Effectiveness of the prevention of mother-to-child transmission (PMTCT) policy in the Northern Cape, South Africa

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I, Bianca Myburgh declare that:

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Bianca Myburgh
July 2015

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List of Abbreviations

AFASS	Acceptable, Feasible, Affordable, Sustainable, Safe
AIDS	Acquired Immune-Deficiency Syndrome
ART	Antiretroviral Therapy
ARV	Antiretroviral
AZT	Zidovudine
BF	Breastfeed
BFHI	Baby Friendly Hospital Initiative
BMI	Body Mass Index
CI	Confidence Interval
DOH	Department of Health
EBF	Exclusive Breastfeeding
FPL	Food Poverty Line
HAART	Highly Active Antiretroviral Therapy
HCT	HIV counselling and testing
HIV	Human Immunodeficiency Virus
LBPL	Lower Bound Poverty Line
LBW	Low Birth Weight
MDG	Millennium Development Goals
MTCT	Mother- to- child Transmission
MUAC	Mid-Upper Arm Circumference
NCDOH	Northern Cape Department of Health
NVP	Nevirapine
PCR	Polymerase Chain Reaction
PMTCT	Prevention of Mother- to- child Transmission
RTHB	Road To Health Booklet
SASSA	South African Social Security Agency

Sd-NVP	Single-dose Nevirapine
UBPL	Upper Bound Poverty Line
UN	United Nations
UNAIDS	United Nations programme on HIV/AIDS
UNICEF	United Nations International Children's Emergency Fund
VCT	Voluntary Counselling and Testing
WHO	World Health Organization

CHAPTER 1: Introduction and problem statement

1.4 Background and motivation

According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), an estimated 34 million people were living globally with the Human Immunodeficiency Virus (HIV) towards the end of 2011. The new infection rate of HIV decreased by 50% from 2010 – 2012, with the biggest contributing factor being the reduction of child infections (UNAIDS, 2012a:8). In 2010 the number of newly infected children, in South Africa, decreased by up to 59% (UNAIDS, 2012a:42). This reduction in the infection rate can mostly be attributed to the implementation of the Prevention of Mother-to-Child Transmission (PMTCT) policy in South Africa, where 75 – 100% of HIV infected mothers receive PMTCT care (UNAIDS, 2012a:43). PMTCT care has been made available in 95% of all antenatal and maternity facilities throughout South Africa (Goga *et al*., 2010:2). During 2010, in the Northern Cape, 16% of infants were exposed to HIV, of which 1.4% were HIV infected. The Northern Cape Province had a 90% PMTCT coverage at antenatal facilities and 99.3% of all pregnant women were tested for HIV infection (Goga *et al.*, 2010:33).

The PMTCT policy was first introduced in South Africa during 2002. The initial PMTCT policy included voluntary counselling and testing (VCT), counselling on infant feeding practices, using single dose Nevirapine (sdNVP) as treatment and providing infant formula to all babies of mothers who were HIV infected (DOH, 2008:3). In South Africa a 33% reduction in child mortality under the age of 5 years was observed from 2003 to 2006. It was also noted that children born to HIV infected mothers who did not initiate antiretroviral therapy (ART) postpartum had a higher mortality rate than children whose mothers initiated ART postpartum (Ndirango *et al*., 2012:84). Since the initial introduction of the PMTCT policy, extensive scientific advances have been made.

After evaluating the effectiveness of the PMTCT policy in 2005, it was realised that providing sdNVP alone, was not as effective in protecting infants from Mother-to-Child Transmission (MTCT). The issue of resistance to monotherapy was also a concern (DOH, 2008:3).

Adjustments to the PMTCT policy were made and the United Nations (UN) implemented a strategic approach to PMTCT which consisted of four primary elements:

- Prevention of HIV infection among women of childbearing age;
- prevention of unintended pregnancy among HIV infected women;
- providing appropriate treatment, care and support for women living with HIV; and
- preventing HIV transmission from the mother to her infant (Luo *et al*., 2007:181).

These four elements were categorized in four stages, namely primary prevention of HIV infection, antenatal care, labour and delivery and postnatal care. This policy was much more extensive than the initial policy (DOH, 2010:8).

In 2008 dual ART was introduced. Mothers then received Zidovudine (AZT) from 28 weeks gestation with sdNVP at onset of labour. After delivery the infant received an sdNVP and then AZT for 7 or 28 days according to specified criteria (Barron *et al.,* 2013:71).

In 2010 the South African PMTCT policy was further modified. These modifications included routine HIV testing and counselling for all pregnant women and dual ART to reduce MTCT. Postnatal prophylaxis Nevirapine (NVP) was also given to breastfeeding infants of HIV positive mothers for as long as breastfeeding continued. Mothers were also started on AZT from 14 weeks gestation. Mothers with a CD4 cell count of less than 350cells/mm^3 received highly active antiretroviral therapy (HAART) (DOH 2010:13; Barron *et al.,* 2013:71).

1.5 Problem statement

HIV has shown to be an important predicting factor for mortality in children. Mortality of children born to mothers known to be HIV infected was seen to be much higher than that of children born to mothers who are not HIV infected. 12.8% of HIV exposed children died by the age of 5 years compared with the 3.9% of deaths of children who were not HIV exposed (Ndirango *et al*., 2012:84).

HIV infection in children does not only affect the mortality of these children but also the morbidity. A recent study in South Africa found that HIV infected children had more than double the risk for hospitalization and more than four times higher risk for mortality

compared to HIV uninfected children, which makes HIV a primary risk factor for mortality and morbidity in children (Venkatesh *et al*., 2011:114).

Children who are infected with HIV have been found to have developmental delays as well as a higher risk of low birth weight and present with physical growth delays (Debrova-Krol *et al.*, 2010:246). Neurological assessments also showed that HIV can cause damage to a developing brain causing motor and cognitive impairments (Bruck *et al*., 2001:694). Debrova-Krol *et al*. (2010:247) and Puthanakit *et al*. (2010:144) also concluded that HIV infection is related to poor cognitive function in children. Functional status scores are significantly lower for HIV infected children (Lee *et al.*, 2006:276) and cognitive abilities seem to decline as HIV infection progresses and Acquired Immunodeficiency Syndrome (AIDS) symptoms become apparent (Smith *et al*., 2006:856). Lee *et al.* (2006: 276) found that HIV infected children between the ages of five and11 years had a much lower score for physical resilience and social functioning compared to uninfected children. Living and social functioning of HIV infected children were also impaired when compared to their peers (Puthanakit *et al*., 2010:145).

The most common causes of hospitalisation of HIV infected children are tuberculosis, pneumonia, gastroenteritis (diarrhoea) and urinary tract infections and these children show a longer duration of hospitalisation as well as a higher in-hospital mortality rate (Meyers *et al*., 2012:507).

Hospitalisation due to diarrhoea and pneumonia was found to be four times higher among HIV infected children (Venkatesh *et al.*, 2011:117). HIV infected children presented with more persistent episodes of diarrhoea (Bachou *et al.*, 2006:29; van Eijk *et al*., 2010:224) which can further lead to increased mortality. Episodes of diarrhoea in HIV infected children were also significantly more likely not to have a pathogenic cause when compared to diarrheal episodes of HIV uninfected children (van Eijk *et al*., 2010:223). Children that are HIV infected are also prone to be more malnourished compared to their HIV uninfected peers (Meyers *et al*., 2012:507).

These facts emphasise the importance of a functional and effective PMTCT policy to reduce MTCT of HIV.

Even with a well-developed policy in place, there are various factors that influence the effectiveness of the PMTCT policy.

The effectiveness of the PMTCT programme depends primarily on the willingness of all mothers to be tested for HIV and enrol in the PMTCT programme (Coetzee *et al*., 2005:491). Factors influencing the effectiveness of the policy include: social pressure not to follow medical advice on infant feeding practices (Chinkonde *et al*., 2012:703), mothers' knowledge concerning PMTCT and ART or lack thereof (Boateng *et al*., 2013:4), time of gestation the mother started on the PMTCT programme, if ever (Coetzee *et al.*, 2005:492) as well as mothers defaulting with their own or their infant's ART (Venkatesh *et al*., 2011:115).

Studies in other countries that investigated the PMTCT and ART knowledge of mothers, found that ART defaulting was significantly more prevalent amongst mothers who had little knowledge on these topics. Knowledge about ART was higher among older and married women (Boateng *et al*., 2012:5). Mothers with a higher educational level were also more knowledgeable on the importance of HIV testing and PMTCT and were therefore less likely to default (Merdekios & Adedimeji, 2011:364). Landzani *et al.* (2010:541) found that the knowledge of mothers attending a clinic in South Africa, concerning PMTCT, was very low and therefore mothers did not follow recommended feeding practices.

Before the introduction of postnatal prophylaxis ART for breastfed infants, breastfeeding was reported to be an important risk factor for MTCT and it was recommended that all HIV infected mothers formula feed their children. However, since the introduction of postnatal prophylaxis ART, the World Health Organisation's (WHO) guidelines on HIV and infant feeding (2010:18) recommends breastfeeding as the preferred method of infant feeding, as the risk of HIV infection is lower than the mortality and morbidity risks associated with formula feeding infants in a low resource setting where formula feeding is not acceptable, feasible, affordable, sustainable and safe (AFASS) (Landzani *et al*., 2010:541). It is, however, important that the mother follows prescribed feeding guidelines including exclusively breastfeeding for six months (Coovadia *et al.*, 2007:1112) as well as using ART as prescribed to decrease the MTCT risk. Breastfeeding can therefore remain a risk factor for MTCT if the mother does not adhere to prescribed guidelines.

Partner involvement can also improve the adherence of the mother to prescribed feeding- and ART practices, by providing a supportive environment for the mother (Peltzer *et al*., 2011a:786).

According to Ndirangu *et al.* (2010:4) the place of birth plays an important role in MTCT. Children that were born at home, without any medical help will not receive NVP and therefore showed a 35% increased risk for MTCT.

Coetzee *et al.* (2005:492) found a positive association between an older maternal age and MTCT. The researchers attributed this association to the fact that older mothers were often in a more advanced state of HIV infection and therefore had a lower CD4 count, with viral load and CD4 count are known to have a significant effect on MTCT risk (Colvin *et al.*, 2007:468). Mothers defaulting on their ART also had an increased MTCT rate (van Lettow *et al.*, 2011:431).

Even though there have been major scientific advances made to prevent mother- to- child transmission of HIV/AIDS, the PMTCT policy still has challenges to overcome. There are numerous factors that can contribute to the effectiveness of the PMTCT policy and it is important to investigate these factors in every community to ensure that the policy reaches its intended goal of improved HIV free child survival.

With the devastating effects of infant HIV infection in mind and the various factors that influence compliance to the PMTCT policy, this study investigated the effectiveness of the PMTCT programme in the Northern Cape to enable health professionals to address the factors that will impact on MTCT in future.

1.3 Aim and Objectives

1.3.1 Aim

The aim of this study was to determine the effectiveness of the PMTCT policy to protect breast-fed infants from HIV infection, in the Northern Cape by comparing variables of children that are HIV infected with those who are HIV uninfected.

1.3.2 Objectives

To reach the aim of this study, the following objectives were set:

i. To describe the anthropometric status of mothers and their children;
ii. To describe implementation and adherence to the PMTCT policy in the Frances Baard district, Northern Cape Province;

iii. To determine the factors that influence implementation and adherence to the PMTCT policy in the Frances Baard district;

iv. To determine the number of breast-fed children on the PMTCT programme who are HIV infected six weeks after cessation of breastfeeding; and

v. To identify factors that influence implementation and adherence to the PMTCT policy that best predicts the risk for HIV infection in infants.

1.4 Outline of the dissertation

This dissertation is divided into seven chapters.

Chapter 1 is an introduction and motivation for the study and describes the aim and objectives of this study.

Chapter 2 provides a literature review of the PMTCT policy as well as factors that hinder or enhance the success of this policy. The literature review includes the development of the PMTCT policy and the procedures contained in the PMTCT programme.

Chapter 3 provides an overview of the methodology used in this study and includes study design, sampling, study procedures and ethical considerations.

Chapter 4 is presented in an article format, titled: Anthropometry of Human Immunodeficiency Virus (HIV) infected mothers and their breastfed children. This article describes the anthropometry of the population group and explains the factors that might affect anthropometric status, including factors associated with HIV infection. This article was written to reach objective 1, 4 and 5.

Chapter 5 is presented in an article format, titled: Implementation and adherence to the Prevention of Mother to Child Transmission (PMTCT) programme and risk factors identified for mother to child transmission of Human Immunodeficiency Virus (HIV) in the Frances Baard District: Northern Cape. This article discusses the PMTCT policy compared to how the programme was implemented in this district and indicates the risk factors that are associated with MTCT of HIV. This article addresses objective 2, 3, 4, and 5.

Chapter 6 is presented in an article format, titled: Impact of social grant system on households of Human Immunodeficiency Virus (HIV) infected mothers. Although this article is not based directly on the objectives set for this study, the impact of the social grant system

on households and the contribution it makes to households supports the inclusion of this publication.

Chapter 7 presents the conclusions drawn from this study as well as recommendations for implementation and further research.

CHAPTER 2: Challenges in the Prevention of Mother-to-Child Transmission (PMTCT) programme

2.1 Introduction

During the United Nations' (UN) Millennium Summit in 2000 the need for intervention to eradicate extreme poverty and all its components were discussed. The UN then developed eight Millennium Development Goals (MDG), to be achieved by 2015. These goals aimed to reduce extreme poverty and hunger, achieve universal primary education, promote gender equality, reduce child mortality, improve maternal health, prevent the spread of Human Immunodeficiency Virus (HIV) / Acquired Immunodeficiency Syndrome (AIDS), ensure environmental sustainability and develop a global partnership for development (Sachs & McArthur, 2005:347).

Nine years later Chopra *et al*. (2009: 1024) reported on the progress made to date and the challenges that South Africa faced concerning the MDG. In their report, the researchers stated that South Africa was not on track with reaching their MDG's and that extreme poverty and hunger as well as child mortality increased since the goals were set. It was reported that there was no progress towards the goal to improve maternal health and insufficient progress on the goals to improve primary education and combat HIV/AIDS. The only goal that was on track at that stage was the goal on promotion of gender equality.

According to the Joint United Nations Programme on HIV/AIDS (UNAIDS) report on the AIDS epidemic in 2012, the number of newly HIV infected children decreased globally by 24% from 430 000 in 2009 to 330 000 in 2011. Even though the reduction in adult HIV infections contributed to the decrease in child infections, the introduction of antiretroviral prophylaxis and infant feeding policies are primarily responsible for this decline (UNAIDS, 2012a:42). The Infant and Young Child Feeding Policy was implemented in South Africa and aims to reduce child mortality and morbidity by improving nutritional status (DOH, 2013b:11). The Prevention of Mother-to-Child Transmission (PMTCT) programme, if implemented correctly, aims to contribute to the reduction of child mortality, improvement of maternal health as well as the prevention of the spread of HIV/AIDS. The PMTCT services in South Africa is regarded as widespread and extensive, as 75-100% of all HIV infected pregnant women in the public sector were included in the PMTCT programme in 2011 (UNAIDS, 2012a:43). The PMTCT programme therefore plays a crucial role in achieving the

MDG's. Globally, the number of newly infected children decreased by 52% from 2001 to 2012 since the implementation of HIV prevention services. However, the number of newly infected children was still considered to be extremely high with 260 000 children newly infected in 2012 (UNAIDS, 2014:2).

Goga *et al*. (2010) investigated the effectiveness of the PMTCT programme in South Africa in 2010. They reported that within the first ten years of implementing the PMTCT programme in South Africa, 95% of all government maternity and antenatal facilities provided a PMTCT service. A total of 10154 children were included in the study as participants. Of these children, 32.0% were HIV exposed and nationally the rates of Mother-to-Child Transmission (MTCT) at eight weeks were 3.5%. Of all the provinces, the Northern Cape had the lowest rate of MTCT at 1.4% (Goga *et al.*, 2010:16).

2.2 Transmission of the Human Immunodeficiency Virus from mother to child

AIDS is the term used to describe the symptomatic presentation of HIV. The human immune system includes CD4 cells and HIV invades T-helper lymphocyte cells / CD4 cells and changes its genetic core. HIV infection therefore decreases the immune response, making the body susceptible for opportunistic infections. The HI-virus presents in blood, lymph, semen, vaginal secretions, breast milk and the nervous system. HIV can therefore be transferred from one person to another through intravenous drug use when needles are shared, unprotected sexual activities, unsafe blood transfusions and from a mother to her child (Fenton & Silverman, 2008:993). Since the start of the HIV/AIDS epidemic 75 million people have become infected with the virus and 36 million of these people have died of HIV/AIDS related complications (UNAIDS, 2013:1).

UNAIDS and their partners have set a goal to achieve zero new HIV infections in children by 2015 (UNAIDS, 2014:2). In 2012, the number of children infected by HIV declined by 52% since 2001 (UNAIDS, 2013:1).

Three mechanisms of MTCT of HIV exist. The virus can be transmitted in-uterus, during delivery and via breastfeeding (Foster &Lyall, 2007:126). HIV is present in the amniotic fluid surrounding the foetus during pregnancy (Fenton & Silverman, 2008:994) and therefore the foetus has a risk of HIV infection in uterus. HIV is also present in breast milk and the risk of HIV transmission with breast feeding can be as high as 45% (Fenton & Silverman, 2008:1007). Breastfeeding has shown to be an important risk factor in MTCT of HIV.

Several factors have been identified that increase the risk of MTCT during breastfeeding, such as mixed rather than exclusive breastfeeding, mastitis or breasts that are bleeding and a lower maternal CD4 count resulting in a higher breast milk viral count (Foster &Lyall, 2007:130).

Maternal body weight may also influence the risk of MTCT (Mehta *et al*. 2008:1641) and mothers with a lower BMI are reported to be more likely to have HIV infected children.

The risk of MTCT can be decreased to 5% or less if a mother has access to antiretroviral therapy (ART) and correctly uses ART's during pregnancy, delivery and breastfeeding (UNAIDS, 2014:2). South Africa is one of the few countries that have met the UNAIDS global goal of providing 90% of all HIV infected women with ART in 2011 (UNAIDS, 2012b:10).

2.3 Development of the PMTCT policy

The PMTCT policy was first introduced on a trial basis in South Africa in 2001. The primary aim of this programme was to decrease HIV transmission from infected mothers to their infants. The initial programme included testing and counselling for HIV, counselling on infant feeding practices, single dose Nevirapine (sdNVP) and provisioning of free infant formula as an alternative for breastfeeding. There were some concerns with the initial PMTCT programme and adjustments were later made to following PMTCT programmes (DOH, 2008:3).

UNAIDS describes four fundamental actions to reduce MTCT. These actions include that HIV prevention services must be strengthened to reduce the infection rate of women of child bearing age; that adequate services for family planning for women living with HIV should be provided; that HIV testing, counselling and antiretroviral therapy should be provided in a timely manner to pregnant, HIV infected women; and lastly that proper and timely HIV care, treatment and support must be provided to women who are HIV infected (UNAIDS, 2012a:44).

The South African PMTCT programme therefore currently focuses on four main stages of intervention as shown in Figure 2.1.

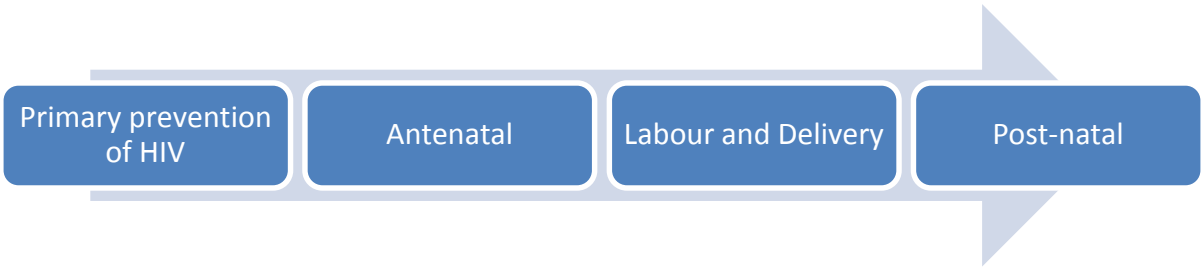

Figure 2.1 Four stages of the PMTCT programme (DOH, 2008:16, Figure 1)

2.3.1 Primary prevention of HIV

The aim of this stage is to reduce the HIV infection rate of woman of childbearing age before pregnancy (DOH, 2008:16). Preventing HIV infection in these women should be the first line of defence that the PMTCT programme should focus on (Luo *et al*., 2007:183). Interventions applied to meet this goal include the improvement of access to family planning services and safer sex options, the improvement of the quality of sexual health services and HIV Counselling and Testing (HCT) services (DOH, 2013a:5).

2.3.2 Antenatal

This stage aims to identify pregnant women who are HIV positive, to enter these women in the PMTCT programme and to provide them with Zidovudine (AZT) from 14 weeks of pregnancy or lifelong ART as soon as possible, depending on the clinical indication. Mothers who are HIV infected (DOH, 2010:10), with a CD4 count of less than 350 cells/mm^3 are started on lifelong ART. HIV infected mothers with a CD4 count of more than 350 cells/mm^3 should be started on the PMTCT ART regimen (DOH, 2010:14). During this period the mother must also be counselled on safe feeding practices for her baby and be informed that breastfeeding is the preferred option (DOH, 2013a:12). Standardised testing of all pregnant women for HIV infection as well as counselling have greatly improved PMTCT programme uptake (Luo *et al*., 2007:181). The 2013 PMTCT algorithm is presented in Figure 2.2. This algorithm provides a breakdown of the process of ART provision during the antenatal period.

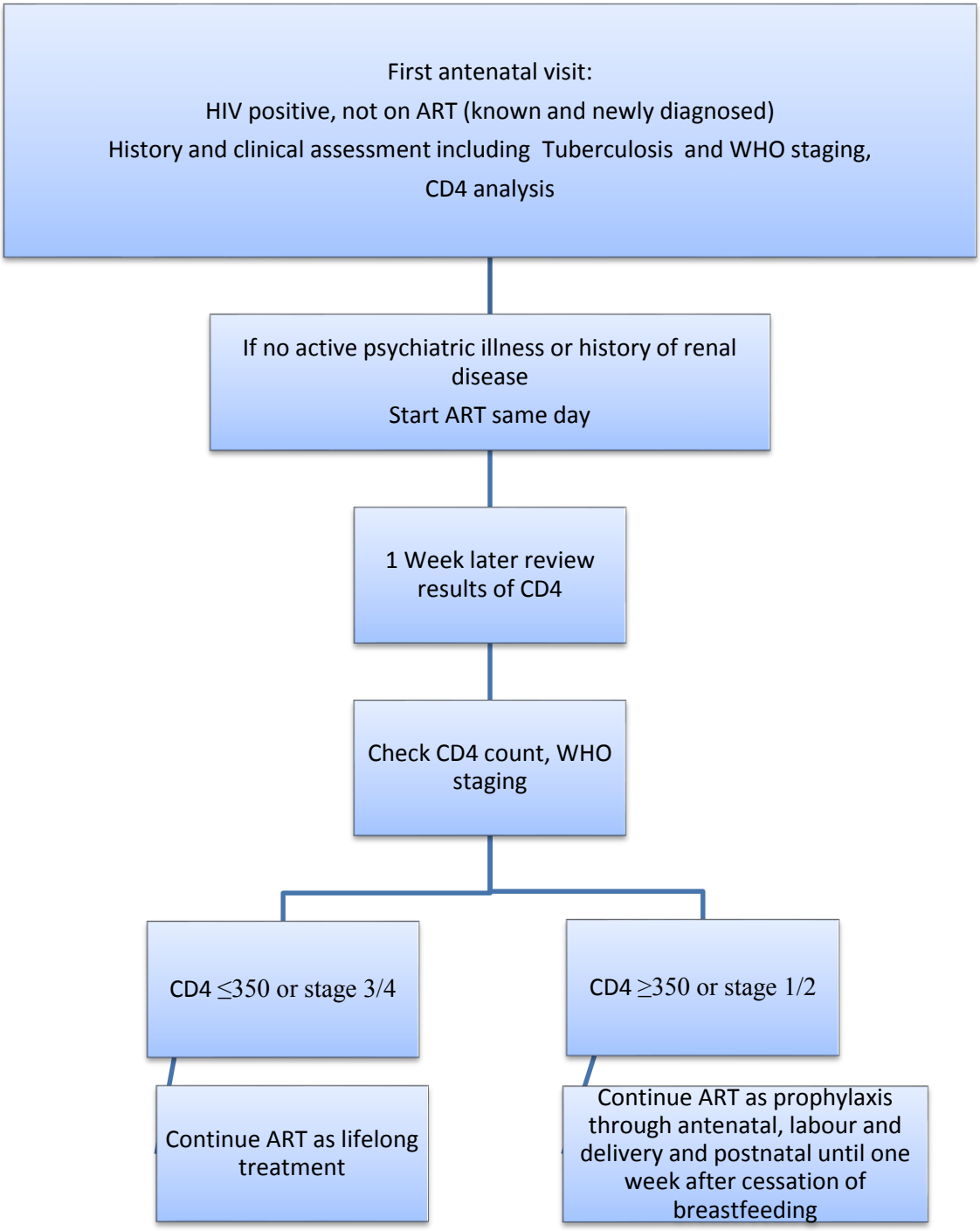

Figure 2.2 PMTCT algorithm for the 2013 PMTCT policy (DOH, 2013a:8, Figure 2)

2.3.3 Labour and delivery

The aim of this stage is to identify HIV infected women in labour, continuing the ARV regimen throughout labour and to initiate prophylactic ART to infants after birth (DOH, 2010:10). Mothers on lifelong ART should continue with their regular dosage of ART during

labour and should therefore not be provided with an additional dosage during labour. Mothers who do not qualify for lifelong ART and are on the PMTCT ART regimen or whose HIV infection state is unknown should receive an ART dosage during labour (DOH, 2010:11).

