and will decrease infant malnutrition especially in impoverished communities
2. It is not the best feeding choice as there is a risk of HIV transmission - the distribution of free formula milks at clinics should be re-instated
3. Other, please specify

_____

_____

Thank you for your participation

Researcher: Liska Janse van Rensburg

Tel: 084 700 9552

Department Nutrition and Dietetics - University of the Free State

APPENDIX B

SOCIO-DEMOGRAPHY

1.1	**Interpreter used?** Yes = 1 No = 2		1
1.2	**Household number:** _____		2-4
2	**Interview date (d d m m y y):** _____		5-10
3	**Names:**		
	1 Mother _____		11
	2 Infant 1 _____		12
	3 Infant 2 _____		13
4	**Gender:**		
	1 = Male 2 = Female		
	2 Infant 1 _____		14
	3 Infant 2 _____		15
5	**Birthdates (d d m m y y):**		
	1 Mother _____		16-21
	2 Infant 1 _____		22-27
	3 Infant 2 _____		28-33
6	**Highest educational level of respondent:** _____		34-35
7	**How many people ≥ 10 years old live in your house?** _____		36-37
	How many children < 10 years old live in your house? _____		38-39
8	**First language of respondent:**		40
	1. Sotho		
	2. English		
	3. Afrikaans		
	4. Other, specify _____		
9	**Employment status of respondent:**		41
	1. Housewife by choice		
	2. Unemployed		
	3. Self-employed		
	4. Fulltime wage earner (salary)		
	5. Other, specify (part time, piece job etc.) _____		
	6. Don't know		
10	**Employment status of husband/partner:**		42
	1. Retired by choice		
	2. Unemployed		
	3. Self-employed		
	4. Fulltime wage earner (salary)		
	5. Other, specify (part time, piece job etc.) _____		
	6. Not applicable, e.g. deceased		
	7. Don't know		
11	**Type of dwelling:**		43
	1. Brick, concrete		
	2. Tin		
	3. Wood, plank		
	4. Traditional mud		
	5. Other, specify _____		
12	**Total number of sleeping rooms in house:**		

SOCIO-DEMOGRAPHY

13	**Do you have a bathroom inside the house?**	Yes = 1 No = 2	46
14	**Do you have a bathroom outside?**	Yes = 1 No = 2	47
15	**Do you have a kitchen inside the house?**	Yes = 1 No = 2	48
16	**Do you have running water inside the house?**	Yes = 1 No = 2	49
17	**Where do you usually get your drinking water?**		50
	1. Own tap		
	2. Communal tap		
	3. River, dam		
	4. Borehole, well		
	5. Other, specify _____		
18	**What type of toilet does the household have?**		51
	1. Flush		
	2. Pit		
	3. Bucket, pot		
	4. VIP		
	5. Other, specify _____		
19	**Does the house have electricity?**	Yes = 1 No = 2	52
20	**Which fuel is mostly used for cooking?**		53
	1. Electricity		
	2. Gas		
	3. Paraffin		
	4. Wood, coal		
	5. Open fire		
	6. Other, specify _____		
21	**Does the house have a working:**		
	1. Refrigerator and/ freezer	Yes = 1 No = 2	54
	2. Stove (electric, gas, coal) or hot plate	Yes = 1 No = 2	55
	3. Paraffin stove or primus	Yes = 1 No = 2	56
	4. Microwave	Yes = 1 No = 2	57
	5. Kettle	Yes = 1 No = 2	58
	6. Radio	Yes = 1 No = 2	59
	7. Television	Yes = 1 No = 2	60
22	**How many people contribute to the total household income?** _____		61-62
23	**Total household income per month** (wages, rent, sales, grant etc.)		63
	1. None		
	2. R100 - R500		
	3. R501 - R1000		
	4. R1001 - R3000		
	5. R3001 - R5000		
	6. Over R5000		
	7. Don't know		
24	**Is this more or less the income you have had over the past 6 months?**		64
	1. More		
	2. Less		
	3. Same		

SOCIO-DEMOGRAPHY

25	**Race of the family** 1. Black 2. White 3. Coloured 4. Other, specify _____	65

ANTHROPOMETRY

ANTHROPOMETRY OF MOTHER

Household Number [ ][ ][ ] 1-3

1		**Is pre-pregnancy weight available?**	[ ] 4
	1.	Available	
	2.	Not available	
1.1		**If yes, obtained how?**	[ ] 5
	1.	In file	
	2.	Recalled by respondent	
1.2		**Pre-pregnancy weight (kg)** _____	[ ][ ][ ].[ ] 6-10
1.3		**Weight changes taken and documented at ante-natal visits available in file:**	[ ] 11
	1.	Available	
	2.	Not available	
1.4		**Specify recorded weights during pregnancy as documented in file (month 1 to 9):**	
	1.	_____	[ ][ ][ ].[ ] 12-16
	2.	_____	[ ][ ][ ].[ ] 17-21
	3.	_____	[ ][ ][ ].[ ] 22-26
	4.	_____	[ ][ ][ ].[ ] 27-31
	5.	_____	[ ][ ][ ].[ ] 32-36
	6.	_____	[ ][ ][ ].[ ] 37-41
	7.	_____	[ ][ ][ ].[ ] 42-46
	8	_____	[ ][ ][ ].[ ] 47-51
	9.	_____	[ ][ ][ ].[ ] 52-56
2		**Weight in hospital - post delivery (kg)** _____ _____ _____	[ ][ ][ ].[ ] 57-61
3		**Height (cm)** _____ _____ _____	[ ][ ][ ].[ ] 62-66
4		**Respondents who cannot stand:**	
	1.	**Knee height (cm)**	[ ][ ].[ ] 67-70
5		**MUAC (cm)** _____ _____ _____	[ ][ ].[ ] 71-74
6		**Triceps skinfold (mm)** _____ _____ _____	[ ][ ][ ][ ] 75-78
6.1		**Hip Circumference (cm)** _____ _____ _____	[ ][ ][ ].[ ] 1-5

APPENDIX C

ANTHROPOMETRY

ANTHROPOMETRY OF INFANT 1

7		**Member number (as on socio-demographic form)** _____	. 2 6-10
8		**Birth weight (g)** _____ _____ _____	11-14
8.1		**Measurements obtained by:**	15
	1.	Researcher	
	2.	File	
9		**Birth length (cm)** _____ _____ _____	. 16-19
9.1		**Measurements obtained by:**	20
	1.	Researcher	
	2.	File	
10		**Head circumference at birth (cm)** _____ _____ _____	. 21-24
10.1		**Measurements obtained by:**	25
	1.	Researcher	
	2.	File	

ANTHROPOMETRY OF INFANT 2

7		**Member number (as on socio-demographic form)** _____	. 3 26-30
8		**Birth weight (g)** _____ _____ _____	31-34
8.1		**Measurements obtained by:**	35
	1.	Researcher	
	2.	File	
9		**Birth length (cm)** _____ _____ _____	. 36-39
9.1		**Measurements obtained by:**	40
	1.	Researcher	
	2.	File	
10		**Head circumference at birth (cm)** _____ _____ _____	. 41-44
10.1		**Measurements obtained by:**	45
	1.	Researcher	
	2.	File	