2.3.4 Post-natal care

This stage of the programme involves post-natal care for the mother three days after birth and post exposure prophylaxis to the infant to reduce HIV transmission through breastfeeding. Post-natal care aims to reduce the mortality of HIV-exposed infants and to identify HIV infected infants, who should then be started on ART (DOH, 2010:11).

The 2013 South African Infant and Young Child Feeding Policy states that it is crucial during the post-natal care stage to explain to the mother the importance of following recommended feeding practices, to encourage breastfeeding and discourage mixing breastfeeding with formula milk or any other non-breast milk foodstuff. Mothers should be encouraged to comply with their own and their child's ART regimen and to practice safe sex during the breastfeeding period. MTCT through breastfeeding should also be discussed (DOH, 2013b:19).

All HIV exposed infants should routinely undergo a rapid polymerase chain reaction (PCR) HIV test during the six week visit, as well as a PCR HIV test six weeks after cessation of breastfeeding and a PCR HIV test at 18 months. HIV exposed infants that present with symptoms (failure to thrive, anaemia, oral candidiasis or any opportunistic infection) should be tested immediately regardless of age (DOH, 2013a:6).

According to the 2010 PMTCT programme, HIV infected mothers who are on lifelong ART, will continue with ART throughout labour and breastfeeding (DOH, 2010:24). The exposed child of a mother on lifelong ART will receive Nevirapine (NVP) prophylaxis for six weeks after birth regardless of feeding choice, where after the child's ART will be discontinued (DOH, 2010:12) as seen in Figure 2.3.

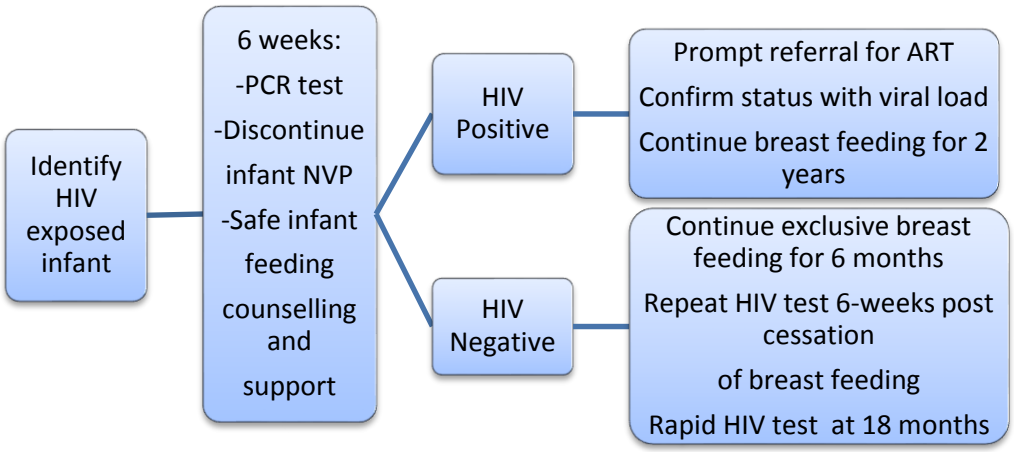

Figure 2.3 Treatment of breastfed children whose mothers are on lifelong ART (DOH, 2010:12, Figure 4)

Mothers on the PMTCT ART regimen who do not qualify for lifelong ART receive a single dose of ART after delivery. ART is then stopped regardless of feeding choice (DOH, 2010:25). The exposed child of a mother who is on the PMTCT ART regimen will continue with NVP prophylaxis until one week after breastfeeding cessation (DOH 2010:13) as shown in Figure 2.4.

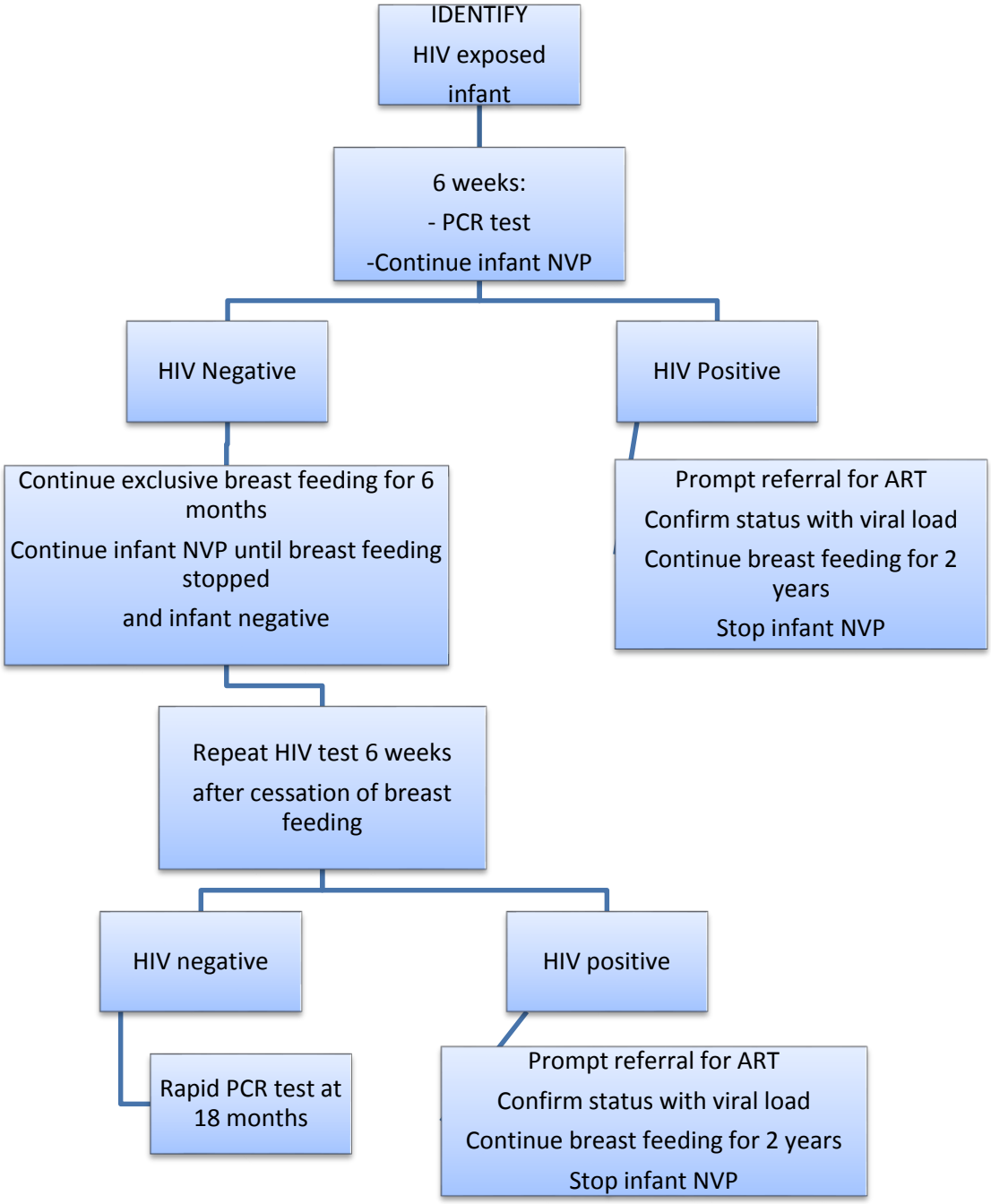

Figure 2.4 Treatment of children whose mothers are not on lifelong ART (DOH, 2010:13, Figure 5)

The 2013 PMTCT programme states that if a mother is on lifelong ART, the child will receive prophylactic ART until six weeks (DOH, 2013a:31). If the mother is not on lifelong ART, the mother's PMTCT ART that was started during the antenatal period will be continued until one week after the cessation of breastfeeding, while the child will be given prophylactic ART until six weeks (DOH, 2013a:11).

Mothers, who are HIV uninfected and choose to breastfeed, should be tested for HIV every three months until cessation of breastfeeding (DOH, 2013a:7).

A study that investigated access of pregnant woman to PMTCT services as well as ART intervention in Umlazi, South Africa, found that 99.2% of all pregnant women were tested for HIV infection antenatally. 74.3% of these women's first visit to an antenatal clinic was between 14 and 28 weeks of pregnancy and only 1.2 % of the mothers registered after 36 weeks of pregnancy. Of the HIV infected women, 97.3% had CD4 cell counts determined and 96.8% were started on ART prophylaxis for PMTCT regardless of their CD4 cell count, while 2.9% were never started on any ART. Of children exposed to HIV, 58.9% were tested for HIV after delivery with 2.4% of these infants reported to be HIV infected. The contributing causes for MTCT was that mothers were not initiated on ART and that proper PMTCT procedures were not followed concerning the provision of specific ART according to the mothers' CD4 cell counts (Hussain *et al*., 2011:2). The study showed widespread coverage of PMTCT services in South Africa, but still identified inadequate implementation.

Some advances can be seen since the implementation of the first PMTCT programme in South Africa. A study in 2004 showed that by the age of two years, 52.5% of all HIV infected children died compared to their HIV uninfected peers of whom 7.6% died (Newell *et al*., 2004:1239). A study published in 2012 showed that there was a major decrease in child mortality caused by HIV infection, with 12.8% of children under the age of five years that died (Ndirango *et al*., 2012:84).

Skilled health care providers are central to a strong PMTCT and healthcare system. Therefore the quality of service provided must be improved for the PMTCT programme to reach its maximum effect (Luo *et al*., 2007:182). There are many factors that may influence the outcome of the PMTCT programme on individuals. These factors will be further discussed.

2.4 Factors that may influence the effectiveness of the PMTCT policy

2.4.1 Socio economic factors

Socio economic factors have shown to play a role in the MTCT rate. Coetzee *et al*. (2005:492) reported that maternal age was positively associated with MTCT and attributed this finding to the positive association between maternal age and advancement of HIV stage in the mother. When investigating the adherence of mothers to ART, default of medication was more prevalent in younger mothers (Ayuo *et al*., 2013:4).

Boateng *et al*. (2013:5) investigated the influence of socio demographic factors on the knowledge of mothers concerning HIV/AIDS and the PMTCT policy. Participants of older age, formal education and that were married were found to have more knowledge on these topics. Married women and their partner's education and being employed before childbirth were positively associated with initiation and continuation of breastfeeding. Gibson-Davis & Brooks-Gunn (2007:1112) found that the probability of the mother to work the year after the birth was negatively associated with breastfeeding initiation.

Household income may also play a role in the effectiveness of and adherence to the PMTCT programme. Poverty has been recognised as a predicting factor for mothers not to wean their children at the age recommended by the PMTCT programme. These mothers felt that they could not provide adequate nutrition for their children after weaning from breastfeeding and therefore continued breastfeeding beyond the recommended time (Chinkonde *et al*., 2012:706).

Aidam *et al*. (2005:793) described socio economic status by means of homeownership as well as appliances owned and household income. They found that a higher socio economic status (owning a home, more appliances and higher income) were significantly associated with following advice given by healthcare professionals concerning breastfeeding practices.

Mothers with a higher level of schooling (secondary level schooling and above) were found to be more likely to follow recommended feeding practices than those who had lower levels of schooling. Level of schooling was also positively associated with the duration of breastfeeding (Gudnadottir *et al*., 2006:421, Henderson & Redshaw, 2010:746).

Stigma also plays a major role in PMTCT adherence, as mothers are confronted with stigma from their communities when it is known that they are HIV infected. Infected mothers would rather abstain from all PMTCT programme instructions than disclose their status (Ujiji *et al*., 2011:833).

2.4.2 Antenatal clinic attendance

It is important that women start attending the antenatal clinic as soon as possible, as the PMTCT programme states that the HIV infected women must be started on ART at 14 weeks of gestation or lifelong ART as soon as possible, according to the mothers clinical staging (DOH, 2010:10).

The 2013 PMTCT policy states that a pregnant woman should receive at least four counselling sessions on infant feeding (DOH, 2013a:41) which means that the mother should attend the antenatal clinic at least four times during her pregnancy. Colvin *et al*. (2007:468) found that mothers with fewer antenatal clinic visits had a higher risk of MTCT. Antenatal as well as perinatal counselling on feeding practices are very important, as it has been shown to be a significant predicting factor for mothers to follow suggested feeding practices (Aidam *et al*., 2005:793, Henderson & Redshaw, 2010:749). Mothers who have had at least four counselling sessions on feeding practices were 5.5 times more likely to adhere to suggested feeding practices (exclusive breastfeeding) (Chopra *et al.,* 2005:359). Mothers who had received counselling at an antenatal clinic were also more likely to initiate breastfeeding and exclusively breastfeed their children until six months (Ogunlesi, 2010:462).

Barry *et al*. (2012:684) investigated the effect of the patient-provider relationship on the PMTCT knowledge of the mother in South Africa. In this study, the number of antenatal clinic visits was recorded. It was found that the more frequent the mother visited the clinics, the better the patient-provider relationship was. Better patient-provider relationships led to more knowledgeable mothers, who accepted the PMTCT programme more easily and who were started on ART more promptly. The researchers then concluded that the relationship between a mother and her healthcare provider plays an important role in the mother's ability to participate fully in the PMTCT programme (Barry *et al*., 2012:684). Mothers who felt that they were treated with respect, spoken to in a way that they could understand and treated as individuals were more likely to follow advice given by the healthcare provider (Henderson & Redshaw, 2010:749).

2.4.3 Knowledge

It has been reported that a patient's knowledge about HIV/AIDS, ARV's and PMTCT affects their motivation to adhere to their medication and the programme. Patients with inadequate

knowledge on these topics were found to be more likely to default their ARV's in comparison with their more knowledgeable peers (Boateng *et al*., 2013:6).

In a study by Landzani *et al*. (2010:539) the knowledge of mothers regarding HIV and MTCT was investigated. The study showed that 31% of mothers thought that HIV infected mothers always infect their children, while 53.8% of mothers knew that MTCT could occur, but can be prevented. When the information provided by the clinic was investigated, 95% of the mothers stated that they were informed of MTCT during delivery, 94.8% of the mothers were informed of MTCT during breastfeeding while only 12% were informed that MTCT could take place in the womb. Another study in South Africa showed that the majority of participating mothers had knowledge of MTCT via breastfeeding (Buskens *et al*., 2007:1102).

Landzani *et* al. (2010:541) stated that mothers had inadequate knowledge of PMTCT and that this lack of knowledge affected feeding practices. The knowledge of the mother about feeding practices and exclusive breastfeeding also affects the mother's attitude towards breastfeeding. The more knowledgeable the mother, the more positive her attitude towards exclusive breastfeeding and the more likely she would be to initiate and continue with exclusive breastfeeding (Aidam *et al.*, 2005:793). Mothers with the least knowledge on PMTCT opted to feed their children with cow's milk or formula milk; where the most knowledgeable mothers opted to exclusively breastfeed (Falnes *et al.*, 2010:14). Mothers with at least secondary schooling were also more knowledgeable on exclusively breastfeeding and MTCT (Byamugisha *et al*., 2010a:56). Chopra *et al*. (2005:361) reported that inadequate knowledge of mothers regarding MTCT was widespread in South Africa, even after counselling. Mothers were also likely to believe that breastfeeding was a definite MTCT pathway and therefore preferred to formula feed their children (Buskens *et al*., 2007:1106).

Health care personnel often overestimate and overemphasise the risk of MTCT through breastfeeding, which cause most HIV infected mothers to opt for formula feeding (Doherty *et al*., 2006:92, Falnes *et al.*, 2010:44). Older mothers, the child having no siblings, the mother presenting at the antenatal clinic late in the pregnancy and not receiving feeding practise counselling, were all associated with having poor knowledge on PMTCT (Falnes *et al*., 2010:44).

This emphasises the importance of clinic staff providing the correct information to mothers, as well as the importance of attendance of antenatal clinics to the mother's knowledge. Training healthcare providers on the PMTCT programme may have a large impact on the PMTCT service delivery, especially in a low resource setting (Kieffer *et al*., 2011:89).

2.4.4 Place of delivery

Place of delivery may play a role in whether or not the mother received ART while in labour, administration of post-delivery prophylaxes to the mother and the child as well as initiation of breastfeeding. As previously stated, according to the PMTCT programme, a mother should receive ART or continue with lifelong ART during the labour period and the infant should receive ART prophylaxis after delivery (DOH, 2010:10).

Women giving birth at different facilities have shown differences in infant feeding practices, especially the initiation and continuation of exclusive breastfeeding (Aidam *et al*., 2005:793). These differences may be due to different training or attitudes that the healthcare professionals at these different facilities portray. Mothers who give birth at health facilities are more likely to initiate breastfeeding within an hour after birth and continue to exclusively breastfeed their children until six months, compared to home deliveries (Ogunlesi, 2010:462).

Some mothers prefer to deliver at home, as this is culturally expected. The option for mothers to collect their ART, to be taken during labour, from the clinic before delivery and then returning to the clinic for the post delivery prophylaxis, was not seen to be effective. Mothers did not collect the ART from clinics nor return after delivery, which meant that these children were left unprotected (Kasenga *et al*., 2007:651).

The place of delivery may also affect child mortality and Coovadia *et al.* (2007:1113) found that children who were not born in hospital or a clinic had a higher mortality rate.

2.4.5 Feeding practices

The South African PMTCT programme does not only focus on prevention of MTCT but also on maximising child survival, therefore this programme supports and promotes exclusive breastfeeding (DOH 2013a:41). The WHO suggests that prioritisation of PMTCT should be balanced with meeting nutritional requirements and the prevention of non-HIV related morbidity and mortality (WHO, 2010:3). The 2010 and 2013 PMTCT programme states that

mothers should exclusively breastfeed their children for the first six months of life and thereafter introduce solids while continuing to breastfeed until 12 months (DOH 2013a:14, DOH 2010:32).

The 2010 WHO guidelines on HIV and infant feeding acknowledge that ARV treatment for either the HIV infected mother or the HIV exposed child can significantly reduce the risk of MTCT of HIV through breastfeeding (WHO, 2010:1).

Therefore the PMTCT programme makes provision for either the mother to use ART or the breastfed child. The treatment is determined by the mother's HIV progression. As previously discussed, the 2010 PMTCT policy stated that if the mother is on lifelong ART, the child will only receive ART until six weeks of age. If the mother is not on lifelong ART, the use of the mother's PMTCT ART will be discontinued after birth and the child will continue on ART until cessation of breastfeeding at 12 months (DOH, 2010:11). However, the 2013 PMTCT policy stated that if a mother was on lifelong ART, the child will receive ART until six weeks (DOH, 2013a:31). If the mother was not on lifelong ART, the mother's PMTCT ART started during the antenatal period will be continued until one week after cessation of breastfeeding, while the child should be given ART until six weeks (DOH, 2013a:11).

Alvarez-Uria *et al*. (2012:6) investigated and compared the HIV free survival of breastfed and formula fed children. In this study, the use of formula milk was associated with increased child mortality and decreased HIV uninfected survival compared to breastfed children. Formula feeding also increased the malnourished child's health burden in this population, as the formula fed children did not grow as well as the breastfed children. It was therefore concluded that even though breastfeeding increases the risk of MTCT, the mortality of children due to malnutrition outweighed the mortality associated with MTCT (Alvarez-Uria *et al*., 2012:8). Mothers choosing to feed their children with infant formula also struggled to obtain formula milk, as they were dependent on the health facilities as provider and had no other way of obtaining formula feeds themselves. In cases where health clinics or the mother would run out of stock before the next clinic date, there would be no formula at home for the child (Doherty *et al*., 2006:93), which meant that formula feeding was not sustainable.

Chopra *et al*. (2005:359) reported that the counselling mothers received at the antenatal clinic in some South African sites on the preparation of formula milk were insufficient and did not equip the mothers to correctly prepare feeds for their children.

Formula feeding of children was also culturally unacceptable in many communities and was associated with being HIV infected. This caused mothers not to follow recommended feeding practices due to the pressures of stigma. Mothers would not want to formula feed their infants, as to not disclose their HIV status (Doherty *et al*., 2006:92) and did not want to obtain infant formula from the clinics, which presented a barrier to the PMTCT programme (Kebaabetswe, 2007:359).

According to the more recent PMTCT programmes (DOH 2013a:41), formula milk can only be provided when prescribed for special medical conditions. The mother can still choose to formula feed her infant after being properly counselled. Formula feeding may only be encouraged by health professionals if the mother meets the AFFAS requirements (Goga *et al*., 2009:526, Landzani *et al*. 2010:541). The WHO guidelines on HIV and infant feeding indicates that the decision to formula feed should consider the socio-economic and cultural context of the population, the quality and availability of health services as well as the main causes of maternal and child malnutrition and child morbidity and mortality (WHO, 2010:3).

The South African Department of Health released the most recent policy on infant and young child feeding in 2013. The aim of this policy was to define strategies and actions to be implemented to promote, support and protect appropriate infant and young child feeding practices, including in the context of HIV/AIDS. This policy focuses on improved growth, development and nutritional status as well as improved mortality rates of infants and children in South Africa (DOH, 2013b:11).

The WHO and United Nations Children's Fund (UNICEF) introduced a ten step policy, the Baby Friendly Hospital Initiative (BFHI) to support health care providers in the promotion of breastfeeding in their facilities as well as to provide mothers with a supportive environment to breast feed in facilities and their communities (Labbok, 2007:99). Two of the pillars of this programme are to train health care staff in all aspects to promote breastfeeding and the formation of breastfeeding support groups in the community (Labbok, 2007:101). This policy

emphasises the important role healthcare professionals play in the education and support of mothers for successful breastfeeding.

A study in Kwazulu Natal showed that children, who were not exclusively breastfed, either by the early introduction of solids or mix feeding with formula milk, were 11 times more likely to become HIV infected via MTCT than those who were exclusively breastfed. This occurred in the period before six months of age irrespective of the age that solids were introduced (Coovadia *et al*., 2007:1112). Exclusive breastfeeding in South Africa can be described as a challenge as 31 % of HIV uninfected woman and 37% of HIV infected woman have given something other than breast milk already during the first three days of the baby's life. By six weeks postpartum, 13% of HIV uninfected and 32% of HIV infected mothers had completely stopped breastfeeding (Doherty *et al*., 2012:108).