APPENDIX D

HOUSEHOLD FOOD SECURITY

		Household Number	[ ][ ][ ] 1-3
1		**How much money is available to spend on food for the household weekly?**	[ ][ ] 4-5
	1.	R0-R50	
	2.	R51-R100	
	3.	R101-R150	
	4.	R151-R200	
	5.	R201-R250	
	6.	R251-R300	
	7.	R301-R350	
	8.	R351-R400	
	9.	Over R400	
	10.	Don't know	
2		**What is your main source of income?**	[ ] 6
	1.	Wages and salaries from formal employment	
	2.	Self employment (including home enterprises)	
	3.	Casual employment (agricultural or non agricultural)	
	4.	Crop production and livestock sales	
	5.	Sale of assets	
	6.	Land/ flats /equipment rental	
	7.	Old age pension or state grant	
	8.	Domestic work	
	9.	Other, specify _____	
3		**Do you grow vegetables, crops or fruit?** Yes = 1 No = 2	[ ] 7
4		**Do you own livestock?** Yes = 1 No = 2	[ ] 8
5		**Who in the family is served first when meals are served?**	[ ] 9
		1. Father/ men in the family	
		2. Mother/ women in the family	
		3. Children	
		4. All eat at the same time	
		5. Lives and eats alone	
6		**HUNGER SCALE (encircle answer)**	
a		**Does your household ever run out of money to buy food?**	[ ] 10
		1. Yes	
		2. No	
b		**Do you ever rely on a limited number of foods to feed your children?**	[ ] 11
		1. Yes	
		2. No	
		3. No children in household	
c		**Do you ever cut the size of meals / skip any because there is not enough food in house?**	[ ] 12
		1. Yes	
		2. No	
e		**Do you ever eat less than you should because there is not enough money for food?**	[ ] 13
		1. Yes	
		2. No	

APPENDIX D

HOUSEHOLD FOOD SECURITY

f		**Do your children ever eat less than you feel they should because there is not enough money for food?** 1. Yes 2. No 3. No children in household	14
g		**Do your children ever say they are hungry because there is not enough food in the house?** 1. Yes 2. No 3. No children in household	15
h		**Do you ever cut the size of your children's meals or do they ever skip meals because there is not enough money to buy food?** 1. Yes 2. No 3. No children in household	16
i		**Do any of your children ever go to bed hungry because there is not enough money to buy food?** 1. Yes 2. No 3. No children in household	17
		Has the family ever experienced periods of food shortage? 1. Yes 2. No	18
7		**If yes, how did the family cope during this period?** Yes = 1 No = 2	
	1.	Found other/additional sources of income	19
	2.	Asked family/relatives/ neighbours for help (money/food)	20
	3.	Family members went to live elsewhere	21
	4.	Sold assets	22
	5.	Worked for payment in kind	23
	6.	Depended on charity/welfare	24
	7.	Borrowed money/food	25
	8.	Increased production of food	26
	9.	Could not do anything	27
	10.	Other, specify	28

APPENDIX E

REPORTED HEALTH AND MEDICAL HISTORIES

		Household Number	1-3
1		**Marital status:**	4
	1.	Never married	
	2.	Currently married/ Traditional marriage	
	3.	Living with partner	
	4.	Widowed	
	5.	Separated	
	6.	Divorced	
	7.	Other, specify _____	
2		**Which best describes your history of smoking?**	5
	1.	Never smoked	
	2.	Currently smoke (during pregnancy)	
	3.	Formerly smoked	
		If currently, how many cigarettes per day? _____	6-7
		If yes, at what age did you start? _____	8-9
3		**Which best describes your history of snuffing?**	10
	1.	Never used snuff	
	2.	Currently use snuff	
	3.	Formerly used snuff	
		If currently, how many times per day do you snuff _____	11-12
		If yes, at what age did you start? _____	13-14
4		**Which best describes your history of alcohol use?**	15
	1.	Never used alcohol products	
	2.	Currently use alcohol products (during pregnancy)	
	3.	Formerly used alcohol products	
5		**If currently, what form of alcohol do you use at least once a week?** Yes = 1 No = 2	
	1.	Spirits (rum, whisky, gin, vodka etc.)	16
	2.	Wine	17
	3.	Beer	18
	4.	Homemade beer	19
6		**At least once a month, do you consume >5 alcoholic drinks per day?** Yes = 1 No = 2	20
7		**At what age did you start using alcohol?** _____	21-22
8		**On weekends, how many alcohol-containing drinks do you consume?** _____	23-24
9		**Do you feel tired on Monday after heavy alcohol consumption (more than 5 drinks per day) during the weekend?** Yes = 1 No = 2	25
10		**Current disability:** Yes = 1 No = 2	
	1.	Do you have any trouble walking about?	26
	2.	Do you have trouble seeing someone across the room (with glasses)?	27
	3.	Do you have trouble reading (with glasses)?	28
	4.	Do you have trouble speaking and being understood?	29
	5.	Do you have trouble hearing?	30
11		**Have YOU ever been diagnosed with the following?** Yes = 1 No = 2	
	1.	Diabetes	31
	2.	High blood pressure	32
	3.	Stroke	33
	4.	Heart disease/ Angina/ Heart attack	

REPORTED HEALTH AND MEDICAL HISTORIES

	5.	Heart failure	35
	6.	Cancer	36
	7.	Liver disease/ Hepatitis/ Jaundice	37
	8	Lung disease e.g. emphysema or asthma	38
	9.	Tuberculosis	39
	10.	Epilepsy	40
12		**Has a family member ever been diagnosed with the following?** Yes = 1 No = 2	
	1.	Diabetes	41
	2.	High blood pressure	42
	3.	Stroke	43
	4.	Heart disease/ Angina/ Heart attack	44
	5.	Heart failure	45
	6.	Cancer	46
	7.	Liver disease/ Hepatitis/ Jaundice	47
	8	Lung disease e.g. emphysema or asthma	48
	9.	Tuberculosis	49
	10.	Epilepsy	50
	11.	HIV/AIDS	51
13		**Have you experienced any of the following in the last six months?** Yes = 1 No = 2	
		1. Chest pain or tightness with usual activity	52
		2. Breathlessness with usual activity	53
		3. Cough for at least 2 weeks	54
		4. Wheezing or whistling in the chest	55
		5. Loose stools/ diarrhoea for at least 3 days	56
		6. Vomiting/nausea	57
		7. Loss of appetite	58
		8. Swelling of feet	59
		9. Blood in urine	60
		10. Involuntary weight loss of > 3 kg	61
		11. Skin rash	62
		12. Joint pain	63
		13. Sexually transmitted diseases	64
13.1		**Other medical problems/complications:**	
		_____	65-66
		_____	67-68
		_____	69-70
		_____	71-72
		_____	73-74
14		**Medication & Supplement use at home (at least once per week)** Yes = 1 No = 2	75
14.1		**If yes, list all including traditional medicines and supplements taken daily/weekly:**	
	1.	_____	76-77
	2.	_____	78-79
	3.	_____	1-2
	4.	_____	3-4
	5.	_____	5-6
	6.	_____	7-8
	7.	_____	9-10
	8	_____	11-12
	9.	_____	13-14
	10.	_____	15-16