Numerous reasons exist that can lead to women starting to mix feed or stop breastfeeding completely. Doherty *et al*. (2012:108) investigated these reasons in South Africa and found that the intention not to breastfeed, or being undecided on feeding choice during the antenatal stage was the biggest predictor for early cessation of breastfeeding. These finding agreed with others where the antenatal intention to breastfeed increased the initiation and duration of exclusive breastfeeding (Henderson & Redshaw, 2010:748). Breast problems as well as the mother having her own source of income were also predicting factors for early cessation. After adjustments had been made for these factors, HIV infection did not show to be a significant predictor. This may show that proper antenatal education concerning feeding practices, breast problems as well as proper postnatal care provided to the mothers may prolong the duration of breastfeeding (Doherty *et al*., 2012:108). Goga *et al*. (2009:524) also found that mothers who had less antenatal visits and counselling were more likely to stop breastfeeding earlier.

A study in South Africa by Buskens *et al*. showed that mothers had positive attitudes towards breastfeeding, as it was seen to be superior to formula milk, but that most mothers felt that they could not exclusively breastfeed their children. The mothers felt that exclusive breastfeeding was impractical and that it was in conflict with their own beliefs. Most mothers mixed fed with water and traditional medicine. The mothers were also more likely to trust the information provided by their relatives to that provided by the healthcare worker. Since the norm in the communities is to mix feed children, mothers who exclusively breastfed were

questioned on HIV status and were therefore scared to exclusively breastfeed their children. This may be why non-disclosure can have a negative effect on prescribed feeding practices (2007:1106).

Chinkonde *et al.* (2012:703) investigated the factors that contribute to mothers not following suggested feeding practices in Malawi. They found that it was expected of a woman to breastfeed her child in this community, and that if mothers did not breastfeed, or weaned their infant too early, they were seen either as unfit mothers, or HIV infected.
The risk of the mother not weaning the child at the suggested age also increased if the mother had not disclosed her status to her partner. In South Africa, the practice of mixed feeding of formula and breast milk was seen to be high due to this stigma. Mothers would breastfeed at home or in company, but formula feed at clinics or in private (Landzani *et al.*, 2010:540).
Aidam *et al.* (2005:793) found that the attitude of the mothers concerning breastfeeding, intention to breastfeed at time of delivery as well as the amount of counselling the mother received regarding breastfeeding had a significant effect on whether the mother will initiate and continue exclusive breastfeeding for the recommended time.

It is not only important for health care professionals to support and assist mothers with breastfeeding, but also with the cessation of breastfeeding at the appropriate time. In some South African communities, the mother is not allowed to wean the child without permission from the father and grandparents (Buskens *et al.*, 2007:1106). Goga *et al*. (2009:524) investigated the feasibility and effectiveness of breastfeeding cessation in HIV infected woman. Mothers had difficulties to adhere to the proposed feeding practices; and family support and social factors played a role in adherence of the mothers. The authors found that counselling mothers on the cessation of breastfeeding had a positive effect on adherence to the policy. Even though the WHO recommends that breastfeeding be stopped at 12 months, they also recommend that breastfeeding only be stopped once a nutritionally adequate diet without breast milk can be provided to the child. Abrupt cessation of breastfeeding is not advised (WHO, 2010:6) and the Infant and Young Child Feeding Policy encourage mothers to gradually wean their children during the last month of breastfeeding (DOH, 2013b:20).

The role that health care workers play on the decision making process is highlighted throughout many studies. It is therefore important that appropriate training materials and training courses be made available to health care workers to improve the quality of service

provided by health care facilities (Chopra *et al*., 2005:362). A key principal highlighted by the WHO is skilled counselling and support in appropriate feeding practices and ART intervention for all HIV infected mothers (WHO, 2010:25).

2.4.6 Partner involvement and support

A study in South Africa showed partner involvement to be a significant factor to the mother's adherence to the PMTCT programme. The authors contributed this to the improvement in communication between partners, HCT and serostatus disclosure (Peltzer *et al*., 2011a:786). Goga *et al*. also found that woman who were single were more likely to stop breastfeeding earlier (2009:524). Early cessation of breastfeeding could be due to a lack of partner support or that mothers had to return to work to earn an income.

Not many studies have been done in South Africa to establish the effect of partner involvement on the outcome of the PMTCT programme but other studies in Africa have shown clear results.

Aluisio *et al.* found in Kenya that fathers who had previously been tested for HIV had a higher attendance of antenatal clinic with the pregnant mothers and these mothers were also more likely to adhere to ART (2011:79). Disclosure of HIV status to the partners and the support of these partners have shown to increase the mothers' adherence to feeding practices and ART (Chinkonde *et al*., 2012:703; Chopra *et al*., 2005:361). Partner involvement and attendance of antenatal clinic as well as whether the partner was tested for HIV was associated with significantly lower HIV infection in children as well as a significant increase in HIV free survival of these children (Aluisio *et al*., 2011:81).

Mothers who were married or living with their partners were more likely to initiate and continue breastfeeding compared to households where the father is not present or only visits. Even though these results were significant, it was also noted that mothers who had financial support from their partners often opted to formula feed as there would be finances available for formula milk and the father would also want to take part in the feeding of the child (Gibson-Davis & Brooks-Gunn, 2007:1112).

Studies investigating factors influencing partner involvement, found that fathers that were more educated in terms of years of school attendance were more likely to attend antenatal

clinics with their partners. Fathers who knew their HIV status and had heard about the PMTCT programme were also significantly more likely to be involved in the PMTCT and antenatal process. Partners who did not want to disclose their status were less likely to attend antenatal clinic with the mothers (Byamugisha *et al*., 2010b:15). Byamugisha *et al*. also held focus group discussions with fathers to determine the reason for fathers not attending antenatal clinic with their wives. Lack of space at the clinics as well as nursing staff not allowing fathers to attend consultations were mentioned. Fathers also stated that they did not have time to attend the clinic or that they did not want to pay transport for two people. Some of the fathers were concerned about the negative cultural attitude as it is not socially acceptable for men to attend clinic with their wives (2010b:16).

Culturally, gender roles play a part in the father's attendance to the antenatal clinic as it is not seen as a man's responsibility to attend antenatal clinic (Falnes *et al*., 2011:28). In a study by Nkuoh *et al*. (2010:365) partners did not attending antenatal clinic because the partner had to work and it is not a traditional role of the father to attend the antenatal clinic.

Lack of partner involvement and support was identified as the main barrier to the promotion of the PMTCT programme (Kebaabetswe, 2007:358).

2.4.7 Antiretroviral Therapy compliance of child and mother

2.4.7.1 Administration of the children's antiretroviral therapy

The 2010 PMTCT programme has specific instructions on the administration of infant NVP (DOH, 2010:30). The different NVP regimens for infants born to mothers on lifelong ART, mothers on PMTCT ART, mothers on no ART and mothers without a known HIV status are provided in Table 2.1. Table 2.2 provides the amount of NVP syrup a child should receive once a day, increasing as age progresses.

Table 2.1: Nevirapine prophylaxes infant regimens (DOH, 2010:30, Table 6.2)

Infant 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 regimen	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 breastfeeding	Assess ART eligibility for the mother within two weeks
Unknown maternal status because 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 PCR

Table 2.2: Nevirapine administration of infants and children (DOH, 2010:31, Table 6.3)

Drug	**Birth Weight**	**Dose**	**Quantity**
NVP syrup (10mg/ml)	Birth to 6 six weeks ≤2.5kg birth weight	10mg/d	1ml
	Birth to six weeks ≥2.5kg	15mg/d	1.5ml
	Six weeks to six months	20mg/d	2ml
	Six months to nine months	30mg/d	3ml
	Nine months to end of breastfeeding	40mg/d	4ml

It is important for mothers to adhere to the prescribed prophylactic NVP regimen prescribed by the healthcare worker in order to have its full intended effect. In South Africa the administration of ART to children, starting in hospital, has significantly increased from 2007 – 2011 and during this time the mortality of HIV infected children decreased (Meyers *et al*., 2012:509). Peltzer *et al*. found that partner involvement, having attended a support group, less experience of stigma and not experiencing discrimination from health workers increased adherence to child ART (2011b:1256).

2.4.7.2 Mothers' use of ART

According to WHO recommendations, all pregnant and lactating mothers who are HIV infected should be provided with lifelong ART or ART prophylaxis (PMTCT ART) to prevent MTCT (WHO, 2010:6).

Even though ART is freely available from government clinics and hospitals, some people, including pregnant and lactating woman are defaulting on their treatment. Women report that they collect their ART regularly from healthcare providers, but it is crucial for these women to consume the medication as prescribed for the PMTCT programme to achieve its full benefit (Peltzer *et a*l., 2011b:1255). Children born to mothers who adhered to prescribed ART regimens were 60% less likely to be HIV infected and had a significant lower mortality at age 24 months compared to mothers who took no ART during pregnancy (Ruton *et al*., 2012:9).

Ayuo *et al*. (2013:4) investigated factors that influence the adherence of mothers to ART. They found that younger age, fewer years of education, being married and earlier stage of gestation when ART was started was associated with poor adherence. The association with the earlier stage of gestation that ART was started on could be due to the longer follow up times, which means that these patients had more time to default. Married woman could default more, as they might not want to disclose their HIV status to their partner. Women with higher CD4 cell counts also defaulted more on their medication. This was contributed to a better health status associated with a higher CD4 cell count. These patients did not feel ill and thought it unnecessary to adhere to medication prescription. Woman on other chronic medication were less likely to default on their treatment. This was speculated to be due to the more frequent follow up dates these patients had for a symptomatic illness that is not as stigmatising as HIV and motivated them to adhere to medication. Clinics not having stock was also a contributing factor for poor adherence (Peltzer *et al*., 2011b:1256).

Musheke *et al*. (2012) also studied the reasons women in general defaulted on their medication. Some of the participants reported that side effects of the ARV's including stomach pain, diarrhoea, leg pain, headache, fatigue and vomiting were the reason for defaulting. Improved wellbeing after using the ARV's for a period of time and wanting to feel "normal" also contributed to patients not using their ARV's as prescribed. The women also feared losing social and emotional support if use of the ARV's would disclose their status to their partners, family and friends. They rather stopped using their medication. Women also felt that the waiting times at clinics were too long and that attending the clinic regularly would disrupt their daily duties. Travelling to the clinics regularly was also a costly process which hindered women's adherence to ART. Some women would rather seek the help of a religious healer and use herbal medication (Musheke *et al*., 2012:17372).

Lack of HIV infection state disclosure to the partner and family proves to hinder adherence to infant feeding advice and drug administration (Chopra *et al*., 2005:361).

Some mothers reported that there was a communication problem and that they did not understand the instructions given by the healthcare workers on ART administration. Forgetting to take ART was also reported when the mother experienced an interruption in personal routine like visiting family, being out of town or attending some event (Mepham *et al*., 2011:743).

2.4.8 Human Immunodeficiency Virus infection state of mother

The CD4 cell count is generally used to diagnose the progression of HIV as CD4 progressively decreases as HIV disease advances. The normal absolute CD4 cell count in adults and adolescents ranges from 500-1500 cells/mm^3 (WHO, 2007:14).

The CD4 cell count of the mother is a determining factor for ART administration during pregnancy. According to more recent policies, all patients including pregnant woman who have a CD4 cell count less than 350 cells/mm^3 or HIV clinical stage three or four are eligible for lifelong ART (DOH, 2013c:4). Pregnant woman who do not meet this inclusion criteria are initiated on a PMTCT ART regimen till after delivery (DOH, 2010:25) or until cessation of breastfeeding (DOH, 2013a:11).

The clinical HIV stage of the mother also plays a role in the management of MTCT and the effectiveness of the PMTCT policy. Clinical staging can be used as a determining factor for ART initiation if CD4 cell count is not available (WHO, 2007:12). Table 2.3 provides the classification of the four stages of HIV infection.

Table 2.3: WHO staging of HIV infection (WHO, 2007:16 Table 3)

HIV-associated symptoms	**WHO clinical stage**
Asymptomatic Persistent generalized lymphadenopathy	1
Mild symptoms Moderate unexplained weight loss (<10% of presumed or measured body weight) Recurrent respiratory tract infections sinusitis, tonsillitis, otitis media and pharyngitis Herpes zoster Angular cheilitis Recurrent oral ulceration Papular pruritic eruptions Seborrhoeic dermatitis Fungal nail infections	2
Advanced symptoms Unexplained severe weight loss (>10% of presumed or measured body weight) Unexplained chronic diarrhoea for longer than one month Unexplained persistent fever (above 37.6°C intermittent or constant,for longer than one month) Persistent oral candidiasis Oral hairy leukoplakia Pulmonary tuberculosis (current) Severe bacterial infections (such as pneumonia, empyema, pyomyositis, bone or joint infection, meningitis or bacteraemia)	3

Acute necrotizing ulcerative stomatitis, gingivitis or periodontitis Unexplained anaemia (<8 g/dl), neutropaenia (<0.5 × 109 per liter) or chronic thrombocytopaenia (<50 × 109 per liter)	
Severe symptoms HIV wasting syndrome Pneumocystis pneumonia Recurrent severe bacterial pneumonia Chronic herpes simplex infection (orolabial, genital or anorectal of more than one month's duration or visceral at any site) Oesophageal candidiasis (or candidiasis of trachea, bronchi or lungs) Extrapulmonary tuberculosis Kaposi's sarcoma Cytomegalovirus infection (retinitis or infection of other organs) Central nervous system toxoplasmosis HIV encephalopathy Extrapulmonarycryptococcosis including meningitis Disseminated non-tuberculous mycobacterial infection Progressive multifocal leukoencephalopathy Chronic cryptosporidiosis (with diarrhoea) Chronic isosporiasis Disseminated mycosis (coccidiomycosis or histoplasmosis) Recurrent non-typhoidal Salmonella bacteraemia Lymphoma (cerebral or B-cell non-Hodgkin) or other solid HIV-associated tumours Invasive cervical carcinoma Atypical disseminated leishmaniasis Symptomatic HIV-associated nephropathy or symptomatic HIV-associated cardiomyopathy	4

The CD4 cell count of the mother was found to have a strong association with MTCT (Coovadia *et al*., 2007:1113, Coetzee *et al.*, 2005:492). Coovadia *et al*. (2007:113) stated that maternal CD4 cell count was a much stronger predicting factor for MTCT than maternal age,

low birth weight or type of delivery. Maternal viral load was also found to be a statistically significant risk factor for early MTCT (Colvin *et al*., 2007:468).

After testing HIV exposed children soon after birth, 88.9% of infants who were HIV infected were those of mothers with a CD4 cell count of less than 41 cells/mm^3. These mothers were eligible for ART, but were never initiated on ART (Hussain *et al*., 2011:4). Mortality in children is also associated with low maternal CD4 cell count, which could be due to higher risk of MTCT (Newell *et al*., 2004:1239).

2.5 Conclusion

According to UNAIDS global statistics, 700 children became HIV infected and 600 children died of HIV related illnesses every day in 2012 (UNAIDS, 2014:4). This emphasises that even though there is a PMTCT policy in place, children are still infected with HIV daily and that this is a major predicting factor for child morbidity and mortality. Investigation needs to be done to determine where the challenges of the PMTCT programme are to eliminate these factors. As shown by literature, these factors may be culturally and socio-economically independent to different population groups. It is therefore necessary for studies to be undertaken in different population groups to determine the factors that may influence the effectiveness of the PMTCT policy for this policy to reach its maximum potential in each population group.

CHAPTER 3: Methodology

3.1 Introduction

This study investigated the effectiveness of the Prevention of Mother- to- Child Transmission (PMTCT) programme to prevent Mother-to-Child Transmission (MTCT) in breastfed children as well as possible factors that may contribute to MTCT.

In this chapter the methodology for this study is described. The study design, sampling, recruitment, operational definitions, study procedures, statistical analyses, validity, reliability and ethical consideration are discussed.

3.2 Methods

3.2.1 Study design

A cross sectional descriptive study was done.

Data was collected from 22 October 2013 until 23 June 2014 at four clinics in the Frances Baard district, Northern Cape Province.

3.2.2. Sampling

3.2.2.1 Study population

The study population included mother-child pairs from four clinics in the Frances Baard district of the Northern Cape. The four clinics included Phutanang, Betty Gaetsewe, Masakhane and Galeshewe Day Hospital. These clinics were included as they provide paediatric care and have implemented the PMTCT programme. PMTCT care is widely accessible in the Frances Baard District through a large number of primary health care facilities as well as a tertiary hospital. During the 2012 / 2013 financial year, 7329 mothers attended antenatal clinics for their first antenatal visit in the Frances Baard district. Of the mothers with unknown HIV infection status, 98.8% were tested for HIV whereof 10.9% were HIV infected. Up to 84.8 % of HIV infected mothers were included in the PMTCT programme (NCDOH, 2013).

3.2.2.2 Study sample

A sample of 100 mother-child pairs who stopped breastfeeding and have completed the routine PCR test, at age six weeks and/ or six weeks after cessation of breastfeeding and have provided informed consent to participate in the study was included.

Inclusion criteria

HIV infected mothers who chose to breastfeed their infants at birth and were enrolled in the PMTCT programme were included in the study. The mother must also have been a patient at the same clinic as the child to ensure that the file of the mother with the necessary information could be obtained.

Exclusion criteria

Mother-child pairs were excluded from the study if:

-the biological mother was deceased or not present;

- the mother was HIV uninfected or not enrolled in the PMTCT programme;

- the mother never breastfed her child;

- an PCR test was not performed at six weeks and/ or six weeks after cessation of breastfeeding; or

- the child was older than 40 months. These children were excluded as the practices questioned would have been in the distant past and mothers may not remember the practices accurately.

3.2.3 Participant recruitment

HIV infected mothers, enrolled in the PMTCT programme, who have breastfed their children were identified by the nursing staff or researcher, informed about the study and referred to the researcher, if they were willing to participate in the study. To improve participation, mothers were ensured that they would not lose their place in the queue to consult with the doctor/ nursing staff. A number system was put in place by the researcher where all the patients waiting in the queue would receive a number. If a patient was then recruited by the researcher/ nursing staff to partake in the study, the patient was excused from the queue and after the questionnaire had been completed, the participant could then return to her former

place in the queue. The researcher obtained the mother's file from the clinic for further information and to cross check information provided by the mother. Mothers received an incentive if they participated in the study in the form of sponsored children's blanket, clothing or toys.

After data were collected from the mother, the researcher experienced some challenges obtaining all the mothers' files. Some of the files got lost at the clinic or the mother was no longer a patient at the specific clinic. This resulted in these participants to be excluded from the study as indicated in Figure 3.1.

Figure 3.1 Recruitment process of 100 participants

3.2.4 Operational definitions

The following operational terms are defined:

Socio economic status

Socio economic status refers to an individual's or family's measure of economic and social position and is based on income, education and occupation. In this study employment status, education, income and dependants on income were used to describe socio economic status.

Exclusive breastfeeding

Exclusive breastfeeding refers to providing a child with only breast milk. This means that no other solid or fluid, including water is given. Only medically prescribed medication is allowed.

Mixed feeding

Breastfeeding while giving any other foodstuff (including water, formula milk, solids, semi-solids) before six months of age.

Introduction to solids

For the purpose of this study, introduction to solids was defined as introduction of any other foodstuff, whether solid, semi-solid or liquid to the diet, other than breast milk or formula milk if the child was changed from breast milk to formula milk before the introduction of solids.

3.2.5 Measurements and techniques

3.2.5.1 Anthropometric measurements

The following anthropometric measurements were measured for all children: height, weight and mid-upper arm circumference (MUAC).

The height/length of children was used to interpret weight–for-height as well as height-for-age. The weight of the child was used to interpret weight-for-height as well as weight-for-age.
World Health Organisation (WHO) growth charts were used to interpret these values. Z-scores were used to indicate the deviation of a child's measurement from the median value of a reference population. For the purpose of this study the z-scores were interpreted using Table 3.1. Table 3.1 was compiled by using the data obtained from the WHO global database on child growth and malnutrition (WHO, 1997:50).

Height and weight of mothers were measured and used to calculate body mass index (BMI). The BMI of the mother was interpreted using Table 3.2 to evaluate the weight status of the mother.

3.2.5.1.1 Height/ Length

The height of mothers and children older than 24 months was measured using a stadiometer, accurate to the nearest 0.1cm. The stadiometer was placed on a hard surface. All participants were measured without shoes. The participants were measured with feet together and heels, buttocks and shoulders against the back of the meter. Arms were relaxed next to the body and the head was in the Frankfort position. Children younger than 24 months were measured using a paediatric measuring board. Infants were measured from head to heal to the nearest 0.1cm (WHO STEPS surveillance, 2008:8).

3.2.5.1.2 Weight

The weight of mothers as well as children older than 24 months was measured using a digital electronic scale. The scale was placed on a hard surface. The participants were weighed without shoes and with minimal clothing. The participants stood in the middle of the scale and did not hold on to anything. The weight was measured accurate to the nearest 0.1kg. Children younger than 24 months were weighed using an infant scale. The child was weighed with minimal clothes (WHO STEPS surveillance, 2008:9).

Table 3.1: Cut off points for standard deviations to classify nutritional state of children

Z-score/ Standard deviation	**>3**	**3 - 2**	**+2 - -2**	**-2 - -3**	**<-3**
Weight-for-age			Normal	Moderate Malnutrition	Severe Malnutrition
Height/ Length-for-age			Normal	Moderate Malnutrition	Severe Malnutrition
Weight-for-Height/ Length	Overweight		Normal	Moderate Malnutrition	Severe Malnutrition

3.2.5.1.3 Body Mass Index (BMI)

The weight status of the mother was interpreted by using the body mass index (BMI). The BMI refers to the weight (kg) of a person divided by their height (m) squared and can be used to classify a person according to their body composition. Table 3.2 indicates the different classifications that can be made using BMI as indicator.

Table 3.2: Classification of BMI (WHO, 2006: Online)

BMI Classification	**Principal cut-off points (kg/m²)**
Underweight	<18.5
Severely thin	<16.0
Moderate thinness	16.0-16.99
Mild thinness	17.00-18.49
Normal Range	18.5-24.9
Overweight	≥ 25
Pre-obese	25.0-29.9
Obese	≥30
Obese class 1	30-34.9
Obese class 2	35-39.9
Obese class 3	≥40

3.2.5.1.4 Mid-upper Arm Circumference

A non-stretch measuring tape was used to measure the MUAC of the child. The vertical distance from the underside of the right elbow to the right acromion, with elbow bent at 90˚ was measured. This distance was halved and a landmark made at this point, to indicate the mid-upper arm. A tape measure was used to measure the circumference of the arm at this point. The measurement was made to the nearest 0.1cm. The tape measure fitted tightly, but did not make a dent in the upper arm (Gibson, 2005:236). The WHO/ United Nations Children's Fund (UNICEF) standards for MUAC were used to interpret the MUAC of the child. A MUAC of less than 115mm indicates that the child is malnourished (WHO/UNICEF, 2009:2).

3.2.5.2 Questionnaire

Adherence to the PMTCT policy and factors influencing adherence to the policy were determined by a questionnaire completed during an interview with the researcher (Addendum A). The questionnaire was pretested during a pilot study to assure clarity, consistency and acceptability of the questions. All questionnaires were completed by the researcher in a private, structured interview with the mother. All questions were asked as open ended questions so that the questions did not lead the mothers in any way. The answers were then coded. For the purpose of this study the following factors that influence the effectiveness of the PMTCT policy was investigated:

3.2.5.2.1 Socio economic factors

Socio economic factors that were investigated include the age of the mother, educational/ schooling level of the mother, marital status of the mother, employment status of the mother, household income as well as the number of people dependant on the household income (Boateng *et al*., 2013:5, Merdekios&Adedimeji, 2011:364). The source of the household income was also investigated.