REPORTED HEALTH AND MEDICAL HISTORIES

15		**List medications given while in hospital (patient file):**	
	1.	_____	17-18
	2.	_____	19-20
	3.	_____	21-22
	4.	_____	23-24
	5.	_____	25-26
	6.	_____	27-28
	7.	_____	29-30
	8	_____	31-32
	9.	_____	33-34
	10.	_____	35-36
16		**During the last year, have you been hospitalized? Yes = 1 No = 2**	37
17		**If yes, how many times?**	38-39
18		**If yes, give details :**	40-41
		_____	
19		**If yes, for how many days?** _____	42-44
20		**Have you ever used an injectable contraceptive?** Yes = 1 No = 2	45
21		**Have you ever used condoms (male/female)?**	46
22		**How many live children have you given birth to?**	47
23		**Did you breastfeed any of your children?**	48
24		**If yes, at what age (months) did you add anything other than breast milk to the diet?** _____	49-50
25		**Are you a member of a church?** Yes = 1 No = 2	51
26		**Do you attend services at least 2x/month?** Yes = 1 No = 2	52
27		**Stress is defined as feeling irritable or filled with anxiety, or as having sleeping difficulties as a result of conditions at work or at home. How often have you felt stress in the last 2 months?**	
	1.	Never	53
	2.	A few periods of stress	
	3.	Several periods of stress	
	4.	Permanent stress	
28		**During the past 12 months, was there ever a time when you felt sad, blue or depressed for two weeks or more in a row?** Yes = 1 No = 2	54
29		**Do you know people who have HIV/AIDS?** Yes = 1 No = 2	55
		If yes, which of these people: Yes = 1 No = 2	
	1.	Your children	56
	2.	Your grandchildren	57
	3.	Your spouse	58
	4.	Your family members	59
	5.	Your friends	60
	6.	People in the community	61
30		**Do you care for orphans in your household?** Yes = 1 No = 2	62
31		**When were you diagnosed with HIV? (Which Year)** _____	63-66
32		**Most recent CD4 count:** _____	67-70
32.1		**Most recent Hb:** _____	71-72
32.2		**Most recent Albumin:** _____	73-74
33		**Delivery route:** NVB = 1 Caesarian section = 2	75

REPORTED HEALTH AND MEDICAL HISTORIES

MEDICAL HISTORY OF INFANT 1

34		**Member number (as on socio-demographic form):** _____	. 2 76-80
35		**Gestational age (weeks):** _____	1-2
36		**PCR at birth:** Positive = 1 Negative = 2	3
37		**Medical problems:** Yes = 1 No = 2	
	1.	Jaundice	4
	2.	Sepsis	5
	3.	Meconium aspiration	6
	4.	Prematurity	7
	5.	Cardiovascular	8
	6.	Pulmonary	9
	7.	Other, specify:	10
		_____	
		_____	
		_____	
38		**Planned feeding choice made by mother:**	11
	1.	Breastfeed	
	2.	Formula feed	
	3.	Mixed feed	
	4.	Other, specify _____	
39		**What was fed to infant after birth?** Yes = 1 No = 2	
	1.	Breastmilk (mother)	12
	2.	Breastmilk substitute	13
	3.	Breastmilk (milk bank)	14
	4.	Heat treated breastmilk (mother)	15
	5.	Other, specify _____	16
40		**If it is not as planned,why did feeding mode change?** Yes = 1 No = 2	
	1.	Medical complication in infant	17
	2.	Medical complication in mother	18
	3.	Other, specify	19-20
		_____	
41		**Specify complications causing change in planned feeding option:**	
	1.	_____	21-22
	2.	_____	23-24
	3.	_____	25-26
	4.	_____	27-28
42		**If breastfeeding, did it start within 1 hour of birth?** Yes = 1 No = 1	29
43		**If not, why?**	
	1.	_____	30-31
	2.	_____	32-33
	3.	_____	34-35
	4.	_____	36-37

REPORTED HEALTH AND MEDICAL HISTORIES

44 **List of medications given in hospital:**

1. _____ 38-39
2. _____ 40-41
3. _____ 42-43
4. _____ 44-45
5. _____ 46-47
6. _____ 48-49
7. _____ 50-51
8. _____ 52-53
9. _____ 54-55
10. _____ 56-57

45 **If breastfeeding, list any problems:** Yes = 1 No = 1

1. Attachment 58
2. Positioning 59
3. Low milk production (perceived) 60
4. Infant not able to suckle effectively 61

46 **Other, specify :**

1. _____ 62-63
2. _____ 64-65
3. _____ 66-67
4. _____ 68-69

MEDICAL HISTORY OF INFANT 2

47 **Member number (as on socio-demographic form)** _____ . 3 70-74

48 **Gestational age (weeks)** _____ 75-76

49 **PCR at birth:** Positive = 1 Negative = 2 _____ 77

50 **Medical problems:** Yes = 1 No = 2

1. Jaundice _____ 78
2. Sepsis _____ 79
3. Meconium aspiration _____ 80
4. Prematurity _____ 1
5. Cardiovascular _____ 2
6. Pulmonary _____ 3
7. Other, specify: _____ 4

_____

_____

_____

51 **Planned feeding choice mother made:** 5

1. Breastfeed
2. Formula feed
3. Mixed feed
4. Other, specify _____

52 **What was fed to infant after birth?** Yes = 1 No = 2

1. Breastmilk (mother) 6
2. Breastmilk substitute 7
3. Breastmilk (milk bank) 8
4. Heat treated breastmilk (mother) 9
5. Other, specify 10XV

REPORTED HEALTH AND MEDICAL HISTORIES

53		**If it is not as planned,why did feeding mode change?** Yes = 1 No = 2	
	1.	Medical complication in infant	11
	2.	Medical complication in mother	12
	3.	Other, specify _____	
54		**Specify complications causing change in feeding option:**	
	1.	_____	13-14
	2.	_____	15-16
	3.	_____	17-18
	4.	_____	19-20
55		**If breastfeeding, did it start within 1 hour of birth?** Yes = 1 No = 1 _____	21
56		**If not, why?**	
	1.	_____	22-23
	2.	_____	24-25
	3.	_____	26-27
	4.	_____	28-29
57		**List of medications given in hospital:**	
	1.	_____	30-31
	2.	_____	32-33
	3.	_____	34-35
	4.	_____	36-37
	5.	_____	38-39
	6.	_____	40-41
	7.	_____	42-43
	8	_____	44-45
	9.	_____	46-47
	10.	_____	48-49
58		**If breastfeeding, list any problems:** Yes = 1 No = 1	
	1.	Attachment	50
	2.	Positioning	51
	3.	Low or late milk production	52
	4.	Infant not able to suckle effectively	53
59		**Other, specify :**	
	1.	_____	54-55
	2.	_____	56-57
	3.	_____	58-59
	4.	_____	60-61

KNOWLEDGE, ATTITUDES AND PRACTICES

Household Number [ ][ ][ ] 1-3

1 **Do you think there are advantages for a baby if he/she breastfeeds?** Yes = 1 No = 2 [ ] 4

2 **If yes, list as many as you know:**

1. _____ [ ][ ] 5-6
2. _____ [ ][ ] 7-8
3. _____ [ ][ ] 9-10
4. _____ [ ][ ] 11-12
5. _____ [ ][ ] 13-14
6. _____ [ ][ ] 15-16
7. _____ [ ][ ] 17-18
8. _____ [ ][ ] 19-20
9. _____ [ ][ ] 21-22
10. _____ [ ][ ] 23-24

3 **Do you think there are advantages for the mother if she breastfeeds?** Yes = 1 No = 2 [ ] 25

4 **If yes, list as many as you know:**

1. _____ [ ][ ] 26-27
2. _____ [ ][ ] 28-29
3. _____ [ ][ ] 30-31
4. _____ [ ][ ] 32-33
5. _____ [ ][ ] 34-35
6. _____ [ ][ ] 36-37
7. _____ [ ][ ] 38-39
8. _____ [ ][ ] 40-41
9. _____ [ ][ ] 42-43
10. _____ [ ][ ] 44-45

5 **If a HIV infected mother chose to breastfeed, until what age must she give <u>only</u> breastmilk (exclusive breastfeeding)?** _____ months [ ][ ] 46-47

6 **Do you think breastmilk is enough for the baby 0 - 6 months old, or does the baby need extra food/liquids with the breastmilk?** [ ] 48

1. Breastmilk is enough
2. Baby needs extra food/liquids with the breastmilk

7 **Which do you think is best for a baby (0-6 months)?** [ ] 49

1. Breastmilk
2. Formula milk
3. Cow's milk
4. Breastmilk and other milks/foods
5. Other, specify _____

8 **If breastfeeding, what is the main reason for you choosing to breastfeed?** [ ] 50

1. Family/nurse told you to breastfeed
2. It's best for baby
3. It's free
4. Don't want community/family to know you are HIV+
5. Other, specify

_____

_____

_____

KNOWLEDGE, ATTITUDES AND PRACTICES

9		**If formula feeding, what is the main reason for you choosing to formula feed?**	51
	1.	It's best for the baby	
	2.	Family/nurse told you to	
	3.	Don't want to risk passing on HIV	
	4.	Only poor mothers breastfeed	
	5.	Other, specify _____	
10		**Did anyone influence your choice to breastfeed or formula feed, or did you decide on your own?**	52
	1.	Influenced	
	2.	Decided on own	
11		**If your choice was influenced, who/what mainly influenced you?**	53
	1.	Elders	
	2.	Boyfriend, husband, partner	
	3.	Friends	
	4.	Sister, nurse, doctor	
	5.	Media (TV, radio, posters, pamphlets etc.)	
12		**When did you decide what you are going to feed your baby?**	54
	1.	During early ante-natal visits	
	2.	During late ante-natal visits	
	3.	Close to giving birth	
	4.	After giving birth	
	5.	Other, specify _____	
		IF YOU PLAN TO BREASTFEED YOUR BABY	
13		**Will you feed only during the day, or during night when baby wakes up as well?**	55
	1.	Day-and night feeds	
	2.	Only day feeds	
14		**Will you give the baby teats, pacifiers or dummies?** Yes = 1 No = 2	56
15		**Do you plan to breastfeed the baby as long as he wants or make specific times in which he may breastfeed?**	57
	1.	Baby can suckle for as long as he wants	
	2.	Baby can only suckle at specific times	
		IF YOU PLAN TO FORMULA FEED YOUR BABY	
16		**Will you feed only during the day, or during night when baby wakes up as well?**	58
	1.	Day-and night feeds	
	2.	Only day feeds	
17		**How will you mainly know how much milk to prepare for the baby each day?** Yes = 1 No = 2	
	1.	Read on tin	59
	2.	Hear from family/friends	60
	3.	Hear from clinic/hospital staff	61
	4.	Do not follow any specific guidelines	62
	5.	Other sources, specify _____	63
18		**How do you mainly plan to feed the newborn baby?**	64
	1.	Bottle and teat	
	2.	Cup	
	3.	Spoon	
	4.	Other, specify _____	

KNOWLEDGE, ATTITUDES AND PRACTICES

19 **Will you add water to powder or powder to water?** [65]

1. Water to powder
2. Powder to water

20 **How often will you wash the bottle, teat, cup, spoons, jugs etc.?** [66]

1. Every time you prepare milk
2. Once a day
3. 3 times per week
4. Once a week
5. Other, specify _____

21 **What will you mainly use to wash the bottle, teat, cup, spoons, jugs etc.?** [67]

1. Rinse with cold water
2. Cold water and soap
3. Warm water and soap
4. Boiling water, soap, disinfectant
5. Other, specify _____

22 **Do you think you will always have enough formula milk when baby is 0-6 months old?** [68]

1. Yes
2. No

23 **If not, what will you do?** Yes = 1 No = 2

1. Use less powder when mixing feeds to make the tin last longer [69]
2. Give less feeds during the day [70]
3. Let the baby breastfeed [71]
4. Give the baby other liquids or foods like cow's milk [72]
5. Other, specify _____ [73]

24 **At what age do you plan to first start giving the baby liquids like** _____ months [74-75]
water, tea, juice, cow's milk?

25 **At what age do you plan to first start giving the baby solid foods like** _____ months [76-77]
pap, vegetables, rice, fruits, meats etc.?

26 **Should you continue to breastfeed/formula feed a baby if he has diarrhoea or is sick?** [78]

1. Yes
2. No
3. Don't know

27 **Is there a chance that HIV can pass through breastmilk to the baby (on ARVs or not)?** [79]

1. Yes
2. No
3. Don't know

28 **Can a HIV infected woman breastfeed her baby?** [80]

1. Yes
2. No
3. Don't know

29 **What is the chance that the the baby will get HIV because of breastfeeding?** [1]

1. No chance
2. Small chance
3. Good chance
4. Very large chance
5. Don't know

KNOWLEDGE, ATTITUDES AND PRACTICES

30		**Between 0- 6 months, is it safe to breastfeed and give other foods or liquids when the mother is HIV infected?**	2
	1.	Yes	
	2.	No	
	3.	Don't know	
31		**If a mother is HIV infected, until what age can she breastfeed her baby?** _____ months	3-4
32		**Are you aware of the provision of free milk for babies of HIV infected mothers (in the Free State) at clinics for the first 6 months?**	5
	1.	Yes	
	2.	No	
33		**What are your thoughts regarding giving free milk to HIV infected mothers?**	6-7
		_____	
		_____	
		_____	
		_____	
		_____	
34		**Are you aware that there is a chance that the provision of free milk will end in the near future?**	8
	1.	Yes	
	2.	No	
35		**What are your thoughts regarding the possible withdrawal of the free milk?**	9-10
		_____	
		_____	
		_____	
		_____	
		_____	
36		**What would you feed your baby if you no longer have the option of receiving free milk at the clinics (if formula feeding at some time)? (choose only one)**	11
	1.	Buy formula milk	
	2.	Give animal milks	
	3.	Breastfeed	
	4.	Give breastmilk and other milks/foods	
	5.	Other, specify _____	
37		**Which of the following do you have ?** Yes = 1 No = 2	
	1.	Access to safe, clean water	12
	2.	Around R400 per month to buy formula milk	13
	3.	Soap, disinfectant and hot water to clean utensils used to prepare formula milk	14
	4.	Ability to give formula milk for 0 - 6 months of baby's life	15
	5.	Support from your family to formula feed	16
	6.	Easy access to clinic/hospital in case baby gets sick	17

APPENDIX G # KNOWLEDGE, ATTITUDES AND PRACTICES OF HEALTH CARE WORKERS

Voltooi asseblief die volgende (anoniem) vraelys sonder die hulp van andere, handboeke, joernale ens. U samewerking is uiters waardevol om by te dra tot die otwikkeling van beter opleiding vir gesondheidsorgwerkers in verband met MIV en babavoeding.
(neem ongeveer 5 minute om te voltooi). Wanneer u die vraelys voltooi, gee u toestemming vir die data om gepubliseer te word.
Indien u verkies om die vrealys in Afrikaans of Sotho in te vul, vrae asseblief die navorser, Liska Jv Rensburg.