3.2.5.2.2 Antenatal clinic attendance

Antenatal clinic attendance was described by obtaining the gestational age when the mother first attended antenatal clinic as well as the gestational age when the mother was started on the PMTCT programme (Coetzee *et al.*, 2005:492). According to the 2010 PMTCT policy, mothers are supposed to receive ARV's from 14 weeks of gestation and it is therefore important that the pregnant women started antenatal clinic care as soon as possible (DOH, 2010:30). The number of visits to the clinic during pregnancy was also recorded. The number of clinic visits was compared to the mother's knowledge of PMTCT to determine if there was an association.

3.2.5.2.3 Knowledge

Knowledge of the mother regarding the PMTCT policy, her own use of ART and the administration of the child's ART were determined (Boateng *et al*., 2013:4, Landzani *et al.,* 2010:541). These questions were open ended and interpreted by the researcher. Knowledge questions were coded as "does know" or "does not know". If the mothers

could answer the open ended questions according to the operational definitions it was indicated as correct.

3.2.5.2.4 Place of delivery

As place of delivery may be a factor in the administration of ART during labour and delivery (Ndirangu *et al.*, 2010:4), place of delivery was recorded. According to the PMTCT policy, a mother in labour that is on AZT or no treatment should receive AZT three hourly from the onset of labour until delivery. A mother that is on lifelong ART should continue with her regular regimen until delivery (DOH, 2010:11). As the place of delivery is not always indicative of ART administration during labour, as clinics could be out of stock or midwives could have provided ART during home deliveries, the mothers were also asked if they remember receiving ART during labour.

3.2.5.2.5 Feeding practices

Infant feeding practices by the mother was investigated. This included information on exclusive breastfeeding, introduction of solids and age of cessation of breastfeeding. According to the PMTCT policy, mothers who choose to breastfeed must do so exclusively for the first six months of the baby's life, after which solids can be introduced, while continuing with breastfeeding up to one year (DOH, 2010:32).

Factors influencing feeding practices including stigma, social pressure and knowledge of mother were investigated (Chinkonde *et al.*, 2012:703, Landzani *et al.*, 2010:540, Boateng *et al.*, 2013:4). According to the PMTCT policy, the mother should receive counselling regarding feeding practices at the first antenatal clinic visit and every visit thereafter providing a total of at least four infant feeding counselling sessions (DOH, 2010:32).

3.2.5.2.6 Partner involvement and support

Partner involvement and support during antenatal clinic visits, during the breastfeeding period and disclosure of HIV status were investigated as these factors have shown to have an effect on MTCT (Peltzer *et al.*, 2011a:786).

3.2.5.2.7 Antiretroviral compliance of child and mother

Actual administration of the child's antiretroviral therapy was described by determining whether the mother is administering ART according to prescription. The PMTCT policy has clear guidelines on Nevirapine (NVP) regimes. All children born to HIV infected mothers must receive NVP daily for the first six weeks of life (DOH, 2010:28). If the infant is breastfed and the mother is on lifelong ART, the NVP is stopped at six weeks (DOH, 2010:30). If the mother is not on lifelong ART, the child will continue NVP daily until seven days after the cessation of breastfeeding (DOH, 2010:32). For the purpose of this study the amount of NVP prescribed by the doctor in the patient's file was used as the reference value for each individual participant. The dosage the mother indicated that she gave to the baby was compared to the prescription and recorded as too much, correct or too little. For the purpose of this study, the 2010 guidelines were used for comparison, as the age group of participants would still have been using the 2010 guidelines.

The type of ART used by the mother if any as well as compliance of the mother to the ART were also recorded (Colvin *et al.*, 2007:468, Venkatesh *et al*., 2011:115). The information given by the mother regarding compliance of ART usage was validated by comparing it with the data in the patient's file. Patients who visit these clinics undergo an ART pill count every time they visit the clinic. According to the number of pills left over from the previous month, the nursing staff would indicate in the file whether adherence to ART is satisfactory or not. The researcher identified the number of visits that were indicated as "not satisfactory" and these visits were reported as a percentage of the total visits, indicating the adherence of the mother to her ART. Adherence to medication during pregnancy and the breastfeeding period was also obtained from the file.

3.2.5.2.8 Human Immunodeficiency Virus infection state of mother

HIV state of the mother was described by means of the CD4 cell count of the mother and interpreted according to the WHO classification of HIV stage. The CD4 cell count as well as the WHO classification were obtained from the participant's file. If this information was not available, it was indicated as "not available" on questionnaire.

The WHO clinical staging of HIV and AIDS for adults were used to identify the stage of the mother's HIV & AIDS infection. The HIV stage indicated in the mother's file was used.

3.2.5.2.9 Human Immunodeficiency Virus infection state of child

HIV status of the infant was obtained from the patient's file and additional testing was not done by the researcher. According to the PMTCT guidelines (DOH, 2010:13) a child of an HIV infected mother must be tested at six weeks of age as well as six weeks after cessation of breastfeeding. A polymerase chain reaction (PCR) test was done.

The mother was also asked about HIV infection status of older children at home as well as the age of these children.

3.3 Study procedures

The study was implemented according to the following steps:

Step 1: Approval

- The study was presented to an evaluation committee from the School for Allied Health Professions, Faculty of Health Sciences, University of the Free State;
- Approval to conduct the study was obtained from the Northern Cape Department of Health research Ethics Committee (Addendum D). This included approval from clinic heads as well as the Head of Department of Health, Northern Cape.
- Ethical approval for the study was obtained from the Ethics Committee from the Faculty of Health Sciences, University of the Free State (Addendum E).
- Informed consent was obtained from mothers that meet the inclusion criteria for the study before inclusion in the study (Addendum F).

Step 2: Pilot study

A pilot study was performed where the questionnaire was pre-tested to evaluate the clarity, consistency and acceptability of the questions and to streamline procedures. Problems experienced during the pilot study were then addressed. Five questionnaires were completed as part of the pilot study. The same inclusion and exclusion criteria were used during the pilot

study. The researcher completed all the pilot study questionnaires as the researcher was the only one who completed the actual questionnaires and therefore the same procedure and interpretations were used.

On completion of the pilot study questions were adapted and more questions were added to ensure that the information obtained were valid and reliable. Questions were adapted to include more answer options and options were adapted to improve coding of answers. Problems experienced with the clarity of the questions were corrected. Pilot questionnaires were not included in the final data.

Step 3: Collection of data

- The four clinics that were included for collection of data were Phutanang, Betty Gaetsewe, Masakhane and Galeshewe Day Hospital. These clinics were included as they provide paediatric care and have implemented the PMTCT programme. The nursing staff of each clinic, involved with paediatric care, was notified of the inclusion and exclusion criteria for participation in this study. Nursing staff were then requested to refer all mothers that meet the inclusion criteria and that were willing to participate in the study to the researcher.
- After the study had been explained to the mother, the mother received an information page to further explain the study. The consent form was signed before the mother and child were included in the study.
- The questionnaire was completed by the researcher during a structured interview with the mother.
- The interviews as well as measurements were conducted/ taken in a private consultation area.
- Weight and height of mothers were obtained by the researcher in a private room.
- Weight, height and MUAC of the children were obtained by the researcher in a private room.
- Participants received an incentive in the form of sponsored toys, clothing or blankets for children after completion of the questionnaire.

Step 4: Processing of data

All data were collected on the questionnaire and captured by the researcher on an Excel spreadsheet. Data were captured in duplicate by the researcher and compared electronically by the Department of Biostatistics, University of the Free State, to ensure accurate capturing.

3.4 Statistical analysis

The Department of Biostatistics, Faculty of Health Sciences, University of the Free State assisted with analysis of the data. The data analysis for this study was done using SAS/STAT software, Version 9.3 of the SAS system for Windows, Copyright © 2010 SAS Institute Inc. Descriptive statistics namely, means and standard deviations or medians and percentiles for continuous variables and frequencies and percentages for categorical variables were calculated. 95% confidence intervals (CI) for the percentage or median difference and Spearman's correlations were used to describe and test associations between variables. Kruskal Wallis test was calculated when the sample was too small to calculate confidence intervals.

3.5 Reliability and validity

Validity refers to the extent to which an instrument measures what it claims to measure as well as the degree to which evidence and theory support the interpretation of the measurement (Ary *et al.*, 2010:224).

Reliability is the tendency towards consistency found in repeated measurements of the same phenomenon. The more consistent the results are that are given by the repeated measures, the more reliable the measurement procedures are (Ary *et al*., 2010:225)

3.5.1 Anthropometry

The validity of the anthropometric measurements was ensured by following standardized methods described by the WHO STEPS surveillance user manual (2008:3-3-3) and Gibson (2005:245). All anthropometric measurements were measured by the researcher with the same equipment, which ensured reliability of the measurements. Calibration of equipment and repeating measures three times, using the median value, also contributed to increased measurement reliability.

3.5.2 Questionnaire

To ensure the validity of the questionnaire, questions were based on the investigated literature and the current PMTCT policy. A pilot study to test understanding of the questions was performed. This ensured that all the questions were easily understood by participants and relevant data collected. All questionnaires were completed by means of a structured interview, conducted by the researcher, which eliminated the risk of different interpretations of different fieldworkers that could influence reliability of answers. The questionnaire was compiled in English and the researcher could interview the participant in the language of choice, whether it is English or Afrikaans. If a participant did not understand English or Afrikaans, a member of the nursing staff was asked to translate. The translator was trained by the researcher to understand questions and interpret answers as the researcher does, to ensure validity.

The content validity of the questionnaire was confirmed by the evaluation committee of the University of the Free State.

Cross checking was done where possible to ensure that the information provided by the participant was reliable. The following questions were cross checked:

- Whether the mother has defaulted on ARV use was not only asked, but her clinic file was investigated to check whether she defaulted ARV's.
- As the place of delivery does not accurately predict whether the mother received ARV's during labour, due to the clinic that might have been out of stock, the mother was asked whether she remembered receiving ARV's during labour.

As participants in this study were treated according to the 2010 and 2013 PMTCT programs, both of these regimes were seen as acceptable when data were evaluated.

3.6 Ethical considerations

The Head of the Department of Health (Addendum B) as well as the heads of all participating clinics (Addendum C) were briefed about the study and approval to perform the study was obtained. The study was submitted to the Ethics Committee of the Northern Cape Department of Health and a statement of approval was obtained from this committee (Addendum D).

Approval for this study was obtained from the Ethics Committee from the Faculty of Health Sciences of the University of the Free State (Addendum E).

All participants received information about the study before signing consent to participate. The information pages (Addendum F) as well as the consent forms (Addendum G) were made available in English, Afrikaans as well as the local language, Tswana.

Participants were free to not answer any questions or withdraw from the study at any stage without any negative influence on their further treatment.

Participation to the study was confidential and no name or other form of identification was used that could identify the participant from the study.

Participants were not remunerated for participation, but receive incentives in the form of blankets and infant clothes or toys.

3.7 Conclusion

The results of this study will be made available in the form of articles to be published and will also be made available to the Department of Health to improve and enhance services delivered by PMTCT facilities.

Chapter 4

Anthropometric status of Human Immunodeficiency Virus (HIV) infected mothers and their breastfed children

This article describes the anthropometric status of HIV infected mothers and their breastfed children to report on the first objective of this study as stated in chapter 1. The anthropometric status of mother-child pairs where mother to child transmission took place is further compared to pairs where transmission did not take place. The article is prepared according to the author instructions of the South African Journal of Clinical Nutrition and the author guidelines are attached as Addendum H. The references used for this study is reported according to the Department of Nutrition and Dietetics' guidelines.

Abstract

Objectives: To describe the anthropometric status of HIV infected mothers and their breastfed children in the Francis Baard district and to investigate the effect of anthropometric status on Mother-to-Child Transmission (MTCT) of HIV.

Design: A cross sectional, descriptive study was performed.

Setting: Four clinics providing Prevention of Mother-to-Child Transmission (PMTCT) services in the Frances Baard District in the Northern Cape Province were identified to participate in this study.

Subjects: A sample of 100 mother-child pairs that were included in the PMTCT programme at their local clinic was included. For inclusion in the study, the child had to be breastfed and the biological mother had to be present for an interview.

Outcome measures:

Anthropometry of the mothers and children were measured. Data related to socio economic status, HIV infection stage, PMTCT care, child feeding practices and MTCT transmission of HIV were collected.

Results: According to weight-for-height z-scores, 7% of the children were moderately malnourished and none were severely malnourished however, mid-upper arm

circumference (MUAC) identified three children with severe acute malnutrition (SAM). Height-for-age classified 29% of the children as stunted. Six mothers were underweight, while 74 mothers were classified as overweight or obese based on Body Mass Index (BMI).

The mother's CD4 cell count, household income, marital status, employment status and education level showed no significant effect on her own or the child's weight status. Mothers with lower CD4 cell counts (p= 0.03), more advanced HIV stage (95% CI: [23.5% ; 87.1%]) and an underweight BMI (95% CI: [0.3% ; 74.2%]) had HIV infected children. HIV infected children were more likely to have a lower weight-for-age z-score (95% CI: [13.0% ; 86.9%]).

Conclusions: Maternal health and anthropometry were related to the HIV infection status of children. Measures to improve maternal health are important to improve child health and mortality.

Keywords:

Human Immunodeficiency Virus (HIV), Acquired Immunodeficiency Syndrome (AIDS), Mother-to-Child Transmission (MTCT), Prevention of Mother-to-Child Transmission (PMTCT), Anthropometry, Breastfeeding, Feeding practices

4.1 Introduction

Human immune-deficiency virus (HIV) infection has proven to have a detrimental effect on body composition, with HIV infected individuals presenting with a significantly lower body weight, body mass index (BMI), waist circumference and mid-upper arm circumference (MUAC) compared to HIV uninfected peers (Swaminathan *et al*., 2008:948). Contributing factors include decreased food intake, decreased nutrient absorption capability and/ or increased nutritional needs resulting from the infection (de Pee & Semba, 2010:318).

Low birth weight (LBW) is common amongst both children born HIV infected or HIV exposed (Dreyfuss *et al*., 2001:817; Makasa *et al*., 2007:599; Dobrova-Krol *et al.*, 2010:246). These children often have developmental delays and physical growth delays (Dobrova-Krol *et al.*, 2010:246). Lee *et al.* (2006: 276) reported that HIV infected children between the ages

of five and 11 years had a much lower score for physical resilience compared to non-infected children.

According to Berhane *et al*. (1997:3) perinatal HIV mother-to-child transmission (MTCT) is a predicting factor for early and severe cases of malnutrition and failure to thrive in children. HIV infected children assessed in their study showed progressive decrements in height and weight, which were contributed to the children being more prone to opportunistic infections. Poor nutritional status is a attributed factor in the acceleration of the onset of acquired immune-deficiency syndrome (AIDS) from HIV infection (Berhane *et al*., 1997:3; de Pee & Semba, 2010:318) and protein energy malnutrition is exacerbated by HIV infection (Bachou *et al*., 2006:6).

Dreyfuss *et al*. (2001:816) investigated factors that could contribute to LBW in children and found that HIV infection of the mother was an important risk factor. The stage of HIV infection and the mother's CD4 count were associated with LBW. The mother's weight, height and MUAC were negatively associated with LBW in children. The CD4 count of the mother was also negatively associated with MTCT (Rollins *et al*., 2007:325). A low maternal BMI, indicating that the mother is underweight, has been shown to be a predicting factor for MTCT of HIV (Mehta *et al*., 2008:1643).

As breastfeeding poses as risk for MTCT, the Prevention of Mother-to-Child Transmission (PMTCT) policy has been implemented by the Department of Health in South Africa to reduce this risk. Since the implementation of this programme, the World Health Organisation's (WHO) guidelines on HIV and infant feeding (WHO, 2010:6) has been published. This recommends breastfeeding rather than formula feeding in resource poor settings, as the risk of HIV infection is lower than the mortality and morbidity risks associated with formula feeding.

Breastfeeding has proven to be effective in preventing stunting and wasting in HIV exposed children, partly because breast feeding decreases opportunistic infection risk in children (Venkatesh *et al*., 2010:1372). The PMTCT policy therefore recommends that mothers should exclusively breastfeed their infants until six months and then introduce solids, while continuing breastfeeding until 12 months (DOH 2013:14).

This article reports on the anthropometric status of HIV infected mothers and their breastfed children, to describe the effect of recommended feeding practices on nutritional status and PMTCT.

4.2 Methods

A cross sectional, descriptive study was performed. A sample of 100 mother-child pairs that were included in the PMTCT programme and attended their local clinic for paediatric care were included. For inclusion in the study, the child of the HIV infected mother had to be breastfed and the six weeks post breastfeeding cessation HIV test had to be done. Children had to be younger than 40 months and the biological mother had to be present for an interview.

4.2.1 Ethical approval

Approval to conduct the study was obtained from the Northern Cape Department of Health Research Ethics Committee, which includes approval from clinic heads as well as the Head of Department of Health, Northern Cape. Ethical approval for the study was also obtained from the Ethics Committee, Faculty of Health Sciences; University of the Free State (230408-011). Informed consent was obtained from mothers before inclusion in the study

4.2.2 Measurements and techniques

4.2.2.1 Anthropometric measurements

For mothers, height and weight were measured using standard techniques to calculate body mass index (BMI).

Height / Length, weight and MUAC were measured for all children. The height of children was measured, using standard techniques and used to interpret weight–for-height as well as height-for-age. The weight of the child was measured to interpret weight-for-height as well as weight-for-age. The World Health Organisation (WHO) z-scores were used to interpret anthropometric measures. Measures were interpreted as normal if the z–score was between +2 and -2 standard deviations (SD). Underweight was identified when the weight-for-age were between -2 and -3SD and severely underweight if the z-score were less than -3SD (WHO, 1997:50). Height- for- age was classified as stunted if the z-score were between -2 and -3SD and severely stunted if the z-score were less than -3SD. A weight-for-height z-

score of -3 to -2 was classified as moderate acute malnutrition (MAM) while a z-score of less than -3 as severe acute malnutrition (SAM).

Body Mass Index

BMI is calculated by dividing the weight (kg) of a person by their height (m) squared, and can be used to indicate body adiposity. The WHO categories were used to interpret the BMI of the mother. A BMI of less than 18.5kg/m² was classified as underweight, a BMI of 18.5kg/m² - 24.9kg/m² as normal and a BMI of 25kg/m² - 29.9kg/m² as overweight and 30kg/m² or more as obese (WHO, 2006: Online).

Mid-Upper Arm Circumference

A non-stretch measuring tape was used to measure the MUAC of the child, using standard techniques. The WHO/ United Nations Children's Fund (UNICEF) standards for MUAC were used to interpret the MUAC of the child. A MUAC of less than 115mm indicate that the child is malnourished (WHO/UNICEF, 2009:2).

4.2.2.2 Questionnaire

A questionnaire was used to obtain information on the socio-demographic background of the household; HIV disease progression of the mother; antenatal clinic attendance; infant feeding practices; factors influencing feeding practices; administration of the child's antiretroviral treatment (ART); type of ART used by the mother, if any, as well as duration of ART use by the mother and birth weight of the child.

The questionnaire was pretested during a pilot study to assure clarity, consistency and acceptability of the questions. All questionnaires were completed by the researcher during a private, structured interview with the mother. All questions were asked as open ended questions so that the questions did not lead the mothers in any way. The answers were then recorded and coded.

4.2.3 Statistical analysis

Statistical analyses were performed by the Department of Biostatistics, University of the Free State. Data was entered by the researcher in duplicate on an Excel spreadsheet to ensure

accuracy and compared electronically. Descriptive statistics were used to explain the sample; and medians and percentiles were calculated to report on continuous variables. Frequencies and percentages were calculated for categorical variables. Groups were compared by means of 95% confidence intervals (CI) for the percentage or median difference. Kruskal Wallis test was calculated when the sample was too small to calculate confidence intervals.

4.3 Results

4.3.1 Population characteristics

The study sample consisted of 100 mothers-child pairs; therefore percentages will only be indicated if the population referred to does not include all 100 participants. Table 4.1 shows that most mothers (n=78) had a high school education, the median household income was R3000 and most mothers were either single (n=39) or living with their partner (n=39). Thirty three mothers were employed, 33 unemployed and 25 were unemployed by choice. All of the mothers were HIV infected and were enrolled in the PMTCT programme at their local clinic.

Of the 100 mothers recruited as part of the mother-child pairs, six had a BMI classified as underweight, 20 had a BMI classified as normal, while 35 were classified as overweight. Most of the mothers were classified as obese (n=39) as indicated in Table 4.1.

Table 4.1: Demographic description, HIV profile and anthropometric measures of mothers (n=100)

Characteristics	**n / %**	**Median (range)**
Age (years)		32.0 (21.1 – 45.4)
Education level obtained		
No schooling	1	
Primary school (grade 1-7)	16	
Secondary school (grade 8-12)	78	
Tertiary education	5	
Marital status		
Single	39	
Married	15	
Living with partner	39	
Divorced	3	
Widowed	4	
Employment status		
Employed	33	
Unemployed	33	

Unemployed by choice	25	
Employed part time	7	
Attending school	2	
Characteristics	**n / %**	**Median (range)**
Household income (R)		R3000.00 (600.00 – 2400.00)
HIV stage		
Stage 1	78	
Stage 2	22	
Stage 3	0	
Stage 4	0	
CD4 count (cells/mm^3)		412 (126 – 1854)
<350	42	
>350	58	
First tested for HIV		
Before last pregnancy	56	
During last pregnancy	44	
After last pregnancy	0	
While breastfeeding	0	
Duration of HIV infection (years)		4 (1 – 13)
Type of ART used		
Lifelong	59	
PMTCT until birth	27	
PMTCT until BF cessation	3	
None	11	
BMI		
Severely underweight ($\leq$16.0 kg/m^2)	1	
Underweight (16.1 -18.4kg/m^2)	5	
Normal weight (18.5 – 24.9kg/m^2)	20	
Overweight (25.0 – 29.9kg/m^2)	35	
Obese ($\geq$30kg/m^2)	39	

In Table 4.2 the anthropometry of the children is categorised according to the WHO's z-score system. According to the weight-for-height z-scores, five (12.8%) boys and two (3.3%) girls were moderately malnourished and none were severely malnourished. The height- for- age z-scores indicated that five (12.82%) boys and 21 (34.42%) girls were below the -2 z-score and can therefore be classified as stunted. Thirteen children had a birth weight of less than 2.5 kg while there were 13 children that had a birth weight of more than 3.5 kg.

Three children had a MUAC of less than 115mm, indicating SAM.

Table 4.2: Weight –for-age, height-for-age and weight-for-height z-scores of male and female children

Z - score	Weight – for – age						Height – for – age						Weight – for - height					
	Male		Female		Total		Male		Female		Total		Male		Female		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
≤3SD	1	2.5	1	1.6	2	2.0	2	5.1	11	18.0	13	13.0	0	0.0	0	0.00	0	0.0
-3 - -2 SD	3	7.6	4	6.5	7	7.0	3	7.6	10	16.4	13	13.0	5	12.8	2	3.3	7	7.0
-2 – 2 SD	33	84.6	55	90.1	88	88.0	29	74.3	38	62.3	67	67.0	33	84.6	56	91.8	89	89.0
2-3 SD	1	2.5	1	1.6	2	2.0	4	10.2	1	1.6	5	5.0	1	2.6	3	4.9	4	4.0
>3 SD	1	2.5	0	0.0	1	1.0	1	2.5	1	1.6	2	2.0	0	0.0	0	0.0	0	0.0

4.3.2 HIV stage, ART usage and anthropometry

Table 4.3 shows the BMI categories of the mothers and the outcomes measured according to the mother's nutritional status. When the BMI categories (underweight or overweight) of the mothers were investigated, there was no difference in CD4 cell count (95% CI: [-201; 311]), duration of being HIV infected (95% CI: [-0.30; 0.10]), duration that the mother had used ART (95% CI: [-0.30; 0.10]) or HIV stage (95% CI: [-35.5%; 22.3%]) between the two groups.

Table 4.4 indicates the contributing factors to malnutrition in children. The CD4 cell count of the mothers did not affect the weight-for-age (95% CI: [-14.6% ; 9.9%]) or weight-for-height (95% CI: [-0.6; 0.3]) of the child but mothers with HIV infected children had significantly lower CD4 cell counts compared to mothers of HIV uninfected children (p=0.03). The HIV stage of the mother did not affect the weight-for-age of the child (95% CI: [-44.5%; 10.8%]) but mothers with an early stage of HIV infection had children with normal weight-for-height rather than a weight-for-height indicating malnutrition (95% CI: [-65.7%; -4.4%]). Mothers with an advanced stage of HIV infection were 0.2 times more likely to have children with MAM. HIV infected children had mothers with a more advanced HIV stage (95% CI: [23.5%; 87.1%]).

Table 4.3: Outcome measures according to maternal nutritional status

	BMI: underweight (n=6)			**BMI: normal weight (n=20)**			**BMI: over weight (n=74)**		
		%	Range		%	Range		%	Range
Median CD4 (cells/mm^3)	439.5		134 – 893	401		190 – 951	413		126 – 1854
HIV stage									
Stage 1	5	83.3		15	75.0		58	77.3	
Stage 2	1	16.7		5	25.0		16	21.6	
Median duration of HIV infection (months)	54.0		52.8 – 54.4	54.0		53.8 – 54.4	54.1		53.2 – 54.5
Median duration of ART usage (months)	54.0		53.8 – 54.4	54.1		53.8 – 54.4	54.1		53.2 – 54.5
Median age of mother (years)	32.8		29.7 – 36.5	29.2		21.8 – 37.2	33.1		21.1 – 45.4
PCR positive at six weeks	0	0.0		0	0.0		0	0.0	
PCR positive six weeks post breastfeeding	1	16.7		2	1.0		0	0.0	
Median weight of child (kg)	9.58		5.1 – 13.6	9.35		6.9 – 13.9	9.74		5.2 – 18.6
Median household income (R)	2500.00		1600.00 - 3500.00	2900.00		600.00 – 4000.00	3000.00		800.00 – 24000.00
Employment status									
Employed	1	16.7		0	0.0		32	43.2	
Unemployed	5	83.3		9	45.0		19	25.7	
Unemployed by choice	0	0.0		10	50.0		15	20.3	
Employed part time	0	0.0		0	0.0		7	9.5	
School	0	0.0		1	5.0		1	1.4	
Marital Status									
Single	5	83.3		7	35.0		27	36.5	
Married	0	0.0		0	0.0		15	20.3	
Living with partner	1	16.7		12	60.0		26	35.1	
Divorced	0	0.0		0	0.0		3	4.1	
Widowed	0	0.0		1	5.0		3	4.1	

Table 4.4: Contributing factors to malnutrition in children and the relative risk for malnutrition associated with these factors

	Anthropometric status of children																	
	Weight-for-age						**Height-for-age**						**Weight-for-height**					
	Under-weight (n=9)		Normal/ overweight (n=91)		Relative risk	95% CI for relative risk	Stunted (n=26)		Normal (n=74)		Relative risk	95% CI for relative risk	Moderately malnourished (n=7)		Normal (n=93)		Relative risk	95% CI for relative risk
	n	%	n	%			n	%	n	%			n	%	n	%		
Low maternal BMI	2	22.2	4	4.4	4.5	[1.2 ; 17.0]*	3	11.5	3	4.1	2.0	[0.9 ; 4.9]	2	28.6	4	4.3	6.3	[1.5 ; 25.8]*
Mother CD4 ≤350	3	33.3	39	42.9	0.7	[0.2 ; 2.6]	8	30.8	34	45.1	0.6	[0.3 ; 1.3]	5	71.4	37	39.8	3.5	[0.7 ; 16.9]
Mother HIV stage					0.6	[0.2 ; 2.1]					1.2	[0.5 ; 2.8]					0.2	[0.1 ; 0.9]*
Stage 1	6	66.6	72	79.1			21	80.8	57	77.0			3	42.9	75	80.7		
Stage2	3	33.3	19	20.9			5	19.2	17	23.0			4	57.1	18	19.4		
Infection state					9.2	[3.2 ; 27.0]*					1.3	[0.3 ; 6.6]					12.9	[4.0 ; 41.7]*
HIV infected	2	22.2	1	1.1			1	3.9	2	2.7			2	28.6	1	1.1		
Not HIV infected	7	77.7	90	99.0			25	96.2	72	97.3			5	71.4	92	98.9		
Low birth weight	2	22.2	11	12.2	1.9	[0.4 ; 8.1]	7	28.0	6	8.1	2.6	[1.3 ; 4.9]*	0	0.0	13	14.1	0.4	[0.0 ; 6.9]
Children who were mixed fed	6	66.6	44	48.4	2.0	[0.5 ; 7.6]	16	61.5	34	46.0	1.6	[0.8 ; 3.2]	4	57.1	46	49.5	1.3	[0.3 ; 5.7]
Education level					1.4	[0.3 ; 6.1]					0.2	[0.0 ; 1.3]					6.5	[1.6 ; 26.5]*
Grade 1-7	2	22.2	15	16.5			1	3.9	16	21.6			4	57.1	13	14.0		
Grade 8 +	7	77.8	76	83.5			25	96.2	58	78.4			3	42.9	80	86.0		
Household Income					0.7	[0.2 ; 2.6]					1.6	[0.8 ; 3.1]					1.8	[0.4 ; 7.8]
≥ R3000	6	66.7	52	57.1			12	46.2	46	62.2			3	42.9	55	59.1		
< R3000	3	33.3	39	42.9			14	53.9	28	37.8			4	57.1	38	40.9		

*Statistically significant

4.3.3 Socio economic status and anthropometry

When the children's z-score groups (z-score <-2 and z-score >-2) were compared with household income, household income showed no effect on weight-for-age (95% CI: [-700; 1000]) or height-for-age (95% CI: [-1000; 200]) of the child. Household income also did not have an effect on the child's MUAC (95% CI: [-9.6; 9.2]). Household income did not differ between the underweight and overweight mothers (95%CI: [-1500; 500]).

When comparing the mother's BMI with employment status, mothers who were employed were more overweight than their unemployed peers (95% CI: [-54.6%; -23.9%]). Employment status however showed no affect on the weight-for-age (95% CI: [-37.8%; 9.6%]) or weight-for-height (95% CI: [-0.5; 0.6]) of the child.

The education level of the mothers did not differ between the weight-for-age (95% CI: [-1; 1]) z-score groups of the children. As indicated in Table 4.4, mothers with a lower level of education were 6.5 times more likely to have a child presenting with MAM.

The age of the mother affected BMI as older mothers were more overweight than normal weight (95% CI: [-6.66; -1.02]). The age of the mother did not affect the height-for-age of the child (95% CI: [-3.8; 1.1]). Mothers who were not married were underweight rather than normal weight (95% CI: [3.1%; 70.0%]) or overweight (95% CI: [5.6%; 63.8%]). Whether the mother was married or not did not have an effect on the weight-for-height (95% CI: [-7.8%; 15.3%]) or the weight-for-age (95% CI: [-29.9%; 26.4%]) of the child.

4.3.4 Effect of mother's weight on the child's weight and height

Whether the mother was overweight or underweight did not affect the weight of the child (95% CI: [-3.83; 2.83]). There was, however, a significant difference between the weight-for-age of children of mothers with an underweight BMI (95% CI: [4.6%; 66.0%]) or normal BMI (95% CI: [2.0%; 37.7%]) compared to overweight BMI. Weight-for-height z-scores of children from underweight (95% CI: [6.1%; 67.4%]) and normal weight (95% CI: [0.5%; 33.4%]) mothers differed significantly from overweight mothers. Children of underweight mothers were 4.5 times more likely to have weight-for-age- and 6.3 times more likely to have weight-for-height z-scores of less than -2 indicating malnutrition than mothers with a BMI indicating normal or overweight. The mother's BMI had no significant effect on the height-for-age of the child (95% CI: [-7.4%; 58.0%]).

There was a statistical significant difference between the BMI of mothers of HIV infected and HIV uninfected children as more underweight mothers had an HIV infected child (95% CI: [0.3%; 74.2%]).

4.3.5 Feeding practices and the impact of ART usage on the child's anthropometry

Whether or not the child's weight-for-age was <-2 or > -2 z-score was not affected by the age that solids were introduced (95% CI: [-2; 0]) or if solids were introduced before six months (mix feeding) (95% CI: [-14.8%; 36.7%]). The duration of breastfeeding (95% CI: [-3; 3]), the duration of prophylactic ART / NVP administration to the child (95% CI: [-20; 0]), whether prophylactic ART was administered or not (95% CI: [-12.2%; 24.6%]) and birth weight of the child (95% CI: [-0.60; 0.05]) did not affect the current weight-for-age of the child.

Weight-for-age of children that were HIV infected were significantly different from those not HIV infected (95% CI: [13.0%; 86.9%]) as HIV infected children were more underweight than their uninfected peers (weight-for-age z-score of less than -2). Children that were HIV infected were 9.2 times more likely to be underweight and 12.9 times more likely to present with MAM.

4.4 Conclusion

Even though older mothers in this study had an higher BMI and single mothers were more likely to be underweight, age and marital status did not affect the anthropometry of the child which was in contradiction with Venkatesh *et al*. (2010:1367) and Arpadi *et al*. (2009: 352) who reported that younger mothers were more likely to have underweight children and married women have heavier children. Mothers who are employed and more educated are reported to have heavier children compared to their unemployed peers (Arpadi *et al*., 2009:352). However, in this study, employment and educational level showed no effect on the child's weight-for-age and weight-for-height.

Maternal CD4 cell count seems to be a significant predicting factor for child growth, as a lower CD4 cell count is linked to growth faltering in children, resulting in lower weight-for-age and height-for-age (Venkatesh *et al*., 2010:1367) scores. Lower CD4 cell counts increase MTCT of HIV (Rollins *et al*., 2007:325) as also supported by this study. An advanced maternal HIV stage is also known to effect children's growth (Arpadi *et al*., 2009:352). In this study however, maternal CD4 cell count did not affect weight-for-age or weight-for-

height of children. Mothers with a stage one HIV infection had children with a healthy weight-for-height z-score.

The BMI of the mothers was associated with the weight-for-age and weight-for-height of their children. The positive association between maternal BMI and child weight is supported by studies by Makasa *et al*. (2007:599) and Arpadi *et al*. (2009:346).

According to Mehta *et al*. (2008:1641) maternal BMI is a predicting factor for MTCT of HIV, which is supported by this study, which showed more underweight mothers to have HIV infected children.

Feeding practices did not have any effect on the weight-for-age of the children, as supported by other studies that showed that the duration of exclusive breastfeeding (EBF) did not affect the anthropometry of the child and that growth faltering occurred even before cessation of EBF (Makasa *et al*., 2007: 598).The duration of breastfeeding also did not affect weight-for-age (Arpadi *et al*., 2009:346).

HIV infection has shown to predict stunting and wasting (Venkatesh*et al*., 2010:1368) and in this study all HIV infected children had a weight-for-age z-score of less than -2 SD, indicating malnutrition.

As the weight of the mother impacts the health of the child, including MTCT of HIV and growth, it is important that women of childbearing age not be overlooked by the national health system and that mother and child health care be prioritised.

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Chapter 5

Implementation and adherence to the Prevention of Mother-to-Child Transmission (PMTCT) programme and risk factors identified for Mother to Child Transmission of Human Immunodeficiency Virus (HIV) in the Frances Baard district: Northern Cape

This chapter is presented in an article format to describe the implementation of and adherence to the Prevention of Mother- to- Child Transmission (PMTCT) policy in the Frances Baard District in the Northern Cape Province, in order to report on objective 3, 4 and 5 of this study, as described in chapter 1. The article elucidates the policy and evaluates how the policy guidelines are met by facilities in this district. The article also reports on counselling provided to mothers in the PMTCT programme, to determine whether the PMTCT policy is implemented as required. Factors that may affect the effectiveness of the PMTCT policy is also investigated and the associated risk of these factors for mother to child transmission (MTCT) of Human Immunodeficiency Virus (HIV) in this population is described. The format of this article is adapted according to the requirements of the South African Medical Journal (SAMJ). The author guidelines set for the SAMJ are included as Addendum I. The references used for this study is reported according to the Department of Nutrition and Dietetics' guidelines.

Abstract

Background: The Prevention of Mother- to- Child Transmission (PMTCT) of Human Immunodeficiency Virus (HIV) policy has been implemented in South Africa for more than ten years. Transmission of HIV from mother to child has decreased considerably since introduction of this policy. The Northern Cape had the lowest reported mother-to-child transmission (MTCT) rate of 1.4% in 2010.

Objectives: To describe implementation and adherence to the PMTCT policy in the Frances Baard district, Northern Cape Province; and determine factors that may affect the effectiveness of this policy to reduce MTCT.

Methods: 100 Mother-child pairs, enrolled in the PMTCT programme at four local clinics in the Frances Baard District were recruited. A cross-sectional,

quantitative, descriptive study was conducted, using a structured questionnaire and information from patient files to collect data on medication and clinic adherence.

Results: Even though most mothers had adequate knowledge regarding feeding practices and PMTCT, no association was found between their knowledge and actual practice. Three children (3%) were HIV infected six weeks after cessation of breastfeeding. HIV infected children had mothers with a more advanced stage of HIV infection [23.5%; 87.1%], lower CD4 levels (p=0.03) and who defaulted ART during breastfeeding [21.3%; 85.4%].

Conclusion: The PMTCT programme is implemented according to the national policy in this district and most mothers received ample opportunity for counselling regarding HIV, PMTCT and optimal feeding practices. The programme proved to be effective to reduce MTCT of HIV to 3% in this population. Improved ART compliance and earlier PMTCT uptake may further improve effectiveness of this policy.

5.1 Introduction

In 2013, Human Immunodeficiency Virus (HIV) infection and Acquired Immunodeficiency Syndrome (AIDS) was ranked the third leading cause of natural death in South Africa, compared to seventh in 2011. HIV/AIDS was the leading cause of death in the Northern Cape in 2013, being responsible for 8.7 % of all deaths. That was the first year that HIV/AIDS was documented as the leading cause of death in any province since 2007 (STATS SA, 2014:36).

Since 2001, the HIV infection rate amongst children has globally decreased by 58% as reported in 2013, but despite this progression, 240 000 children were still newly infected in 2013 in low and middle income countries globally (UNAIDS, 2014:2).

The United Nations (UN) developed eight millennium development goals (MDG) to be reached by 2015 (Sachs & McArthur, 2005:347). Of these goals the Prevention of Mother – to-Child Transmission (PMTCT) policy contributes to the reduction of child mortality, improvement of maternal health and prevention of the spread of HIV/ AIDS.

The PMTCT programme was introduced in South Africa in 2002 (DOH, 2008:3). The PMTCT programme consists primarily of four elements, namely prevention of HIV infection among women of childbearing age, prevention of unintended pregnancy among HIV infected

women, providing appropriate treatment, care and support for woman living with HIV and preventing HIV transmission from mother to infant (Luo *et al*., 2007:181).

In South Africa 75 – 100% of HIV infected pregnant women received PMTCT care in 2011, making this programme widely available and accessible (UNAIDS, 2012:43). In 2010, the national rate of MTCT in South Africa was 3.5% at eight weeks of age, with the Northern Cape having the lowest MTCT rate of 1.4% (Goga *et al.*, 2010:16).

Since proper antiretroviral and infant feeding policies have been put in place, the Joint United Nations Programme on HIV/AIDS (UNAIDS) reported a decrease in child HIV infections from 430 000 in 2009 to 330 000 in 2011 globally (UNAIDS, 2012:42).

The PMTCT policy can only be effective if implemented properly, which depends primarily on the willingness of all mothers to be tested for HIV and if positive, to enrol in the PMTCT programme (Coetzee *et al*., 2005:491). The proper implementation of the PMTCT policy further relies on a strong health care system and skilled healthcare workers (Luo *et al*., 2007:182). The PMTCT programme sets specific goals to ensure optimal efficiency and steps should be put in place by health care facilities to reach these goals.

Clinic attendance

Initial HIV counselling and testing (HCT) should be done during the first antenatal clinic visit. CD4 cell count and HIV staging should be determined if the mother tested HIV infected (DOH, 2013: 25). The mother should attend at least four counselling sessions on optimal feeding practices during the antenatal period (DOH, 2013:41). It is therefore important that the mother should comply with scheduled clinic appointments and that these appointments be scheduled by health facilities.

Counselling on feeding practices

The PMTCT policy states breastfeeding as the preferred method of infant feeding. Mothers are counselled to breastfeed exclusively for the first six months of life; where after other foods may be introduced, while continuing breast feeding until the age of one year (DOH, 2013:41).

Antiretroviral therapy initialisation

According to the 2010 PMTCT policy, mothers should receive antiretroviral therapy (ART) from 14 weeks of gestation (DOH, 2010:30). The 2013 policy states that the mother should start on ART as soon as possible during pregnancy. Mothers that are already on lifelong ART should continue with ART throughout pregnancy (DOH, 2013:27). It is therefore important that the mother starts antenatal care as soon as possible.

Children of mothers that are HIV infected should be started on Nevirapine (NVP) within 72 hours after birth (DOH, 2013:33).

The 2010 PMTCT policy states that if the mother is on lifelong ART, she should continue with breastfeeding while the child receives prophylactic NVP for the first six weeks of life. If the mother is not on lifelong ART, the PMTCT ART should be stopped after birth and the child should continue on prophylactic ART until cessation of breastfeeding (DOH, 2010:11). According to the 2013 PMTCT policy, a mother that is not on lifelong ART should continue with PMTCT ART until one week after cessation of breastfeeding while the child's NVP is stopped at six weeks of age (DOH, 2013:34).

Mothers in labour, that are on PMTCT ART or receiving no treatment should receive ART three hourly from the onset of labour until delivery. A mother that is on lifelong ART should continue with her regular regimen until delivery (DOH, 2010:11).

Testing of children

HIV exposed children should routinely be tested for HIV infection at six weeks, six weeks after cessation of breastfeeding and at eighteen months (DOH, 2013:6).

Road to health booklets

The Road to Health booklet (RTHB) is a tool used by health professionals to monitor a child's growth and health from birth to early childhood. The booklet also contains information regarding PMTCT and HIV exposure care provided. Every child should have a RTHB, which acts as tool for management of children at health care facilities (DOH, 2013:14).

Partner involvement

Mothers should be encouraged to involve her partner during antenatal care, delivery and post-natal care (DOH, 2013:12).

This study investigated the implementation of and adherence to the PMTCT policy; factors that may influence the effectiveness of this policy as well as MTCT in the Frances Baard district of the Northern Cape, South Africa.

Antenatal clinic attendance of mothers, counselling on feeding practices received, initialisation of ART during pregnancy and labour, knowledge of mothers about PMTCT, use of RTHB's and partner involvement will be reported on. Compliance of the PMTCT service to the national PMTCT policy will also be described.

5.2 Methods

A cross-sectional, descriptive study was performed.

5.2.1 Study population

One hundred mother-child pairs, who attended antenatal clinics in the Frances Baard District, Northern Cape Province for PMTCT care, were included in this study. Mothers who breastfed their children, stopped breastfeeding with children 40 months or younger, who had their six week post breastfeeding cessation HIV test done, were included in the study.

5.2.2 Questionnaire

A questionnaire, on adherence to the PMTCT policy and factors influencing adherence, was completed by the researcher during a structured interview with the participants in the study. The questionnaire was pretested to assure clarity, consistency and acceptability of the questions.

Socio demographic information, including age, educational/schooling level, marital status and employment status of the mother; household income, as well as the number of people dependant on the household income were collected.

HIV infection of the mother was described by CD4 cell count and HIV stage. The CD4 cell count and WHO classification of HIV stage was obtained from the clinic file.

Antenatal clinic attendance was described by the gestational age when the mother first attended antenatal clinic as well as gestational age when the mother entered the PMTCT programme. The number of clinic visits during pregnancy was also recorded.

Knowledge of the mother about the PMTCT policy, her own use of prescribed ART and the administration of the child's ART was determined. These questions were open ended and recorded by the researcher. Knowledge questions were interpreted as 'knows' or 'does not know'. If the mothers could answer the open ended questions according to the operational definitions, it was indicated as correct. Exclusive breastfeeding indicated that no other food or drink was given to the child except breast milk. Mixed feeding referred to mothers giving anything other than breast milk during the first six months of the child's life.

As place of delivery influence the administration of ART during labour and delivery, the place of delivery was recorded in the questionnaire.

The knowledge and practices of the mother regarding exclusive breastfeeding, introduction of solids and age of cessation of breastfeeding were investigated.

Factors influencing feeding practices including stigma, social pressure and knowledge of mother were also recorded.

Information on adherence to ART of the mother and prophylactic ART of the child was obtained from the mother as well as from the files.

Administration of ART to the child was described by determining whether the mother is administering ART in the correct manner or not. The amount of NVP prescribed was used as reference and compared to the amount given to the baby as indicated by the mother.

The type of ART used by the mother, if any, as well as compliance of the mother was recorded. Compliance according to the mother was cross checked with the patient file, which indicated adherence according to a pill count as satisfactory or not.

Partner involvement and support during antenatal clinic visits, during the breastfeeding period and disclosure of HIV status was investigated.

HIV status of the infant at six weeks and six weeks after cessation of breastfeeding was obtained from the patient file and additional testing was not done by the researcher.

5.2.3 Ethical approval

Approval for the study was obtained from the Northern Cape Department of Health Research Ethics Committee. Ethical approval was obtained from the Ethics Committee, Faculty of Health Sciences; University of the Free State (230408-011). Informed consent was obtained from mothers that met the inclusion criteria for the study, before inclusion in the study.

5.2.4 Statistical analysis

Data were entered in duplicate by the researcher on an Excel spreadsheet and compared electronically, to ensure accuracy. Descriptive statistics were used to describe the sample. Medians and percentiles were calculated to summarise continuous variables. Frequencies and percentages were calculated for categorical variables. Confidence intervals (CI) of 95% for the percentage or median difference were used to describe and test associations between variables. Kruskal Wallis test was calculated when the sample was too small to calculate confidence intervals.

5.3 Results

5.3.1 Population characteristics

One hundred mother-child pairs were included in the study and numbers with percentages will only be provided if the sub-group described differs from the study population of 100. Table 5.1 summarises the demographic information of the sample. Mothers were between 21 and 46 years old and children between three months and three years. Most mothers were single (39%) or living with a partner (39%), a third were employed, a third unemployed and 25% unemployed by choice. This population earned a median income of R3000 per month with a median of five people dependant on this income. The median education level of mothers was grade 10.

Table 5.1: Demographic characteristics of the study population (n=100)

Characteristics	**Median (range)**
Age of mother (years)	32.0 (21.1 – 45.4)
Age of child (months)	16.9 (3.2 – 37.4)
Household income (R)	3000.00 (600.00 – 24000.00)
Persons dependant on household income	5 (3 – 12)
	Percentage (%)
Education level obtained by the mother	
No schooling	1
Primary school (grade 1-7)	16
Secondary school (grade 8-12)	78
Tertiary education	5
Marital status of the mother	
Single	39
Married	15
Living with partner	39
Divorced	3
Widowed	4
Employment status of the mother	
Employed	33
Unemployed	33
Unemployed by choice	25
Employed part time	7
Attending school	2
Partner involvement	
Attended antenatal clinic	43
Present during labour	32
Supportive of feeding choice	99

5.3.2 Antenatal clinic attendance

All mothers in the study attended an antenatal clinic. Twenty two women attended the antenatal clinic less than four times and were therefore not exposed to sufficient counselling opportunities. Close to half (41%) of the mothers visited the antenatal clinic for the first time during the first trimester of pregnancy and 36%during the second trimester. Twenty three mothers first attended an antenatal clinic during their third trimester of whom 12 (52.2%) were tested for HIV for the first time during the pregnancy, resulting in a missed opportunity for early diagnosis and not receiving ART promptly.

CD4 cell count and HIV infection stage were indicated for all mothers in their file. A minimum CD4 cell count of 126 cells/mm^3, a maximum 1 854 cells/mm^3 of and a median of 412 cells/mm^3 were reported.