[ ][ ][ ] 1-3

For office use only

1	**Wat is u professionele status, bv. suster, verpleegster, dokter, dieetkundige?** _____	[ ][ ] 4-5

<u>Antwoord asseblief die volgende vrae deur die korrekte opsie te omsirkel, bv.:</u>

Swanger vrouens behoort goeie kwaliteit berading te ontvang om hulle te help om die beste voedingskeuse vir hulle baba te maak.

(1.) Waar
2. Vals

2	**Hoe gereeld gee u advies aan MIV ge-infekteerde ma's oor babavoeding?** 1. Nooit 2. Selde 3. Gereeld 4. Daagliks	[ ] 6
3	**Wat beskou u as u kennisvlak ten opsigte van MIV en babavoeding?** 1. Baie lae kennisvlak 2. Lae kennisvlak 3. Matige kennisvlak 4. Hoë kennisvlak 5. Kenner / "Expert"	[ ] 7
4	**Wat is u houding teenoor MIV ge-infekteerde ma's wat hulle babas borsvoed? (kies slegs een)** 1. Hulle behoort nie te borsvoed nie aangesien daar 'n risko van MIV oordrag is 2. Borsmelk is 'n uitstekens voedingskeuse maar die ma's moet berading ontvang rakende gepaste borsvoedingpraktyke asook die korrekte gebruik van anti-retrovirale middels 3. Ander – lewer asseblief kommentaar: _____ _____ _____	[ ] 8
5	**Wat is u houding teenoor MIV ge-infekteerde ma's wat hulle babas formule melk gee? (kies slegs een)** 1. Dit is die veiligste metode van babavoeding in hierdie vroue aangesien dit verseker dat die baba MIV negatief bly en dus gesond sal wees 2. Dit mag net bevorder word vir vroue wat die 'AFASS' kriteria kan bereik – 'affordable, feasible, acceptable, sustainable and safe' 3. Ander - lewer asseblief kommentaar: _____ _____	[ ] 9

6	**Oor die algemeen het babas wat borsmelkvervangers soos formule melk drink 'n hoër risko om siek te word (diarree, longontsteking ens.) asook sterfte, as babas wat geborsvoed word.** 1. Waar 2. Vals 3. Ek weet nie	☐ 10
7	**Hoeveel sekerheid het u dat u 'n nuwe moeder suksesvol kan wys hoe om haar baba te posisioneer en aan die bors te heg vir borsvoeding (volgens die 4 tekens van goeie posisionering en aanhegting)?** 1. Geen sekerheid 2. Lae vlak van sekerheid 3. Matige sekerheid 4. Hoë sekerheid 5. Baie hoë sekerheid	☐ 11
	Hoe lank na geboorte behoort 'n baba aan die bors gesit word om te borsvoed? 1. 30-60 minute 2. 2-3 ure 3. 12 ure 4. 24 ure 5. >24 ure 6. Ek weet nie	☐ 12
8	**Indien 'n ma borsvoed, ten minste hoeveel keer per 24 uur moet sy borsvoed gedurende die eerste maande van lewe?** 1. 1 - 3 keer 2. 4 - 6 keer 3. 7 - 14 keer 4. 15 - 18 keer 5. Ek weet nie	☐ 13
9	**Heoveel sekerheid het u inu vermoë om 'n nuwe ma te wys hoe om haar borsmelk uit te melk / "express"?** 1. Geen sekerheid 2. Lae vlak van sekerheid 3. Matige sekerheid 4. Hoë sekerheid 5. Baie hoë sekerheid	☐ 14
10	**Wat is u opinie oor MIV ge-infekteerde ma's wat hulle borsmelk uitmelk, met hitte behandel en dan vir hulle babas voed? (kies slegs een)** 1. Dit is 'n goeie idee 2. Dit is 'n slegte idee 3. Dit is 'n goeie idee maar is te veel werk en die vroue sal nie daarmee volhard nie 4. Ek weet nie 5. Ander - lewer asseblief kommentaar: _____ _____ _____	☐ 15
11	**Verduidelik 'eksklusiewe borsvoeding'** 1. _____ _____	☐ 16

2. Ek weet nie

12 **Tot op watter ouderdom van die baba behoort 'n MIV ge-infekteerde ma haar baba EKSLUSIEF te borsvoed?** [17]

1. 3 maande
2. 4 maande
3. 6 maande
4. 8 maande
5. Ek weet nie

13 **Tot op watter ouderdom van de baba kan 'n MIV ge-infekteerde ma haar baba borsvoed volgens die nuutste WGO 2010 riglyne (eksklusiewe PLUS nie-eksklusiewe borsvoeding)?** [18]

1. 3 maande
2. 4-6 maande
3. 6 maande
4. 8 maande
5. Tot op 1 jaar
6. Tot op 1 jaar en dan slegs stop wanneer 'n toereikende dieet sonder borsmelk verskaf kan word
7. Ek weet nie

14 **Wat is die risiko van MIV oordrag deur borsvoeding indien die ma/baba NIE volgens die riglyne borsvoed nie en NIE anti-retrovirale middels (ARVs) gebruik nie?** [19-20]

15 **Wat is die risiko van MIV oordrag deur borsvoeding indien die ma/baba WEL volgens die riglyne borsvoed en anti-retrovirale middels gebruik?** [21-22]

16 **Wanneer 'n MIV ge-infekteerde ma haar baba borsvoed en sy gee enige iets ander vir die baba om te eet/drink verhoog dit die risko van MIV oordrag deur borsvoeding.** [23]

1. Waar
2. Vals
3. Ek weet nie

17 **Wat is u opinie oor die nuwe riglyne wat borsvoeding tesame met die gebruik van ARVs bevorder as die nommer een voedingsopsie vir MIV ge-infekteerde vroue in Suid-Afrika? (kies slegs een)** [24]

1. Dit verskaf 'n betroubare bron van voeding aan die babas en voorkom wanvoeding veral in arm gemenskappe
2. Dit is nie die beste voedingkeuse nie aangesien daar 'n kans vir MIV oordrag deur die borsmelk is - die verspreiding van gratis formule melk by die klinieke moet her-ingestel word.
3. Ander - lewer asseblief kommentaar

APPENDIX G **KNOWLEDGE, ATTITUDES AND PRACTICES OF HEALTH CARE WORKERS**

Dankie vir u deelname

Navorser: Liska Janse van Rensburg

Tel: 084 700 9552

Department Voeding en Dieetkunde - Universiteit van die Vrystaat

APPENDIX G

PRINCIPLES AND RECOMMENDATIONS

Household Number [ ][ ][ ] 1-3

PRINCIPLES

PRINCIPLE 1 - BALANCING HIV PREVENTION WITH PROTECTION FROM OTHER CAUSES OF CHILD MORTALITY

1 **Which one of the following babies has a higher chance of getting sick and dying when the mother is HIV infected?** [ ] 4

1. Breastfed baby
2. Formula fed baby
3. Baby fed with animal milks
4. I don't know

2 **Which one of the following has a higher chance of getting sick and dying when the mother is HIV un-infected?** [ ] 5

1. Breastfed baby
2. Formula fed baby
3. Baby fed with animal milks
4. I don't know

3 **Which of the following are you more afraid of:** [ ] 6

1. Passing HIV to your baby through breastmilk
2. Your baby getting sick very often and has a high risk of dying when giving formula milk/animal milks