5.3.3 Feeding counselling and practices

Ninety seven mothers reported that they received counselling on feeding practices at the antenatal clinic, 64after delivery in the hospital and 84 at the clinic after delivery. Only one mother reported that she received no counselling.

As indicated in Table 5.2, more than three quarters of the mothers (77%) could explain exclusive breastfeeding correctly and 76% of mothers knew the recommended duration for exclusive breastfeeding. When asked what the risk was for the mother defaulting ART during breastfeeding, most (75%) mothers knew it could increase the risk for MTCT through breastfeeding.

When mothers were asked to list ways of MTCT, only 12% listed ART defaulting. Seventeen percent of mothers knew that MTCT could occur in uterus, 10% knew during delivery, 82% knew during breastfeeding and 22% said that blood mixing via open wounds caused MTCT. Seven mothers had no idea how MTCT takes place. Few mothers were able to explain that MTCT could occur as a result of early mixed feeding (2%). The median maternal age was significantly different between the "poor knowledge" and "good knowledge" groups with younger mothers being more knowledgeable (95% CI: [0.17; 5.56]). Level of education did not show to affect the mothers' knowledge (95% CI: [-2; 0]).

Twenty three mothers reported that they were pressured to discontinue breastfeeding of which73.9% (n=17) explained that they were pressured by the clinic staff and 17.4% (n=4) by a family member. It is important to note that 11.7% (n=2) of the mothers who were pressured by the clinic to stop breastfeeding were breastfeeding for longer than the recommended 12 months. Mothers breastfed their babies for a median duration of six months with a minimum duration of one month and a maximum of 30 months. Thirty-one mothers started introducing solids before six months indicating mixed feeding with the minimum introduction age of seven days. The median age of introducing solids were six months and 58 mothers introduced solids at this recommended age. Eleven mothers introduced solids after six months with a maximum age of nine months.

Table 5.2: Knowledge of mothers regarding feeding practices and PMTCT and the actual feeding practices by the mother (n=100)

Knowledge regarding PMTCT	**Percentage (%)**
Mothers able to explain exclusive breastfeeding	77
Mothers that knew exclusive breastfeeding should be practiced for 6 months	76
Mothers that knew the MTCT risk if the mother defaults her ART during breastfeeding	75
Can MTCT take place?	
Never	2
Sometimes	89
Always	2
Does not know	7
Do all breastfed infants become HIV infected?	
Yes	0
No	81
Unsure	19
In what ways can MTCT take place?	
In uterus	17
While in delivery	10
Breastfeeding	82
Mother does not know	7
Blood mixing through open wounds	22
Defaulting of ART	12
Mixed feeding	2
Introduction of solids	
Before 6 months	31
At 6 months	58
After 6 months	11
Mix feeding occurrence	31
Questions answered correctly	
<50% (poor knowledge)	27
≥50% (good knowledge)	73

5.3.4 Antiretroviral treatment initialisation

As indicated in Table 5.3, NVP was prescribed and provided to 95% of all children, of whose mothers, 13 (13.7%) indicated that their child did not receive NVP every day. The number of days children did not receive their prescribed NVP ranged from 1 to 14 days, with a mean of four days. Reasons stated for not administrating NVP are indicated in Table 5.3. Of the children who received NVP, 74.7% (n=71) of mothers administered the NVP once per day as prescribed and 60% (n=57) of the mothers administered the correct amount of NVP. The minimum age of ART cessation was one week, the median age 24 weeks and the maximum age 96 weeks.

Fifty two mothers started ART for the first time during their last pregnancy. Thirty mothers were started on PMTCT ART during their pregnancy, 12 mothers were started on lifelong ART and 47 mothers continued on lifelong ART, initiated before their last pregnancy. Eight mothers reported that they never started on any ART.

Seven mothers reported defaulting their ART while breastfeeding, but files indicated that 24 mothers defaulted their ART. Of the 52 mothers who started ART during their last pregnancy only 26 (50%) started on or before 14 weeks of gestation. Forty two mothers had a CD4 cell count of less than 350 cells/mm^3 but only 36 (85.7%) of these mothers started or continued with lifelong ART.

Table 5.3: ART distribution and usage/administration among mothers and their children (n=100)

Mother ART history	n	%	**Child ART history**	n	%
First tested HIV infected			Children who received ART	95	95.0
Before last pregnancy	56	56.0	Of whom received ART every day	82	86.3
During last pregnancy	44				
CD4 count (cells/mm^3)			Vomit / spit out ART (n=95)	10	10.5
≤350	42	42.0	If yes: Give ART again	5	50.0
>350	58	58.0			
HIV stage [mother]			Mother administering ART correctly (n=95)	71	74.7
Stage 1	78	78.0	Times / day	57	60.0
Stage 2	22	22.0	Amount of NVP		
Stage 3	0	0.0			
Stage 4	0	0.0			
Started using ART			Children on ART who defaulted NVP treatment (n=95)	13	13.6
Before last pregnancy	38	38.0			
During last pregnancy	52	52.0			
After delivery	2	2.0			
Never	8	8.0			
Mother currently using ART			Reasons NVP not given (n=95)		
Lifelong	59	59.0	Clinic out of stock	2	15.4
PMTCT until birth	27	27.0	Mother forgot to collect from clinic	8	61.5
None	11	11.0	Travelling without Nevirapine	2	15.4
PMTCT until breastfeeding cessation	3	3.0	Forgot to give to child	1	7.7
Mother default ART during breastfeeding (according to mother)			No access to clinic	0	0.0
Yes	7	7.0			
No	75	75.0			
No ART	13	13.0			
PMTCT ART only during pregnancy	5	5.0			
Mother default ART during breastfeeding (according to file)					
Yes	24	24.0			
No	63	63.0			
No ART	9	9.0			
PMTCT ART only until pregnancy	4	4.0			
Reasons for defaulting medication (during pregnancy/ breastfeeding/ previously) (n=31)	15	55.6			
Forgets	12	44.4			
Side effects	0	0.00			
Clinic out of stock					
Does not want to disclose status	0	0.0			
at home	0	0.0			
Difficult to get to clinic	4	14.8			
Too much effort to collect from clinic					

5.3.5 HIV status of children

During the routine six week PCR test, none of the children tested infected. When the children were tested six weeks after cessation of breastfeeding or during the routine 18 month test, three children were HIV infected.

5.3.6 Road to health booklets

Almost all children (99%) presented with a RTHB.

5.3.7 Partner involvement

Participants reported that 57 partners never attended antenatal clinic and 68 partners were not present during labour. Reasons provided why partners did not attend the antenatal clinic, included that 21 (36.8%) fathers had to work, eight fathers (14.0%) were not interested in attending and 28 (49.1%) of the fathers were no longer present in their lives.

During labour fathers were not present as 28 (41.2%) had to work, eight (11.8%) were not interested and 28 (41.2%) were no longer present in their lives. Of the mothers who had partners only one was not supportive of breastfeeding, as this father was concerned about MTCT.

5.3.8 Effectiveness of counselling

No difference was found when comparing the number of counselling sessions with the mothers' knowledge regarding feeding practices and PMTCT ($p=0.12$).

Whether the mother received counselling on feeding practices did not affect breastfeeding duration ($p=0.1$), the age of solids introduction ($p=0.75$) or the occurrence of mix feeding (95% CI: [-32.8%; 59.1%]). Whether the mother received one counselling session or three or more sessions did not affect breastfeeding duration (95% CI: [-2; 3]) or the age of introduction of solids (95% CI: [-2; 1]). Household income showed no effect on the duration of exclusive breastfeeding (95% CI: [-470; 940]), the cessation age of breastfeeding (95% CI: [-1000; 10]) or the occurrence of mix feeding (95% CI: [-300; 940]).

5.3.9 HIV infected children compared to HIV uninfected children

Mothers with HIV infected children had a more advanced stage of HIV infection, (95% CI: [23.5%; 87.1%]), lower CD4 cell count (p=0.03) and defaulted their ART during breastfeeding (95% CI: [21.5%; 85.4%]) compared to mothers with HIV uninfected children.

As shown in Table 5.4 the mother's knowledge of PMTCT (95% CI: [-37.5%; 28.9%]), counselling received (95% CI: [-5.6%; 55.1%]), education level of the mother (p=0.22), household income (p=0.85), delivery place (95% CI: [-19.5%; 56.2%]), marital status (95% CI: [-25.6%; 50.1%]), employment status (95% CI: [-51.2%; 15.7%]), partner involvement (95% CI: [-36.9%; 38.9%]) and the gestational age that ART was introduced to the mother (p=0.83) did not differ between HIV infected and HIV uninfected children.

Solids introduction / mix feeding (95% CI: [-29.7%; 46.1%]), whether or not NVP was given during breastfeeding (p=0.69), age of NVP cessation (p=0.67), cessation age of breastfeeding (p=0.31) and age solids were introduced (p=0.87) were also not significantly different between the HIV infected and HIV uninfected children.

Table 5.4 Differences between HIV infected and HIV uninfected children

Characteristic	Median (range)		95%CI for % difference	p value
	HIV infected	HIV not infected		
Education level, mother (grade)	7	10		0.22
Household income (R)	3000	3000		0.85
CD4 cell count (cells/mm^3)	237	415		0.03*
Gestational age of mothers' ART initiation (weeks)	21	15		0.83
NVP during breastfeeding	1	1		0.69
Age of NVP cessation (weeks)	24	24		0.67
Cessation age of breastfeeding (months)	12	6		0.31
	Percentage (%)			
	HIV infected	HIV not infected		
Age of solids introduction (months)	6	6		0.87
Marital status (single, not cohabiting)	66.7	45.4	-25.6%; 50.1%	
Employment status (employed)	0.0	41.2	-51.2%; 15.7%	
Place of delivery (clinic)	66.7	39.2	-19.5%; 56.2%	
Partner involvement (no)	66.7	56.7	-36.9%; 38.9%	
PMTCT knowledge (poor)	0.0	27.8	-37.5%; 28.9%	
Number of counselling sessions received (none)	0.0	1.03	-5.6%; 55.1%	
HIV stage (stage 2)	100.0	19.6	23.5%; 87.1%*	
Defaulting ART during breastfeeding (yes)	100.0	21.65	21.5%; 85.4%*	
Mix feeding occurrence (yes)	66.7	49.5	-29.7%; 46.1%	

*Statistically significant difference

All three children that tested HIV infected were of mothers with Stage 2 HIV infection, that had a CD4 cell count of less than 350 cells/mm^3 and defaulted their ART during breastfeeding.

5.4 Discussion

Using the 2010 and 2013 PMTCT policy as benchmark for PMTCT services by the health care facilities in the Frances Baard District, implementation was in line with policy guidelines, although challenges were still identified. More than three quarters of mothers (n=78) visited the antenatal clinic four or more times as recommended (DOH, 2013:41). During these visits all mothers were tested for HIV and CD4 cell count and HIV stage were indicated (DOH, 2013: 25).

Most mothers received PMTCT counselling during pregnancy (n=97), after delivery (n=64) and at the PMTCT clinic after birth (n=84). Mothers were relatively knowledgeable as exclusive breastfeeding and duration of breastfeeding could be explained by 77 and 76 of mothers respectively. Mothers however were not sure of MTCT and although most mothers knew that MTCT could occur during breastfeeding the majority were not aware of the transmission risk in uterus, during delivery, through open wounds, when defaulting ART or when practicing mixed feeding. This indicates an overemphasis of breastfeeding as method of MTCT, also stated by Doherty *et al*. (2006:92) and Falnes *et al.* (2010:44). Younger mothers were significantly more knowledgeable. Few mothers knew the importance of ART adherence (12%) or exclusive breastfeeding (2%) in PMTCT. Counselling should be directed more toward ART adherence as 24 mothers defaulted their ART during breastfeeding and all three HIV infected children's mothers defaulted their ART during breastfeeding. Six mothers who qualified for lifelong ART were never started on lifelong ART and eight mothers were never started on any ART. This shows that some mothers are not treated optimally according to policy.

Most children (n=95) received prophylactic NVP after birth and 86% of mothers (n=86) were started on the appropriate ART during pregnancy. Five children were never started on NVP, although admitted to the PMTCT programme.

Health care providers could improve on an environment supportive of breastfeeding, as 15% of mothers were pressured to stop breastfeeding inappropriately by clinic staff. Partners present in the mother's lives were also motivated to attend antenatal clinic but most partners did not do so as they were at work (n=21) also reported by Nkuoh *et al*. (2010:365).

All routine HIV tests for children were done at the appropriate times as stipulated in the PMTCT policy (DOH, 2013:6). Three children (3%) were HIV infected at the 18 month routine test, which is higher than the rate indicated by Goga *et al*. for the Northern Cape but lower that the national figure of 3.5% (2010:16). It is possible that the use of NVP or the ingestion of the mother's ART through breast milk may result in a false negative test in children as the ART can reduce viral load to undetectable levels (Mazanderani *et al*. 2014:576).

HIV infected children had mothers with a lower CD4 count and more advanced HIV stage, which supports the findings of Coovadia *et al*. (2007:1113) and Rollins *et al*. (2007:325).

The PMTCT policy proves to be relatively effective in keeping the rate of MTCT below the national average in the Frances Baard District even though improvements can be made to improve the impact of this programme. These improvements include optimal HCT, ART coverage and availability and the implementation of training initiatives to sensitise mothers on the importance of early detection, regular clinic attendance, ART adherence and following the prescribed PMTCT protocols. Many of these interventions depend on the elimination of the stigma associated with HIV.

5.5 Study limitations

PMTCT implementation was assessed according to information received from mothers and patient files. Health care providers were not interviewed to determine knowledge and practices during PMTCT counselling.

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Chapter 6

Impact of social grant system on households of Human Immunodeficiency Virus (HIV) infected mothers

This article was written to describe the economic status and the extent to which social grants contributes to income in the study population. The possible benefits and shortcomings of the social grant system in this community are also discussed. The article is prepared according to the guidelines for publication in Social Science and Medicine and the author guidelines are provided as Addendum J. The references are done according to the Department of Nutrition and Dietetics' guidelines.

Abstract

The social grant system in South Africa is extensive and aims to lower the poverty level. People suffering from Human Immunodeficiency Virus (HIV) / Acquired Immunodeficiency Syndrome (AIDS) are especially susceptible to poverty. The social grant system is reported to reduce poverty and hunger in this population. Household income, comprising of social grants and remuneration for employment, was obtained from 100 HIV infected mothers who were attending their local clinic for Prevention of Mother-to-Child Transmission (PMTCT) care. Almost all households (99%) received social grants and 81% of households had at least one member who was employed. A median of three grants per household was reported with a median household income of R3000 and a median income per person of R500. Forty percent of the mothers were employed while 58 mothers were unemployed of whom 43% (n=25) were unemployed by choice. Even though most households received grants and had an employed member, 29% of the households fell below the food poverty line. Whether there was an employed member in the household or not did not affect the number of grants received or the household income, which could discourage mothers to seek employment.

Keywords (<8):Social grant system, Northern Cape, South Africa, HIV infected mothers, Prevention of Mother- to- Child Transmission (PMTCT) programme, Poverty, Household income

6.1 Introduction

In September 2014, the unemployment rate in South Africa was 25.4%, with an estimated 5.2 million people being unemployed (STATS SA, 2014c:5). This high unemployment rate results in a high income inequality and an increased poverty level in South Africa (Altman *et al*., 2009:345). For government to eradicate extreme poverty and unemployment, more work opportunities must be made available and direct interventions including income support must be undertaken (Nattrass, 2003:9).

South Africa makes use of a household expenditure survey to determine its poverty line. Poverty lines are distinguished as food poverty line (FPL), upper bound poverty line (UBPL) and lower bound poverty line (LBPL). The FPL indicates the amount of money needed for an individual to purchase food to provide a 2100kCal diet, without extra money for essential non-food items. LBPL includes essential food and some essential non-food items while the UBPL includes essential food and essential non-food items (STATS SA, 2015:1). In 2011, 45.5% of South Africans lived below the poverty line, while 20.2% lived in extreme poverty (STATS SA, 2014b: 12). South Africa has committed to halving its population living in poverty from 2004 to 2014 (Altman *et al*., 2009:345). To accomplish this target, the government has implemented various policies. One of these includes the social grant system, implemented and controlled by the South African Social Security Agency. This policy aims to financially support children, elders and individuals who are not expected to be economically active (SASSA, 2014a:9).

Social grants are made available in the form of disability grants, child support grants, old age grants, care dependency grants, grants in aid, war veteran's grants and foster care grants. Disability grants are made available for persons between the ages of 18 to 59, who cannot work due to a disability. Child support grants are provided to support children between birth and 18 years, while foster care grants are provided to caregivers of children placed in foster care; and care dependency grants are given to children who are care dependant from birth to 18 years. Pensioners / old age grants are provided to persons 60 years and older. Grant in aid is meant for the elderly or disabled people who require special care (SASSA, 2014a, 10).

According to SASSA's report in 2014, 15 932 473 social grants were paid out to 10 711 401 beneficiaries during the 2013/2014 financial year. Nationally, R111billion was spent on social grants during this time, which amounted to 98.7% of the budget allocated for social grants (SASSA, 2014b:2). Thirty percent of the South African population currently receive a

social grant (SASSA, 2014a:2) and government allocates 60% of the annual spending on social grants (STATS SA, 2014b:8). Individual and household income has significantly increased since the implementation of the social grant system (Venkataramani *et al*., 2010:1395).

The Acquired Immunodeficiency Syndrome (AIDS) epidemic shows a strong association with household poverty (Booysen, 2004:54). A large proportion of South Africans suffer as a result of this epidemic with an infection rate of 12.2% or 6.4 million (Simbayi *et al*., 2014:24), resulting in the poverty burden of this epidemic becoming exponential. Working adults that become HIV infected and ill cannot work and financially provide for the rest of the household. Children are also left orphaned or often have to take over the financial responsibilities of the household, sometimes forcing them to leave school. A grant system is reported to greatly improve the socio economic status of these individuals and provide much needed relief (Venkataramani *et al*., 2010:1398). The food security status of individuals who receive social grants are also likely to be improved (Altman *et al*., 2009:360).

Even though the social grant system has proven to have many benefits for the South African population, there is still some scepticism regarding the long term effectiveness of these programmes.

It is speculated that the social grant system may create a dependency culture where individuals are reluctant to seek employment (Noble *et al*., 2008:1), which is supported by research showing that in households receiving grants, the grant income is often the major contributor to income (Venkataramani *et al*., 2010:1395). Some hypothesise that women have more children than they would normally have, in order to obtain the child grant and that the child grant encourages a rise in teenage pregnancies (Makiwane *et al*., 2006:3). Furthermore it is thought that individuals receiving disability grants would jeopardise their health in order to continue receiving disability grants. Most individuals who receive disability grants have reported being in good health (Venkataramani *et al*., 2010:1395).

The objective of this paper was to determine the average household income of participants receiving grants compared to those who did not receive grants and combined incomes, in order to describe the contribution of social grants on household income of HIV infected mothers.

6.2 Methods

Data reported were collected as part of a study investigating the effectiveness of the Prevention of Mother-to-Child Transmission (PMTCT) programme in the Frances Baard district of the Northern Cape.

6.2.1 Study design

A cross sectional descriptive study was done.

6.2.2 Study population

The study population included mother-child pairs that attended four local clinics for PMTCT care, in the Frances Baard district of the Northern Cape Province, South Africa.

6.2.3 Study sample

A sample of 100 mother-child pairs who provided informed consent to participate in the study was included. The biological mother of the child had to be present for the pair to be included in the study. HIV infected mothers who breastfed their children for any given time, but had stopped breastfeeding were included in the study population. The children were younger than 40 months.

6.2.4 Ethical considerations

Approval for this study was obtained from the Ethics committee, Faculty of Health Sciences, University of the Free State (230408-011). The study was approved by the Ethics committee of the Northern Cape Department of Health. All participants received information about the study in the language of their choice, before providing consent to participate. Participants were free not to answer questions or withdraw from the study at any stage without any influence on their treatment. Participation in the study was confidential and no form of identification was used that could identify the participant in the study.

6.2.5 Statistical analysis

Data were entered in duplicate on Excel spreadsheets and compared electronically to assure accuracy. Descriptive statistics were used to explain the sample; and medians and percentiles were calculated to report on continuous variables. Frequencies and percentages were calculated for categorical variables. 95% confidence intervals (CI) for the percentage or

median difference and Spearman's correlations were used to describe and test associations between variables. Kruskal Wallis test was calculated when the sample was too small to calculate confidence intervals.

6.2.6 Procedures

A questionnaire was used to collect data for this study. Questions concerning the household income of the family, number of dependants relying on the household income, education status and employment status were asked during a structured interview with the researcher. A pilot study was done to ensure the consistency and acceptability of the questions and to streamline procedures. Five questionnaires were completed as part of the pilot study but were not included in the study.

Open ended questions were asked during the interview, not to lead participants in any way and answers were coded by the researcher.

Anthropometric measurements were taken by the researcher using standard procedures. Height and weight of the mothers were used to calculate body mass index (BMI). Height / length, mid-upper arm circumference (MUAC) and weight of children were measured. The anthropometric values were used to evaluate the nutritional status of the participants. World Health Organisation (WHO) standards were used to interpret the measurements (WHO, 2006:online; WHO/UNICEF, 2009:2).

The poverty line was defined according to the latest South African figures published in 2014. The FPL was set at R400.00 per person per month, the LBPL at R544.00 per person per month and the UBPL at R753.00 per person per month (Stats SA, 2015: 1).

6.3 Results

A hundred mother-child pairs, enrolled in the PMTCT programme at their local clinics were included in the study. Mothers were between 21 and 46 years old and children between three and 38 months. All mothers were HIV infected and therefore their children HIV exposed. Percentages are only included if the sub-sample referred to does not include all 100 participants.

6.3.1 Household income

Table 6.1 summarises the household income of the 100 participants, indicating a minimum income of R600.00 and a maximum income of R24000.00. The median household income of the study sample was R3000 per month. Household income was divided into two categories; a household income of less than R3000, classified as a lower income and household income of R3000 or more as a higher income. Total household income did not relate to the number of dependants relying on this income (95% CI: [-18.3%; 18.6%]). As some of the household incomes declared by the participants were lower than the accumulated income from grants received, the greater calculated amount was used to determine mean income.

Table 6.1: Socioeconomic characteristics of households (n=100)

Characteristic	**n (%)**	**Median (range)**
Household income (R/month)		
<3000	42	3000 (600 – 24 000)
≥3000	58	
Household income of households with at least one person employed(R/month)		3000 (800 - 24 000)
Household income of households completely reliable on grants		2500 (600 – 4000)
Household income per person (R/month)		500 (150 - 6000)
Education level of mothers		
No schooling	1	
Primary school (grade 1-7)	16	
Secondary school (grade 8-12)	78	
Tertiary education	5	
≤ Grade 7	17	
≥ Grade 8	83	
Employment status of mothers		
Employed	33	
Unemployed	33	
Unemployed by choice	25	
Employed part time	7	
Number of grants received per household		
0	1	
1	17	
2	21	
3	40	
4	13	
5	3	

6 7	4 1	

6.3.2 Education level and household income

With regard to the level of education, one participant had no formal schooling while 11 finished grade 12 and five had or were still in the process of obtaining a tertiary education. The median education level obtained was grade ten. Education level was divided into two groups as “less education” including mothers with schooling up to grade seven and “more education” including mothers with schooling of grade eight or higher. Seventeen mothers were categorised in the “less education” group and 83 in the “more education” group.

When comparing the two groups no difference were found between education level and household income (95%CI: [-1300; 0]) or education level and employment status (95% CI: [-37.2%; 6.2%]). Marital status also showed no effect on household income (95% CI: [-500; 500]) or employment status (95%CI: [-24.8%; 6.4%]).

6.3.3 Social grants and household income

Only one household from the study sample did not receive any grants and 17 households received one child grant. Twenty one households received four or more grants and one of the households received seven grants in total. Nineteen households completely relied on social grants for income while the other families had at least one person in the household working for an income as indicated in Table 6.2. No one reported receiving foster care grants. A median of three grants per household was reported (range 0 to 7). The median number of child grants were two (range 1 to 5). Table 6.2 provides a more detailed description of the types of grants and combination of grants that families received.

Table 6.2Income contribution from a combination of grant types and working for a salary

Grants received / working person (s) in household				
Child	**Old age/ pension**	**Disability**	**Work salary**	**n (%)**
			1	1
	1		**1**	1
1				4
1			**1**	47
1		**1**		4
1		**1**	**1**	9
1	**1**			3
1	**1**		**1**	22
1	**1**	**1**		8
1	**1**	**1**	**1**	1

The old age / pension grant and disability grant amounts to R1350.00 per month. The child support grant is currently R310.00/ child/ month (SASSA, 2014a:2). The minimum household income obtained solely from grants was R310.00 per month and the maximum R4250.00 per month with a median of R930.00 per month.

6.3.4 Employment and household income

Employment status (employed vs. unemployed) of the mother did not have a significant effect on the household income (95% CI: [0; 1400]) or the number of grants received by the household (95% CI: [-2; 0]). Someone in the household being employed did not affect the number of grants received by a household when compared to households where there was no person employed (95% CI: [-2; 0]).

The household income per person of the population group is indicated in Table 6.1. The median income per person in households with no employed members was R444.44 (ranging

between R155.00 – R1333.33). The median income per person where there is at least one employed member was R500.00 (ranging between R155.00 - R6000.00).

When comparing the income of households where someone is employed with household where nobody is employed, there was no significant deference in income (95% CI: [-1060; 70]) or income per person (95% CI: [-243.1; 1.7]).

6.3.5 National poverty line and household income

The median household income per person of the study sample was R500 per month, which is well above the FPL of R400.00 per month but below the LBPL of R544.00 and UBPL of R753.00. With further investigation, 29% of households had an income per person below the FPL and 29% had an income per person between the FPL and LBPL. 20% of the population had an income per person between the UBPL and the LBPL. 22% of the population had an income per person above the UBPL.

6.3.6 Minimum wage and household income

To compare income with minimum wages, the minimum wage of a domestic worker, as stipulated by the Department of Labour, was used. According to the most recent Government Gazette (2014:5) the minimum wage for domestic workers in the Sol Plaatjie Municipality region is an hourly rate of R10.95, a weekly rate of R476.65 and a monthly rate of R2065.47. Weekly and monthly rates are applicable for a 45 hour week. As many domestic workers are often not employed full time, a 27 hour/ week wage was also calculated as an hourly rate of R12.40, a weekly rate of R334.74 and a monthly rate of R1450.33. All of these minimum wages exceeded the FPL, LBPL and the UBPL.

When comparing household income of households that rely solely on grants, four households (21.0%) received less than the monthly minimum wage of a 27 hour/ week domestic worker, amounting to R1450.33. Fifteen (78.95%) households that rely solely on grants therefore received a higher monthly income than the minimum wage for domestic workers.

6.3.7 Household income and nutritional status

Children were divided into two groups according to their anthropometric measurements. Children with a z-score ≤-2 were categorised as underweight and z-scores >-2 as normal weight. When these two groups were compared, the household income had no effect on the weight-for-age (95%CI: [-700; 1000]) or height-for-age (95% CI: [-1000; 200]) of the child.

Household income also did not have an effect on the child's MUAC (95% CI: [-9.6; 9.2]). Household income did not differ between the underweight and overweight mothers (95%CI: [-1500; 500]).

6.4 Discussion

Social grants play an important role in reducing extreme poverty and relieving the financial burden associated with HIV / AIDS (Booysen, 2004:54). All mothers included in this study were HIV infected and data gathered therefore represent a community affected by HIV / AIDS. Almost all households (99%) participated in the social grant system.

Even though the minimum wage set for domestic workers is well above all three poverty indicators, 78.95% of households that solely depended on grants, received a household income above the minimum wage for domestic workers. When comparing households where a member is employed to households relying on grants, there was no difference in the median incomes of these households. The employment status of the mother did not affect the household income. This might explain why mothers are not motivated to seek employment and why a quarter of mothers are unemployed by choice. This also implies that the majority of household income was obtained from grants, which was also reported by Venkataramani *et al*. (2010:1395).

It is concerning that even though most households had an employed person and received multiple grants, 78% of households fell below the UBPL of which 37 % (n=29) of household fell below the FPL. This indicates that almost a third of the study population did not earn an income that could sustain their essential food requirements. A bigger population of this study is therefore living in extreme poverty, compared to the 20.2 % reported in 2011 (STATS SA, 2014b: 12). This could also be due to the poverty associated with a vulnerable HIV infected population. The household income in this sample did not affect the nutritional status as determined by means of anthropometric measurements of children or their mothers. Although the social grant system was the major source of income for this sample, the social grant system alone does not provide the food security as was expected. In the absence of the social grant system, with good coverage in this community, household food security would have been even more concerning.

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Chapter 7: Conclusion and recommendations

7.1 Conclusion

7.1.1 Anthropometric status of mothers and their children

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) infections are known to have detrimental effects on the anthropometry of both mother (Swaminathan *et al*., 2008:948) and child (Berhane *et al*., 1997:3; Dobrova-Krol *et al*., 2010:246; Venkatesh *et al*., 2010:1368). Poor nutritional status can accelerate the progression of HIV infection to AIDS (Bachou *et al*., 2006:6; de Pee & Semba, 2010:318). The nutritional status as indicated by the anthropometry of mother and child is therefore important to monitor and maintain.

An advanced HIV stage and lower CD4 cell count have shown to have a negative and positive association respectively with the anthropometry of the mother (Venter *et al*., 2009:128) and the child (Arpadi *et al*., 2009:352; Venkatesh *et al*., 2010:1367). This study did not show an association between the CD4 cell count or HIV infection stage of the mother and her Body Mass Index (BMI). The weight of the child was also not affected by the CD4 cell count of the mother. The HIV stage of the mother did not affect the weight-for-age of the child (95% CI: [-44.5%; 10.8%]) but mothers with an early stage of HIV infection had children with normal weight-for-height rather than a weight-for-height indicating malnutrition (95% CI: [-65.7%; -4.4%]).

Initiation of antiretroviral therapy (ART) in HIV infected patients increases BMI (Crum-Cianflone *et al*., 2010:4). Even though this is a positive effect of ART, a study done by Crum-Cianflone *et* al. (2010) found that HIV infected individuals with a normal and overweight BMI at initiation of ART became more overweight and even obese, which further aggravate the negative side effect of lipodystrophy. Patients using ART and classified as overweight or obese were also more likely to have symptoms of Metabolic Syndrome namely: high blood pressure, insulin resistance / high fasting glucose levels, abdominal obesity, high triglyceride levels and low high density lipoprotein levels (Jerico *et al*., 2005:134). This study showed that most mothers (74%) had a BMI classification indicating that they were overweight; of whom 39 (52.7%) were obese. The duration that the mother was using ART did not affect the BMI of the mother in this study.

The anthropometry of the mother can also influence the anthropometry of the child (Arpadi *et al*., 2009:346; Makasa *et al*., 2007:599) and in this study the mother's BMI was positively associated with the weight-for-height and weight-for-age z-scores of the child.

With regard to MTCT of HIV, the anthropometric status of the mother are known to affect the rate of transmission (Mehta *et al*., 2008:1643) and BMI is found to be inversely associated with MTCT of HIV. In this study, mothers with an underweight or normal BMI were more likely to have HIV infected children than mothers with an overweight BMI.

With regard to demographic factors, older mothers had a higher BMI and single mothers were more likely to be underweight. Maternal age did not affect the anthropometry of the child as predicted by Venkatesh *et al*. (2010:1367). Arpadi *et al*. (2009: 352) reported that marital status affected the anthropometry of the child, however this study showed that marital status did not affect weight-for-age or weight-for-height of the child. Mothers who were employed were more likely to be overweight than unemployed mothers but employment status and education level of the mother did not affect the weight-for-age of the child in this study as reported by Arpadi *et al*., (2009:352). Household income did not affect the BMI of the mother or the weight-for-age or height-for-age of the child.

The duration that the mother exclusively breastfed her child, the time that solids were introduced and whether or not mixed feeding took place did not influence the weight-for-age of the child, which is in accordance with findings from Makasa *et al*., 2007: 598. Whether the child received Nevirapine (NVP) and the duration of NVP administration did not seem to have an impact on the weight-for-age of the child.

The weight-for-age of HIV infected children however was more likely to be below the -2 z-score compared to their HIV uninfected peers.

7.1.2 Implementation and adherence to the PMTCT policy in the Frances Baard district, Northern Cape Province

Nationally at least 75% of HIV infected mothers receive PMTCT care (UNAIDS, 2012a:43) as 95% of antenatal facilities in South Africa provide PMTCT services (Goga *et al*., 2010:2). In 2012, 7329 pregnant women visited the antenatal clinic in the Frances Baard District of whom 19.7% were HIV infected (NCDOH, 2013).

7.1.2.1 Antenatal

The success of the PMTCT programme lies primarily in the willingness of the mothers to be tested for HIV, as this is the first step to be included in the PMTCT programme (Coetzee *et al*., 2005:491). All mothers attended an antenatal clinic, of whom 44% were tested HIV infected for the first time during their pregnancy. The rest of the mothers had been tested HIV infected before the pregnancy. No mother was tested for the first time during labour or thereafter as it was not necessary. This implies that no mothers fell through the HIV counselling and testing (HCT) services provided at antenatal clinic level. Access to antenatal facilities that provide PMTCT care can therefore be seen as widely accessible for mothers in this district. Hussein *et al*. (2011:2) also found that PMTCT services in a large township in South Africa were widespread and that 99.2% of all mothers attending antenatal clinic received HCT. Twenty two mothers attended antenatal clinic less than four times. For ample opportunity for counselling, mothers are advised to visit the clinic at least four times (DOH, 2013c:41). Forty one mothers attended antenatal clinic before 14 weeks of gestation but 23 mothers visited the antenatal clinic after 24 weeks. The CD4 cell count of all mothers was tested antenatally. HIV staging was done for all mothers and was indicated in all files. Even though all mothers were tested for HIV before or during pregnancy, two mothers were only started on ART after delivery while eight mothers were never started on any ART.

Ninety seven mothers reported that they had received counselling on feeding practices at the antenatal clinic.

7.1.2.2 Labour and delivery

As all women who participated in this study attended antenatal clinic, all mothers were included in the PMTCT programme when arriving for labour and delivery. HIV test results

were therefore available for all mothers and the proper PMTCT guidelines could be implemented during labour.

Approximately a third of mothers reported that they had received ART during labour (35%) or continued with their lifelong ART (28%) as recommended by the Department of Health (DOH, 2010:11). Some mothers did not know if they received ART (29%) while eight (8%) reported that they had not.

Sixty four mothers reported that they received counselling on feeding practices after delivery in the hospital.

7.1.2.3 Post-natal

All children that were included in this study had a PCR test done at six weeks and at 18 months or six weeks after cessation of pregnancy as recommended by the Department of Health (DOH, 2013a:6). Although not having the test done was an exclusion criteria, no mother-child pairs asked to participate in the study was excluded for this reason as all children had undergone PCR tests. In South Africa early HIV diagnosis in children have improved substantially as 10% of children underwent PCR testing before two months in 2006 compared to 73% in 2012 (Sherman *et al*., 2014:236). Some studies still report that PCR HIV testing is not performed optimally in South Africa and that this could be due to health care staff that are not motivated to follow up on missing results or mothers who do not bare knowledge of the necessity of infant PCR tests (Ibeto *et al*. 2014:109).

Ninety five (95%) of the children were started on prophylactic ART after birth while the other five children never received ART. This indicates that 5% of the children born in health facilities who provide PMTCT services (as all mothers reported giving birth at hospital or at the clinic) fell through the PMTCT system.

Eighty four mothers reported that they received feeding counselling at the clinic when visiting for PMTCT care.

7.1.3 Factors that affect implementation and adherence to the PMTCT policy in the Frances Baard district

7.1.3.1 Socioeconomic

Older mothers are reported to have increased MTCT rates (Coetzee *et al*., 2005:492), be more knowledgeable about PMTCT (Boateng *et al*., 2013:5) and less likely to adhere to ART (Ayuo *et al*., 2013:4). Married women are more likely to breastfeed their children and

mothers with formal education are also found to be more knowledgeable about HIV and PMTCT (Boateng *et al*., 2013:5) and more likely to follow recommended feeding practices (Aidam *et al*., 2005:793). Mothers of lower income are reported to not wean their children from breastfeeding at the recommended time as they were worried about providing the child with other nutrition (Chinkonde *et al*., 2012:706). In this study, income did not effect the duration of breastfeeding or the occurrence of mix feeding.

7.1.3.2 Knowledge and Feeding practices

It is recommended that a mother receive at least four counselling sessions at the antenatal clinic regarding feeding practices and PMTCT (DOH, 2013c: 41). Mothers who receive proper counselling opportunity are reported to be more likely to follow recommended feeding practices (Aidam *et al*., 2005:793; Chopra *et al*., 2005:359; Henderson & Redshaw, 2010:749). Although the majority of pregnant women received PMTCT counselling antenatally and post-natally, assessment of knowledge and practices identified problems in the system. Some studies have shown that mothers lack knowledge of PMTCT even after receiving counselling (Mnyani & McIntyre, 2013:68). Most mothers (82%) knew that MTCT can occur during breastfeeding but very few mothers knew any other mode of MTCT. This agrees with the findings of Falnes *et al*. (2010:43) that health care professionals over emphasise MTCT through breast feeding. Although most mothers could explain exclusive breastfeeding (77%) and the duration of exclusive breastfeeding (76%), almost a third of the mothers did not follow recommended feeding practices and mix fed their children. Byamugisha *et al*. (2010a: 60) and Falnes *et al*. (2010:44) explained that knowledge is an important determinant for behaviour. Landzani *et al*. (2010:541) found that mothers with lack of knowledge were less likely to follow prescribed feeding practices. This study indicates that knowledge does not always affect actual practice. An explanation for this could be that the mothers do not find exclusive breastfeeding to be feasible (Byamugisha *et al*., 2010a:60). The number of counselling sessions in this study did not affect the duration of breastfeeding, duration of exclusive breastfeeding or the rate of mix feeding.

7.1.3.3 Place of delivery

All mothers gave birth at a health care facility providing obstetrics care, giving ample opportunity for ART administration to mother, prophylactic ART to the child and feeding counselling as recommended (DOH, 2010:10). No mothers or children were therefore left

unprotected from HIV infection during birth due to lack of access to ART as is often the case during home deliveries (Kasenga *et al*., 2007:651).

7.1.3.4 Partner involvement

Partner involvement can prove to be crucial to mothers with the uptake of and adherence to ART (Byamugisha *et al*., 2010a:60; Gourlay *et al*., 2013:18591; Kebaabetswe, 2007:358) and following prescribed feeding practices (Chopra *et al*., 2005:361). MTCT has shown to be lower in households where the fathers attend antenatal clinic with the mothers (Aluisio *et al*., 2011:80). Mothers reported that 57% of fathers of the children never attended antenatal clinic with them and 68% of their partners were not present during labour and delivery. The reasons given were mostly that these partners had to work, were not interested or were no longer present in the mother's life. No mothers indicated that it was due to health care facilities not allowing partners to participate in antenatal and labour care. Only one mother reported that her partner did not approve of her choice to breastfeed her child as this partner was afraid of MTCT of HIV.

7.1.3.5 Adherence to ART

The initiation of ART for mother and child can reduce MTCT to less than 5% (Gourlay *et al*., 2013:18589). Lack of adherence to the prescribed ART is an important compromising factor for the effectiveness of the PMTCT programme (Chopra *et al*., 2005:361).

The International HIV/AIDS Alliance published a paper on the factors that hinder the uptake of ART in Africa, which described many reasons for mothers to default their ART. They found that mothers who were newly diagnosed still experienced psychological difficulties to accept their HIV status including denial and depression. Mothers were also afraid of the stigma associated with HIV infection and were afraid of discrimination from their partner, family or health care workers. Lack of knowledge regarding HIV and PMTCT also hindered the uptake of ART (Gourlay *et al*., 2013:18591). In this study, 27 mothers reported that they had defaulted ART during pregnancy, while the files indicated this figure to be 58. Seven mothers reported that they defaulted their ART during breastfeeding, but the files showed that 24 mothers defaulted their ART during breastfeeding. Mothers that defaulted their ART explained that they forgot to take their ART, did not take their ART due to the side effects or that it was too much effort to collect their ART from the clinic monthly. No mothers reported that they did not have access to the clinic, including transport to the clinics or that they were afraid of discrimination from family or friends at home.

Of the 95 children who received ART daily, 13.7% (n=13) of mothers reported that their child had defaulted their ART. The reasons provided for defaulting included that the clinic was out of stock, the mother forgot to collect from the clinic, the mother forgot to give the ART to the baby or that the baby travelled without ART. Access to the clinic was not problematic. Mothers should be educated on the importance of adherence to the ART regimen.

7.1.3.6 Stigma

Mothers experience discrimination when others in their community are aware of their HIV infected status. Mothers would therefore rather abstain from any PMTCT services provides to hide their HIV status (Ujiji *et al.*, 2011:833). Landzani *et al*. (2011:540) indicated that mothers could experience social stigma if they followed prescribed feeding practices. This study did not ask questions specific to stigma, but no open ended questions were answered with any relation to stigma.

7.1.3.7 Pressure to stop breastfeeding

Some mothers (23%) experienced pressure so stop breastfeeding. Four mothers (4%) indicated that they were pressured by a family member. Other mothers (2%) were appropriately pressured to stop breastfeeding by the clinic staff as these mothers were breastfeeding for longer than recommended by the Department of Health (DOH 2013a:14). It is alarming however that 15% of mothers were pressured to stop breastfeeding before 12 months without any medical reason. This could be due to staff not having adequate knowledge regarding PMTCT recommended feeding practices.

7.1.3.8 Staff attitude

A primary factor for a successful PMTCT programme is skilled health care workers (Luo *et al*., 2007:182). No mothers reported that health care staff was uninviting to their partners to attend antenatal clinic or labour with them. Staff did however inappropriately pressure 15% of mothers to stop breastfeeding.

7.1.4 Number of breast-fed children on the PMTCT programme who are HIV infected six weeks after cessation of breastfeeding

Children born to HIV infected mothers and who are therefore HIV exposed should undergo routine rapid Polymerase Chain Reactive (PCR) tests at six weeks of age and six weeks after the cessation of breastfeeding according to the PMTCT policy (DOH, 2013a:6). As HIV can be transmitted from mother to child during pregnancy in-uterus, during birth or through breast milk when breastfeeding (Foster & Lyall, 2007:126), these two test can give an indication of when MTCT took place. The six week test indicates that MTCT took place either in-uterus or during delivery while the six week post cessation of breastfeeding test would indicate that MTCT took place through breastfeeding (Sherman, 2015: 3).

A study in 2010 found that 16% of infants were HIV exposed in the Northern Cape with a 0.3% early HIV infection rate and a 1.4% HIV infection rate at 4-8 weeks (Goga *et al*., 2010:33). Statistics collected by the Northern Cape Department of Health during the 2012-2013 financial years showed that in the Frances Baard District, 10.9% of mothers tested HIV infected during their pregnancy. This indicates that 10.9% of the children were HIV exposed. 3.4 % of infants that were tested for HIV at six weeks tested HIV infected and a further 1.4% of children tested HIV infected at 18 months (NCDOH, 2013).

Recent studies have indicated that the PCR tests could present with false negative results when the child is receiving prophylactic ART or is ingesting the mother's ART through breast milk, as these ART's decrease the viral load to undetectable levels (Mazanderani *et al*., 2014: 576, Sherman, 2015:1).

This study showed that no children were HIV infected at six weeks of age, but three children (3%) were HIV infected six weeks post cessation of breastfeeding. It is therefore likely that MTCT did not take place in-uterus or during delivery but rather through breastfeeding. Considering the findings of Mazanderani *et al*. it could be possible that MTCT took place in-uterus or during delivery but just remained undetected as all three mothers with HIV infected children were either on lifelong ART or started using ART during pregnancy. All three HIV infected children received NVP as prophylactic ART for at least six weeks which could contribute to a false negative PCR test result at six weeks.

7.1.5 Factors that influence implementation and adherence to the PMTCT policy that best predicts the risk for HIV infection in infants

When the group of HIV infected children (3%) and HIV uninfected children (97%) were compared, some factors showed to influence MTCT. The group representing HIV infected children were very small and therefore it was difficult to examine the factors that may have contributed to the HIV infection.

7.1.5.1 Socio economic factors

The marital status, employment status, education level and household income of mothers did not differ between the HIV infected and HIV uninfected groups.

7.1.5.2 Antenatal clinic attendance

Late booking for antenatal clinic has previously shown to be a risk factor for MTCT of HIV (Ibeto *et al*., 2014:109). The files of the three HIV infected children's mothers all showed that these mothers visited the antenatal clinic four times or less and two of these mothers attended antenatal clinic after 24 weeks of gestation.

7.1.5.3 Knowledge

The mothers knowledge about PMTCT and feeding practices did not differ between HIV infected and HIV uninfected groups. The amount of counselling received regarding PMTCT and feeding practices also did not differ between the HIV infected and HIV uninfected groups.

7.1.5.4 Place of delivery

Place of delivery does not affect MTCT of HIV according to studies by Bera *et al*. (2010:10) and Ruton *et* al. (2012:9) which is in accordance with our findings. Although in this study all children were delivered in health care facilities, some were delivered in a clinic providing obstetrics services and others in a hospital.

7.1.5.5 Feeding practices

Exclusive breastfeeding is known to have a protective effect against MTCT of HIV (Iloh *et al*. 2015:51; Kuhn *et al*., 2007:4). Our study found that whether or not the mother mixed fed the child, the age that solids were introduced and the duration of breastfeeding did not

influence the rate of MTCT as there was no difference regarding these factors between HIV infected and HIV uninfected groups. Ruton *et al*. (2012:9) did a similar study and reported that feeding practices did not affect MTCT whether it was exclusive breastfeeding, breastfeeding with early cessation or formula feeding.

7.1.5.6 Partner involvement

Whether or not the partner attended antenatal clinic with the mother or was present during labour and delivery was not different between the HIV infected and HIV uninfected groups which contradicts the results of a study by Aluisio *et al*. (2011:80).

7.1.5.7 ART compliance of mother and child

Maternal use of ART during pregnancy has shown to affect MTCT of HIV (Ibeto *et al*., 2014:109). Mothers who received ART for less than 10 weeks before delivery were five times as likely to transmit HIV to their infant in-uterus or during delivery. The type of ART showed no significance (Bera *et al*., 2010:12). In this study the gestational age that mothers were started on ART did not affect MTCT of HIV.

Eight mothers that were included in this study were never initiated on any ART and 14 mothers were not started on lifelong ART even though they met the inclusion criteria for lifelong ART. This indicates that even when mothers were tested for HIV, proper follow up of test results and treatment procedures were not followed by health care facilities.

In this study, mothers who defaulted their own ART during breastfeeding were more likely to have HIV infected children, also described by other studies (Coovadia *et al*., 2007:1113; Rollins *et al*., 2007:325). All three children that tested HIV infected mothers defaulted their ART during breastfeeding.

Five children that were admitted to the PMTCT programme did not receive any prophylactic ART after birth. The administration of infant prophylaxis showed no effect on MTCT of HIV in a study by Bera *et al*. (2010:10) which agrees with this study where NVP given during breastfeeding and the age of NVP cessation did not differ between the HIV infected and HIV uninfected groups. All three children who tested HIV infected received prophylactic ART, one child received ART for six weeks while the other two both received ART for 24 weeks. None of the HIV infected children's mothers reported defaulting the infant's ART.