PRINCIPLE 2 - INTEGRATING HIV INTERVENTIONS INTO MATERNAL AND CHILD HEALTH SERVICES

4 **Did you have easy access to HIV testing while pregnant?** [ ] 7

1. Yes
2. No

5 **Did you have easy access to ARVs while pregnant?** [ ] 8

1. Yes
2. No

6 **Did you take always the ARVs as prescribed while pregnant?** [ ] 9

1. Yes
2. No

PRINCIPLE 3 - SETTING NATIONAL OR SUB-NATIONAL RECOMMENDATIONS FOR INFANT FEEDING IN THE CONTEXT OF HIV
PRINCIPLE 5 - INFORMING MOTHERS KNOWN TO BE HIV INFECTED ABOUT INFANT FEEDING ALTERNATIVES

7 **Did you receive counselling from a health care professional regarding what you should feed your baby** (that you can choose either breastfeeding or formula feeding)? [ ] 10

1. Yes
2. No
3. Cannot remember

8 **Did he/she tell you that there is a chance that your baby might get HIV through the breastmilk?** [ ] 11

1. Yes
2. No
3. Cannot remember

9 **If yes, did he/she say it is a small chance or a big chance?** [ ] 12

1. Small chance
2. Big chance
3. Cannot remember

PRINCIPLES AND RECOMMENDATIONS

10		**Did the professional tell you what the benefits of breastfeeding are?**	13
	1.	Yes	
	2.	No	
	3.	Cannot remember	
11		**Did the professional explain to you that if you breastfeed you and/your baby must take ARVs to minimize the risk of transmission of HIV through breastmilk?**	14
	1.	Yes	
	2.	No	
	3.	Cannot remember	
12		**Did the professional tell you that if you breastfeed you should only give breastmilk for the first couple of months, nothing else?**	15
	1.	Yes	
	2.	No	
	3.	Cannot remember	
13		**If yes, for how many months did she say you must <u>only</u> give breastmilk?** _____ months	16-17
14		**Did the health care professional tell you that breastmilk protects the baby against infections, diarrhoea and death?**	18
	1.	Yes	
	2.	No	
	3.	Cannot remember	
15		**Did the health care professional tell you that your baby has a high risk of getting sick and dying if you formula feed incorrectly?**	19
	1.	Yes	
	2.	No	
	3.	Cannot remember	
16		**Which of the following did the professional tell you is important to be able to formula feed your baby safely?** Yes = 1 No = 2	
	1.	Safe, clean water	20
	2.	Around R400 per month to buy formula milk	21
	3.	Soap, disinfectant and hot water to clean utensils	22
	4.	Ability to give formula milk for 0 - 6 months of baby's life	23
	5.	Support from your family	24
	6.	Easy access to clinic/hospital in case baby gets sick	25
17		**When did you receive this counselling?**	26
	1.	While pregnant	
	2.	After giving birth	
18		**Did you understand all of the information?**	27
	1.	Yes	
	2.	No	
19		**Was the information enough to make an informed decision that suits your situation?**	28
	1.	Yes	
	2.	No	
		PRINCIPLE 4 - IN THE ABSENCE OF ARVS, BREASTFEEDING MIGHT STILL BE THE BEST CHOICE	
20		**Can a HIV infected mother still breastfeed even if ARVs are not available?**	29
	1.	Yes	
	2.	No	
	3.	Don't know	

PRINCIPLES AND RECOMMENDATIONS

PRINCIPLE 6 - PROVIDING SERVICES TO SPECIFICALLY SUPPORT MOTHERS TO APPROPRIATELY FEED THEIR INFANTS

21 **If you chose breastfeeding, did a professional explain how to breastfeed correctly? (how to position and attach baby etc.)** [ ] 30

1. Yes
2. No
3. Cannot remember

21.1 **Did the professional explain what exclusive breastfeeding is?** [ ] 31

1. Yes
2. No
3. Cannot remember

21.2 **Define exclusive breastfeeding (tick off all which she mentions):**

1. Only breastmilk [ ] 32
2. No other fluids or solids [ ] 33
3. No pacifiers, teats or dummies [ ] 34
4. Other, specify _____ [ ] 35

22 **If you chose formula feeding did a professional explain how to formula feed correctly?** [ ] 36

1. Yes
2. No
3. Cannot remember

23 **At what age were you told to wean your baby?** _____ months [ ][ ] 37-38

24 **What should you do when you have problems with breastfeeding, formula feeding or weaning of your baby?**

1. _____ [ ][ ] 39-40
2. _____ [ ][ ] 41-42
3. _____ [ ][ ] 43-44

PRINCIPLE 7 – AVOIDING HARM TO INFANT FEEDING PRACTICES IN THE GENERAL POPULATION

25 **If you were HIV negative, what would you mainly feed your baby?** [ ] 45

1. Breastmilk
2. Formula milk
3. Animal milks
4. Other, specify _____

26 **Explain your choice:** [ ][ ] 46-47

_____

_____

PRINCIPLE 8 – ADVISING MOTHERS WHO ARE HIV UNINFECTED OR WHOSE HIV STATUS IS UNKNOWN

27 **Were you told how to prevent HIV re-infection (of the mother) during pregnancy and after birth?** [ ] 48

1. Yes
2. No
3. Cannot remember

What were you told to do to prevent HIV re-infection (mother) during pregnancy and after birth?

1. _____ [ ][ ] 49-50
2. _____ [ ][ ] 51-52
3. _____ [ ][ ] 53-54

PRINCIPLE 9 – INVESTING IN IMPROVEMENTS IN INFANT FEEDING PRACTICES IN THE CONTEXT OF HIV

28 **Does the type of foods and drinks that you give your baby influence his health?** [ ] 55

1. Yes
2. No
3. Don't know

PRINCIPLES AND RECOMMENDATIONS

RECOMMENDATIONS

RECOMMENDATION 1 – ENSURING MOTHERS RECEIVE THE CARE THEY NEED
RECOMMENDATION 2 – WHICH BREASTFEEDING PRACTICE AND FOR HOW LONG
RECOMMENDATION 3 – WHEN MOTHERS DECIDE TO STOP BREASTFEEDING
RECOMMENDATION 4 – WHAT TO FEED INFANTS WHEN MOTHERS STOP BREASTFEEDING

29 **At what age did you plan to stop giving breastmilk completely?** _____ months [ ][ ] 56-57

30 **When you stop giving breastmilk, what milk will you mainly give the baby to drink:** [ ] 58-59

1. Expressed, heat treated breastmilk
2. Formula milk
3. Cow's milk
4. Other animal milk
5. No milk
6. Other, specify _____

RECOMMENDATION 5 – CONDITIONS NEEDED TO SAFELY FORMULA FEED

31 **Explain all the steps involved in preparing formula milk:** [ ] 60

_____
_____
_____
_____
_____
_____
_____
_____

32 **If the baby does not finish all of the milk, what will you mostly do with the leftover milk?** [ ] 61

1. Throw it away
2. Let it stand on the table, floor, outside and feed it to the baby during the next feed
3. Put it in the fridge and feed it to the baby during the next feed
4. Give it to the older children to drink
5. Other, specify _____

33 **At what age do you plan to stop giving formula milk completely?** _____ months [ ][ ] 62-63

RECOMMENDATION 6 – HEAT TREATED EXPRESSED BREAST MILK

34 **Are you aware that you can feed your baby expressed, heat treated breastmilk (heat treatment kills the HI virus)?** [ ] 64

1. Yes
2. No

35 **What is your attitude towards heat treating expressed breastmilk?** [ ] 65

1. It's a good idea
2. It's a bad idea
3. It's a good idea but it's too much work
4. Don't know
5. Other, specify _____

RECOMMENDATION 7 – WHEN THE INFANT IS HIV INFECTED

36 **If the baby is HIV infected, what is the best feeding choice?** [ ] 66

1. Breast milk
2. Formula milk
3. Other animal milks
4. Don't know

APPENDIX H

Voeding Navorsingstudie - Pelonomi

TOESTEMMING TOT DEELNAME AAN NAVORSING

U is versoek om aan ‘n navorsingstudie deel te neem.

U kan Prof Corinna Walsh enige tyd kontak by 083 297 6030 of Dieetkundige Liska Jv Rensburg by 084 700 9552 indien u vrae oor die navorsing het of as gevolg van die navorsing beseer is.

U kan die Sekretariaat van die Etiekkomitee van die Fakulteit Gesondheidsweteskappe, UV by telefoonnommer (051) 4052812 kontak indien u enige vrae het oor u regte as ‘n proefpersoon.

U deelname aan hierdie navorsing is vrywillig, en u sal nie gepenaliseer word of voordele verbeur as u weier om deel te neem of besluit om deelname te staak nie. U sal nie vir deelname aan hierdie studie vergoed word nie.

As u instem om deel te neem, sal ‘n ondertekende kopie van hierdie dokument sowel as die deelnemerinligtingsblad, wat ‘n geskrewe opsomming van die navorsing is, aan u gegee word .

Die navorsingstudie, insluitend die bogenoemde inligting is verbaal aan my beskryf. Ek begryp wat my betrokkenheid by die studie beteken en ek stem vrywillig in om deel te neem.

_____ _____

Handtekening van deelnemer Datum

APPENDIX I

INLIGTINGSDOKUMENT

Studietitel: "Infant feeding within the context of HIV"

Dankie dat u bereid is om ons te help met hierdie baie belangrike projek. Ons is seker dat die projek sal bydra om die gesondheid van alle persone in die Vrystaat te verbeter. Ons, die Universiteit van die Vrystaat, Fakulteit Gesondheidswetenskappe, doen navorsing oor die kennis, houdings en praktyke oor MIV en baba voeding van MIV geïnfekteerde vroue asook gesondheidswerkers in die kraamsale van Pelonomi. In hierdie studie wil ons bepaal watter faktore aangespreek moet word in gesondheidsprogramme in die Vrystaat. Die studie behels navorsing en is nie deel van roetine mediese behandeling nie.
Uitnodiging om deel te neem: Ons versoek/nooi u uit om aan 'n navorsingstudie deel te neem en vra u toestemming om u baba/s by die navorsingstudie in te sluit.
Wat behels die studie: Die doel van die studie is om inligting te versamel rakende die huidige kennis, houdings en praktyke van MIV geïnfekteerde vroue en gesondheidswerkers oor MIV en baba voeding. Dit is uiters belangrik om opleiding-en beradingsprogramme vir gesondheidswerkers en MIV geïnfekteerde vroue te ontwikkel.

Vir hierdie studie gaan ons MIV geïnfekteerde vroue in die kraamsale van Pelonomi benader. Die navorser sal tydens 'n private onderhoud met elke vrou sekere vraelyste invul (asook pasiënt leêrs raadpleeg) oor die volgende onderwerpe:

- Sosiodemografie
- Kennis, houdings en praktyke
- Aangepaste vrae oor die 2010 WHO Riglyne oor MIV en Babavoeding
- Geraporteerde gesondheidstatus en mediese geskiedenis (insluitend baba/s) asook beskikbare bloedresultate
- Huishoudelike voedselsekuriteit
- Antropometrie deur navorser geneem (moeder en baba/s) bv. massa, lengte/hoogte ens.

Die gesondheidswerkers in die kraamsale sal versoek word om 'n kort vraelys oor hul kennis, houdings en praktyke oor MIV en babavoeding self in te vul.

U sal nie in die toekoms vir hierdie studie opgevolg word nie. Geen bloed, urien of ander monsters sal geneem word nie.

Die navorser sal poog om inligting oor die uitkoms van die navorsing te verskaf. As navorsing inligting aan die lig bring wat van belang mag wees vir die gesondheid van u familielede, sal u toestemming verkry word voordat sodanige inligting aan die betrokke familielede bekend gemaak word. U inligting sal nie sonder toestemming vir ander gebruike beskikbaar gestel word nie tensy vereis deur die wet.

Risikos van deelname aan die studie: Geen.
Voordele van deelname aan die studie: Deur aan die studie deel te neem sal u ons help om gesondheids- en voedingstrategieë te ontwikkel wat die mense van die Vrystaat sal baat. Die proefpersoon sal pertinente inligting oor die studie ontvang tydens betrokkenheid by die projek en daarna wanneer die resultate beskikbaar is.
Deelname is vrywillig, en weiering om deel te neem sal geen boete of verlies van voordele waarop die deelnemer andersins geregtig is behels nie; die proefpersoon kan te eniger tyd aan deelname onttrek sonder boete of verlies van voordele waarop die proefpersoon andersins geregtig is. U sal nie vir deelname aan hierdie studie vergoed word nie.
Vertroulikheid: Daar sal gepoog word om persoonlike inligting vertroulik te hou. Persoonlike inligting kan bekend gemaak word as die wet dit vereis. Organisasies wat u navorsingsrekords mag ondersoek en/of kopieer vir kwaliteitsversekering en data-analise sluit groepe soos die Etiekkomitee vir Mediese Navorsing en die Medisynebeheerraad in. As resultate gepubliseer word kan dit lei tot individuele/groepsidentifikasie.

Vriendelike groete

Liska Janse van Rensburg
Prof Corinna Walsh
Kontakbesonderhede: 084 700 9552/ 083 297 6030/ 051 4013818(W)

APPENDIX H

Nutrition Research Study - Pelonomi

TUMELLO YA HO NKA KAROLO DIPATLISISONG

O kopuwe ho nka karolo dipatlisison.

O ka ikopanya le Liska Jv Rensburg ho 084 700 9552 kapa Prof Corinna Walsh ho 083 297 6030 nako e nngwe le e nngwe ha o na le dipotso kapa ha o ka wa lematseha ka lebaka la dipatlisiso.

O ka ikopanya le mongodi wa komiti ya Ethics ho Faculty of Health Sciences, UFS mohaleng ona (051) 4052812 ha ebe o na le dipotso ka ditokelo tsa hao jwalo ka motho ya nkang karolo dipatlisisong.

O nka karolo dipatlisisong ka ho ithaopa, ka hoo o ke ke wa ahlolwa kapa wa lahlehelwa ke letho ha o ka hana ho nka karolo kapa ha o ka tlohella ho nka karolo.

Ha ebe o dumela ho nka karolo, o tla fuwa lengolo le tshwanang le lena le saenuweng.

Ke hlaloseditswe ka sepheo sa dipatlisiso, hammoho le tlhahiso leseding ena e ka hodimo ka molomo. Ke utlwisisa le hore ho nka karolo dipatlisisong tsena ho bolela eng, ebile ke dumela ho ithaopa hore ke nke karolo.

_____ _____

Signature ya ya nkang karolo Letsatsi

Nutrition Research Study - Pelonomi

Appendix I

LENGOLO LA TLHAHISO LESEDING

Re leboha ha o dumetse ho re thusa dipatlisisong tsena tse bohlokwa. Re tshepa ha dipatlisiso di tla re thusa ho ntlafatsa maphelo a batho bohle ba Foreisitata.
Rona, re le Yunivesithi ya Foreisitata, Lefapheng la tsa Maphelo, re etsa dipatlisiso tsa ho shebana le tsebo, maikutlo, le diketso tsa bomme ba nang le tshwaetso ya lefu la HIV hammoho le ya basebetsi ba tsa maphelo mabapi le phepo ya masea a bomme ba nang le tshwaetso ya HIV. Ka dipatlisiso tsena re batla ho ithuta hore na ke dintho dife tse hlokang hore di amuwe ditsamaisong tsa tsa bophelo mona Foreisitata. Tsena ke dipatlisiso feela, mme ha se karolo ya tshebeletso ya tsa bongaka.

Sememo sa ho nka karolo: Re o kopa hore o nke karolo dipatlisisong tsena, ebile/ kapa re kopa tumello ya hao ho sebedisa lesea la hao dipatlisisong.
Dipatlisiso tsena di kenyeleditse eng: Sepheo sa dipatlisiso tsena ke ho fumana tlhahiso leseding e lekaneng mabapi le tsebo, maikutlo, le diketso tsa bomme ba nang le tshwaetso ya lefu la HIV hammoho le ya basebetsi ba tsa maphelo mabapi le phepo ya masea a bomme ba nang le tshwaetso ya HIV. Hona ho bohlokwa bakeng sa hore ho tle ho thalwe meralo ya dithuto le ya ho aha maikutlo (counselling) bakeng sa basebeletsi ba tsa maphelo le basadi ba nang le tshwaetso ya lefu la HIV.
Bakeng sa dipatlisiso tsena re hloka ho sebetsa le bomme ba nang le tshwaetso ya lefu la HIV ba leng diphaposing tsa batswetsi sepetleleng sa Pelonomi. Mme e mong le e mong o tla botswa dipotso ke motho ya etsang dipatlisiso, mme dipotso tsena di mabapi le dintlha tsena tse latelang:

- Dipotso ka maemo a hao le ka lelapa la hao,
- Tsebo, maikutlo le diketso
- Dipotso tse tswang ho meralo ya 2010 ya WHO mabapi le phepo ya masea a bomme ba nang le tshwaetso ya HIV
- Maemo a malwetse le bophelo ka kakaretso (le ba lesea), hammoho le diphetho tsa diteko tsa madi
- Tshireletseho ya dijo tsa ka lapeng
- Ho methwa ha boima le botelele ba mme le ba lesea

Basebeletsi ba tsa maphelo ba sebetsang diphaposing tsena tsa batswetse ba tla kopuwa ho tlatsa foromo e batlisisang tsebo ya bona, hammoho le maikutlo le diketso mabapi le phepo ya masea a bomme ba nang le tshwaetso ya lefu la HIV.

O ke ke wa hlotse o botsitswe dipotso hape nakong e tlang. Ha ho diteko tse tla etswang tsa madi le moroto.

Babatlisisi ba tla leka ho fana ka tlhahiso leseding ya sephetho sa dipatlisiso tsena. Ha e be ho na le ho hong ho fumanwang ho wena ho ka bang le thuso ho ba lelapa la hao, kopo e tla etswa ho wena pele ho tsebiswa ba lelapa ka tlhahiso leseding ena. Dintlha tsohle tse fumanwang ho tswa ho wena di ke ke tsa phatlalatswa ntle le tumello ya hao, kantle le ha molao o ka re ho etswe jwalo.

Kotsi tse ka bang teng dipatlisisong: Ha ho kotsi e teng
Ditholwana tsa ho nka karolo: Ha o nka karolo o tla thusa ho rala metjha ya tsa bophelo le phepo ho thusa batho ba Foreisitata. O tla fuwa tlhahiso leseding e bohlokwa tsamaong ya dipatlisiso le ha sephetho sa dipatlisiso se fumaneha.
O nka karolo ka ho ithaopa, mme ha o hana ho nka karolo o ke ke wa lahlehelwa ke letho; o ka tlohella ho nka karolo nako e nngwe le e nngwe ntle le ho lahlehelwa ke letho.
Sephiri: Ho tla etswa maleba-leba a hore dintlha tsa hao di dule e le lekunutu. Dintlha tsa hao di phatlalatswa feela ha molao o re jwalo. Mekgatlo e tla hlahloba kapa e tla kopisa dintlha tsa hao ho lekola boleng e kenyeleditse e kang Ethics Committee ya Medical Research hammoho le Medicine Control Council.
Ha diphetho di ka phatlalatswa, hona ho ka lebisa ho tsebiswa ha motho kapa sehlopha.

Ka boikokobetso
Liska Janse van Rensburg
Prof Corinna Walsh
Mohala: 084 700 9552 / 083 297 6030 / 051 401 3818

10 August 2011

Chief Executive Officer
Pelonomi Hospital
Dr Belcher Road
Heidedal
Bloemfontein
9300

REQUEST FOR APPROVAL TO UNDERTAKE A RESEARCH STUDY AT PELONOMI HOSPITAL
STUDY TITLE: "INFANT FEEDING WITHIN THE CONTEXT OF HIV"

Dear sir/madam

I am currently involved in research with regards to infant feeding within the context of HIV. In order to fully understand the problems involved with this issue, I have to undertake a research study. Permission to execute this study at Pelonomi Hospital would be greatly appreciated.

The study will involve the following:
The aim of this study is to collect enough information regarding the current knowledge, attitudes and practices of HIV positive women and healthcare workers with regards to HIV and infant feeding. This is vital to be able to develop appropriate training and counselling programs for health care workers and HIV positive women.

For the purpose of this study we need to interview HIV positive women who are in the ante- and postnatal units at Pelonomi in the time period just after having given birth. The researcher will conduct a private interview with each woman (and consult files) during which time questionnaires regarding the following topics will be filled in:

- Socio-demography
- Knowledge, attitudes and practices
- Adapted questions from the 2010 WHO Guidelines on HIV and Infant Feeding
- Reported health and medical history (including that of infant/s), including available blood results
- Household food security
- Anthropometrical measurements taken by the researcher (mother and infant/s) such as weight, height/length etc.

The healthcare workers in the ante- and postnatal wards will be asked to fill in a short self-administered questionnaire on their knowledge, attitudes and practices regarding HIV and infant feeding.
For this study, participants will not be followed up again in the future. No blood, urine or other samples will be taken.

Risks of being involved in the study: None
Benefits of being in the study: By participating in the study, the woman and health care workers will help us to develop health and nutrition strategies that will benefit the people of the Free State. Participants will be given pertinent information on the study while involved in the project and after the results are available.
Participation is voluntary, and refusal to participate will involve no penalty or loss of benefits; participants may discontinue participation at any time without penalty or loss of benefits to which they are otherwise entitled.
Confidentiality: Efforts will be made to keep personal information confidential. Personal information may be disclosed if required by law. Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the Ethics Committee for Medical Research and the Medicines Control Council. If results are published, this may lead to individual/cohort identification.

For any enquiries, please contact Professor Corinna Walsh (083 297 6030) or Liska Janse van Rensburg at (084 700 9552) at any time if you have questions about the research.

Thanking you in advance,
Liska Janse van Rensburg
Prof Corinna Walsh