7.1.5.8 HIV stage of the mother

Bera *et al*. (2010:10) reported that the CD4 count of the mother was not a risk factor for MTCT of HIV although a viral load of ≥ 1000 copies/ml increased the risk of HIV transmission 13 times. The importance of suppressed viral load was also reported by Iloh *et al*. (2015:51). Mothers with an advanced HIV stage and lower CD4 cell count were more likely to transmit HIV to their infant in this study which is an agreement with results from other studies (Coovadia *et al*., 2007:1113; Rollins *et al*., 2007:325).

All three children that tested HIV infected at six weeks post cessation of breastfeeding were of mothers with Stage two HIV infection and had a CD4 cell count of less than 350 cells/mm^3.

7.2 Recommendations for improvement of PMTCT programme

Address ART shortage at clinics

Some mothers explained that they defaulted their children's ART because the clinic was out of stock. Even though this was only reported by two mothers, this is unacceptable. All clinics should have enough ART stock to provide in their patient's needs.

Increase knowledge of staff through training

Some issues concerning staff knowledge and attitude were observed during the study. Staff inappropriately pressured 15% of mothers to stop breastfeeding before the cessation age of 12 months recommended by the 2010 / 2013 PMTCT guidelines. It is therefore necessary that staff be trained on the new PMTCT guidelines as often as possible to assure that the appropriate advise be given to mothers concerning feeding practices.

Counselling should focus on ART adherence and MTCT

Most mothers knew that MTCT could occur through breastfeeding but very little mothers knew that MTCT could occur in-uterus or during delivery. Mothers could not explain that defaulting their ART during pregnancy and breastfeeding could also exasperate MTCT rates. It is therefore important that counselling provided antenatal, in hospital after delivery and post-natal focus on ART adherence and improving the mother's knowledge on PMTCT.

HIV test after birth, 6 weeks and 6weeks post BF cessation

As the PCR test can present with a false negative at 6 weeks due to the mother's ART that the child ingests through the breast milk or due to the use of prophylactic ART it could be beneficial to do a PCR test directly after birth, before the child has been exposed to high doses of ART. This could deliver a clearer result on whether the MTCT took place in-uterus. It would also be beneficial to do a HIV test six weeks after cessation of breastfeeding, or at 18 months of age as stated by the PMTCT policy as the child then no longer receives any form of ART.

Home visits to pregnant mothers who default clinic visits

Some of the mothers reported that they defaulted their medication as it was just too much effort to collect their ART from the clinic. It would be beneficial for these mothers if a proper record of all mothers enrolled in the PMTCT programme was compiled. If these mothers default their monthly clinic visits, these mothers could be contacted or home visits could be done to assure that these mothers do receive their medication. This is rather ambitious as this method would be labour and time intensive and would have logistic difficulties.

Encouragement of partner support

Most mothers reported that their partner did not attend antenatal clinic with them and were not present during labour and delivery. Mothers should be motivated at their first antenatal clinic to invite her partner to attend antenatal clinic and assure mothers that the father is allowed to be with her during labour and delivery.

Community awareness of early antenatal clinic booking

For women to book early for antenatal clinic, it is important that all women of childbearing age should be made aware of the benefits of early antenatal care. This message should reach women before they become pregnant. Routine presentations / talks can be held in the clinic for patients that require routine care and pamphlets can be made available.

7.3 Recommendations for researchers

This study was designed with the aim to determine the effectiveness of the PMTCT policy in the Northern Cape to protect breast-fed infants from HIV infection. As can be expected, the

infection rate was low (3%), resulting in difficulty to further investigate factors influencing HIV transmission from mother to child between the HIV infected and HIV uninfected. It is recommended that further research be done to describe the characteristics of a group where mother to child transmission has taken place.

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Addendum A: Questionnaire

1.	Questionnaire number _____
	Date Y Y Y Y M M D D
	Clinic _____
2.	**Mother's weight (kg)** 1._____ 2. _____ 3. _____
	Mother's height (cm) 1._____ 2. _____ 3. _____
	Child's weight (kg) 1._____ 2. _____ 3. _____
	Child's height (cm) 1._____ 2. _____ 3. _____
	Child's MUAC (mm) 1._____ 2. _____ 3. _____
3.	Mother date of birth Y Y Y Y M M D D

	Marital status of mother 1. Single 2. Married 3. Living with partner 4. Divorced 5. Widowed
	Mother's employment status 1. Employed 2. Unemployed 3. Unemployed by choice 4. Employed part time 5. School
	What is the mother's highest level of education? _____
	Household Income? R_____/month
	How many people are dependent of this income? _____
	How does the household obtain this income? (Circle all that are appropriate, indicate the amount at each) 1. Child Grant____ 2. Pension____ 3. Disability Grant____ 4. Work____ 5. Other?_____ (list)
4.	How does mother explain exclusive breastfeeding? _____ 1. Correct 2. Does not know / Incorrect
	For how long should the mother exclusively breastfeed her child to her knowledge? _____ 1. Correct 2. Does not know / Incorrect
	What are the risks to the child if the mother defaults her ART while breastfeeding? _____ 1. Correct 2. Does not know / Incorrect
5.	Did the baby get NVP while being breastfed? 1. Yes 2. No

	If yes, did baby receive NVP every day? 1. Yes 2. No
	Did baby ever vomit / spit out NVP? Yes 2. No
	If yes, did mother then give NVP again? 1. Yes 2. No
	Did the baby have to go without NVP some days? 1. Yes 2. No
	If yes, how many days at a time? _____
	What was the reason for this? 4. Clinic out of stock 2. Mother forgot to collect from clinic 3. Travelled without NVP 4.Forgot to give to baby 5. No access to clinic (includes transport problems) 6.Other_____(list)
	Until what age was NVP given? _____ (weeks)
	Can the mother explain when the child should receive NVP? 1. Yes 2. No
	How many millilitres of NVP did the mother give the child/ day during breastfeeding acc. to the mother? _____ml 1. Correct 2. Too little 3. Too much 4. Does not know
	Do HIV infected mothers transfer HIV to their infants according to the mother? 1. Never 2. Sometimes 3. Always 4. Does not know
	Do all infants that are breastfed get HIV infected? 1. Yes 2. No 3. Unsure
	In which ways can a mother transmit HIV to her infant to the mothers knowledge: 1. In uterus 2. While in delivery 3. Breastfeeding 4. Mother does not know 5. Blood mixing 6.Other _____(list)

6.	Where was the baby delivered? 1. At Hospital 2. At clinic 3. At home 4. Other _____(list)
	Date of birth of child Y Y Y Y M M D D
	Birth weight_____kg
	Does the child have a road to health chart? 1. Yes 2. No
7.	Until what age was the baby breastfed (months)?
	At what age did mother introduce anything other than breast milk / formula milk (indicate days/weeks/months)?
	Did the mother receive any pressure to stop breastfeeding before the child was 12 months old? 1. Yes 2. No
	If yes, where did this pressure come from? 1. Clinic 2. Partner 3. Family member 4. Community 5. Other _____ (list)
	Main reason why the mother stopped breastfeeding? 1. Child old enough 2. Breast problems 3. Told to stop by clinic staff 4. Afraid of MTCT 5. Returned to work 6. Other: _____(list)
8.	Did the mother's partner attend antenatal clinic with her? 1. Yes 2. No If no, why?_____(list)
	Was the partner present during labour/delivery? 1. Yes 2. No If no, why? _____
	Was the mother's partner supportive of her feeding choice? 1. Yes 2. No 3. No partner If no, why? _____

	Has mother disclosed her HIV status to others? (Circle all that are appropriate) 1. No 2. Partner 3. Family 4. Friends 5. Health Worker 6. Teacher 7. Someone at church 8. Other: _____(list)		
9.	**Question**	**According to mother**	**According to file (if available)**
	WHO HIV stage of mother	(only file)	1. Stage 1 2. Stage 2 3. Stage 3 4. Stage 4 5. Not in file
	Mother's CD4 – count	(only file)	
	When did mother first get tested for HIV?	1. Before pregnancy 2. During pregnancy 3. After pregnancy 4. While breastfeeding Date:_____	1. Before pregnancy 2. During pregnancy 3. After pregnancy 4. While breastfeeding Date:_____
	Mother currently on ART?	1. Yes 2. No	1. Lifelong 2. PMTCT (stopped after BF cessation) 3. None 4. PMTCT (stopped after birth)

	When did mother start using ART?	1. Before pregnancy 2. During pregnancy – Weeks of gestation: _____ 3. After delivery 4. Never	1. Before pregnancy 2. During pregnancy – Weeks of gestation: _____ 3. After delivery 4. Never
	Has mother defaulted on ART before?	1. Yes 2. No 3. No ART	1. Yes 2. No 3. Number of previous clinic visits where pills were counted as not taken (as fraction of al visits) ---------- -- 4. No ART
	Did the mother default her ART during breastfeeding?	1. Yes 2. No 3. No ART 4. PMTCT ART (ART only during pregnancy)	1. Yes 2. No 3. No ART 4. PMTCT ART (ART only during pregnancy)
	Is the mother using her ART as prescribed every day?	1. Yes 2. No 3. No ART 4. PMTCT ART	(only according to mother)
	If not, why?	1. Forgets 2. Side effects 3. Clinic out of stock 4.Does not want family/partner to see 5. Difficult to get to clinic 6. Other: _____	(only according to mother)

10.	Did mother attend antenatal clinic during her pregnancy?	1. Yes 2. No	1. Yes 2. No
	How many times did the mother attend antenatal clinic during pregnancy?	_____ 99 Does not know	_____ 99 Not recorded
	Stage of gestation when mother first attended ANC?	_____weeks 99 Mother does not know 0 Never	_____weeks 0 Not in file / never
	Did mother receive ART while in labour?	1. Yes 2. No 3. Does not know 4. Continued lifelong ART	1. Yes 2. No 3. Not recorded 4. Mother on lifelong ART
	Did mother receive counselling on feeding practices:	1. Before delivery at antenatal clinic 2. After delivery in hospital 3. After delivery at clinic 4. No counselling received	1. Before delivery at antenatal clinic 2. After delivery in hospital 3. After delivery at clinic 4. No counselling received/Not in file
11.	HIV status of infant at 6week test: 1. Positive 2. Negative		
	HIV status of infants 6weeks after breastfeeding ended: 1. Positive 2. Negative		

12.		Other children at home **age**	Infection state 1: HIV infected 2:HIV not infected
		None	
		1.	
		2.	
		3.	
		4.	

Addendum B: Approval Head of Department of Health (HOD)

THE OFFICE OF THE Chief EXECUTIVE OFFICER
WEST END SPECIALIZED HOSPITAL
Northern Cape Department of Health
P/Bag X 6086
KIMBERLEY
8300

Tel: (053) 861 3911 / 082 6323 956

Ms B. Myburgh : 0763920087

SUBMISSION

TO **:** Ms. G.E. Matlaopane (Head of Department of Health)

CC : Ms. T. Landu (chief Executive officer West End Specialized Hospital)

FROM : Ms. Bianca Myburgh, Dietician: West End Hospital

DATE : 15 July 2013

RE **:** Request for permission to use clinic patients as participants for research study

Study Title: Effectiveness of the Prevention of Mother-to-Child Transmission (PMTCT) policy in the Northern Cape, South Africa

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Subject:

This letter is to request permission to conduct a study to determine the effectiveness of the PMTCT policy in the Northern Cape, to protect breast-fed children from HIV infection at five clinics in the Frances Baard district. The study will be conducted by Ms Bianca Myburgh, a dietician of the Northern Cape Department of Health, West End Specialized Hospital to fulfil the requirements for MSc in Dietetics from the University of the Free State.

BACKGROUND

The aim of this study is to investigate all the factors that contribute to the effectiveness of the PMTCT policy in this community. These factors may include socio-economic factors, stigma, feeding practices, services rendered etc.

The study has been submitted for approval to the Ethics Committee of the Faculty of Health Sciences, University of the Free State. The study will commence after ethical approval has been obtained and will continue till mid December 2013.

To conduct the study, mothers attending the clinic who meet the inclusion criteria will be interviewed by the researcher and anthropometric measures taken. During the structured interview, a questionnaire will be completed by the researcher. All the information obtained in this study will be kept confidential and will only be used for the purpose of this study. Participation will be voluntary and participants will have to provide informed consent before inclusion in the study.

Assistance from the nursing staff will be required to identify and refer mothers who meet the inclusion criteria to the researcher. Participants will not be remunerated for participation, but will receive incentives in the form of blankets. The clinics that I would like to include in this study are Phutanang, Betty Gaetsewe, Masakhane and Galeshewe Day Hospital.

MOTIVATION

By conducting this study at four clinics in the Frances Baard District, Phutanang, Betty Gaetsewe, Masakhane and Galeshewe Day Hospital, the factors that influence the effectiveness of the PMTCT policy in this district will be determined. This information will improve my knowledge and the service rendered by me when performing my weekly duties as dietician that includes PMTCT counselling at the antenatal clinic at Kimberley Hospital. The information obtained will also be communicated to the rest of the dieticians in this district to assure quality of services rendered.

The study goals are also in line with the millennium development goals namely:

Goal 4 – reduce child mortality by two thirds by 2015
Goal 5- improve maternal health
Goal 6 – Combat HIV/AIDS

The information obtained from this study will therefore not only improve the quality of the services rendered by the dieticians of the Northern Cape, but will also help the province to reach the set development goals.

The study will commence after ethical approval in October and will continue till the end of 2014.

Recommendation

That the HOD gives approval for the researcher, Bianca Myburgh, to conduct research in the Frances Baard district on the factors influencing the effectiveness of the PMTCT policy and to use clinic patients as the participants.

_____ _____

Bianca Myburgh Date

Dietician / Researcher

Addendum C: Approval Heads of Clinics

Request for permission to use clinic patients as participants for research study

Effectiveness of the Prevent Mother-to-Child Transmission (PMTCT) policy in the Northern Cape, South Africa

To: Head of clinics

This letter is to request permission to conduct a study to determine the effectiveness of the PMTCT policy in the Northern Cape, to protect breast-fed children from HIV infection at four clinics in the Francis Baard district. The study will be conducted by Ms Bianca Myburgh, a dietician of the Northern Cape Department of Health. The four clinics chosen for the study is Phutanang, Betty Gaetsewe, City Clinic and Galeshewe Day Hospital.

The study has been submitted for approval to the Ethics Committee of the Faculty of Health Sciences, University of the Free State.

To conduct the study, mothers attending the clinic who meet the inclusion criteria will be interviewed by the researcher and anthropometric measures taken. During the structured interview, a questionnaire will be completed by the researcher. All the information obtained in this study will be kept confidential and will only be used for the purpose of this study. Participation will be voluntary and participants will be requested to provide informed consent before inclusion in the study.

The study will not have any financial implications for the Department of Health or the participants. Assistance from the nursing staff will be required to identify and refer mothers who meet the inclusion criteria to the researcher. Participants will not be remunerated for participation, but will receive incentives in the form of donated children toys, clothing and blankets. The clinics that I would like to include in this study are Phutanang, Betty Gaetsewe, City Clinic, Roodepan and Galeshewe Day Hospital. The study will not take up more than an hour of the participant's time.

I trust that my request will be considered favourably. For more information, please contact me via email at missmyburgh@gmail.com

Kind regards

Bianca Myburgh (RD SA)

Addendum D: Approval to conduct study from the Northern Cape Department of Health, Research Ethics committee

DEPARTMENT OF HEALTH
LEFAPHA LA BOITEKANELO
ISEBE LEZEMPILO
DEPARTEMENT VAN GESONDHEID

Department of Health
Private Bag X5049
KIMBERLEY
8301

Enquiries : Dr. E. Worku
Dipatlisiso :
Imibuzo :
Navrae :

Reference :
Tshupelo :
Isalathiso :
Verwysings :

Tel: 053 830 2134
Fax: 086 541 7122

Date : 12 September 2014
Letlha :
Umhla :
Datum :

Ms. Bianca Myburgh
West End Hospital
Kimberley
8301

Dear Ms. Bianca Myburgh

TITLE: THE EFFECTIVENESS OF THE PREVENTION OF MOTHER TO CHILD (PMTCT) POLICY IN THE NORTHERN CAPE, SOUTH AFRICA.

NC PHREC Reference Number: NC2013/009

The application to conduct the study was received and has been reviewed by the Provincial Health Research and Ethics Committee (PHREC).

Approval is hereby granted to conduct the above-mentioned study in the Northern Cape Cape Province.

The following conditions have to be noted:

1. The research project shall be conducted at no cost to the Northern Cape Department of Health.
2. The approval is limited to the research proposal as submitted in the application.
3. Variation or modification on the research must be notified formally to the PHREC for further consideration.
4. The PHREC may monitor the project at any time

We are committed to achieving our vision through a decentralized, accountable, accessible and constantly improving health care system within available resources. Our caring, multi-skilled, effective personnel will use evidence-based, informative health care and maturing partnerships for the benefit of our clients and patients.

5. The Northern Cape Senior Management Committee will be briefed on the outcome of the study prior the publishing.

At the completion of your study a final report must be submitted to the Research and Development Directorate.

The Committee wishes you success on your study.

Yours Faithfully

Dr. Eshetu Worku
Chairperson: PHREC
E-mail: eworku@ncpg.gov.za
Tel: 053 0830 2134
Cell: 072 703 8037

15/10/2013
Date

Addendum E: Approval to conduct study from the Faculty of Health Science, University of the Free State, Ethics committee

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

Research Division
Internal Post Box G40
☎(051) 4052812
Fax (051) 4444359

E-mail address: StraussHS@ufs.ac.za

Ms H Strauss/hv

2013-09-19

REC Reference nr 230408-011
IRB nr 00006240

MS B MYBURGH
18 SINOVICH AVENUE
CARTERS GLEN
KIMBERLEY
8301

Dear Ms Myburgh

ECUFS NR 151/2013
PROJECT TITLE: EFFECTIVENESS OF THE PREVENTION OF MOTHER-TO-CHILD TRANSMISSION (PMTCT) POLICY IN THE NORTHERN CAPE, SOUTH AFRICA.

- You are hereby kindly informed that the Ethics Committee approved the above project at the meeting held on 17 September 2013.
- Committee guidance documents: Declaration of Helsinki, ICH, GCP and MRC Guidelines on Bio Medical Research. Clinical Trial Guidelines 2000 Department of Health RSA; Ethics in Health Research: Principles Structure and Processes Department of Health RSA 2004; Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa, Second Edition (2006); the Constitution of the Ethics Committee of the Faculty of Health Sciences and the Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines.
- Any amendment, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.
- The Committee must be informed of any serious adverse event and/or termination of the study.
- All relevant documents e.g. signed permission letters from the authorities, institutions, changes to the protocol, questionnaires etc. have to be submitted to the Ethics Committee before the study may be conducted (if applicable).
- A progress report should be submitted within one year of approval of long term studies and a final report at completion of both short term and long term studies.

- Kindly refer to the ETOVS/ECUFS reference number in correspondence to the Ethics Committee secretariat.

Yours faithfully

.....
PROF WJ STEINBERG
ACTING CHAIR: ETHICS COMMITTEE

Cc Dr R Lategan

Addendum F: Consent form for participants

English:

Effectiveness of the Prevention of Mother-to-Child Transmission (PMTCT) policy in the Northern Cape, South Africa

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

I have been asked to participate in the above mentioned research study and the study has been explained to me by _____

Participation in this study is voluntary and it is your own choice to participate in the study. No parent or child will be discriminated against when choosing to participate in the study or not.

Your participation in this study will involve an interview with the researcher during which a questionnaire will be completed. All questions will be explained to you.

All the information obtained through the questionnaire will be confidential and will only be used for the purpose of this study.

You will also receive an information page that will explain the study to you.

I understand what my participation in this study entails and I choose to participate in this study voluntarily.

_____ _____

Signature of mother Date

Afrikaans:

Effectiveness of the Prevention of Mother-to-Child Transmission (PMTCT) policy in the Northern Cape, South

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TOESTEMMING VIR DEELNAME AAN ‘N NAVORSINGSTUDIE

Ek is gevra om aan die bogenoemde studie deel te neem en die studie is aan my verduidelik deur_____

Deelname aan die studie is vrywillig en dit is u eie keuse of u aan die studie wil deelneem. Geen ouer of kind sal benadeel of bevoordeel word weens hul keuse om deel te neem aan die studie nie.

U deelname in die studie behels ‘n onderhoud met die navorser, waartydens ‘n vraelys ingevul sal word. Alle vrae sal aan u verduidelik word.

Alle inligting wat deur die vraelys ingesamel word, sal vertroulik wees, en net vir die doeleindes van die studie gebruik word.

Saam met hierdie vorms ontvang u ‘n inligtingstuk wat die studie meer breedvoerig verduidelik.

Ek verstaan wat my deelname aan die studie behels en stem vrywillig in om aan die studie deel te neem.

_____ _____

Handtekening van ouer Datum

Tswana:

Policy yathibelaya go fedisayagotswabathlokwajwa go mme goyangwanengmo Kapa Bokone, Afrika Borwa.

Tumalano Go Tsaya Karolo mo thutong Patlisiso

Ke kopilwe go ka tsaya karolo mo thuthong Patlisiso e e umakilweng fa godimo, e bile ke e tlhaloseditswe ke……

Go tsaya karolo mo thutong e ke bo ithaopo ebile, ke tlhopho ya gago go ka tsaya karolo mo thutonge .Gago motsadi kgotsa ngwana a ka kgethololwang kgatlhanong le go tlhopa go ka tsaya karolo mo thutong patlisiso kgotsa nyaa.

Go tsaya karolo go goga mo dithutong go akaretsa ledipotso lo tswa ke mmatlisisi ka eko e foromo ya dipotso e tladiwa o ka tlhalosetswa potso tsotlhe.

Tshedimosetsho yotlhe ee fitlheletsweng gotswa mo foromong ya dipotso e ka nna sephiri, ebile etla dirisiwa fela mo ma bakeng a thutho patlisiso.

Ke tlhaloganya go tse eng karolo

Ke tlhalogamya ditla morago tsa go tsaya karolo mo thutong.

Patlisiso e ,ebile ke tlhopo go tsaya karolo mothutng

Patlisiso ka boitheopo

…… ……

Tshaeno ya ga Mme Letlha

Addendum G: Information handout

English:

Effectiveness of the Prevention of Mother-to-Child Transmission (PMTCT) policy in the Northern Cape, South Africa

---

I would like to invite you to participate in the above mentioned research study. Before you decide if you would like to participate, please read this information handout that explains what the study is about and what will be required from you. Feel free to ask questions to the researcher if there is any uncertainty.

What is the Prevent mother-to-child transmission (PMTCT) policy?

The PMTCT policy is a worldwide policy that focuses on the Prevention of Mother-to-Child Transmission of the human immunodeficiency virus (HIV). This means that the policy aims to decrease the amount of children being infected with HIV from their mothers.

Why should I participate in this study?

The goal of this study is to examine if the PMTCT policy is working in the Frances Baard district as well as the reasons why the policy is working or not. If you participate in this study you can help us improve the PMTCT programme offered in the Frances Baard district. This means that the quality of the services rendered to you at the clinics and hospitals can improve.

What will be expected of you if you participate?

If you choose to participate in this study, the researcher will ask you questions while completing a questionnaire. Al the information that you provide will be kept confidential. No personal information, including names and addresses will be asked. The information will only be used for the purpose of this study. You and your child will also be weighed and your length measured. No painful tests or blood tests will be done. The questionnaire and measurements will be done in less than an hour. The study will not cost you any money and will not cause any discomfort.

The results from this study may be presented at academic meetings; however NO personal information on participants will be disclosed.

Who can I contact for more information?

You can ask the researcher any questions before you take part in the study or contact the researcher Ms Myburgh at 053 802 2233.

The researcher:

Bianca Myburgh (Registered Dietician)

Afrikaans:

Effectiveness of the Prevention of Mother-to-Child Transmission (PMTCT) policy in the Northern Cape, South Africa

---

Ek wil u graag uitnooi om aan die bogenoemde studie deel te neem. Voordat u besluit of u wil deelneem, lees asseblief hierdie inligtingsblad wat die studie beter verduidelik. Vra asseblief enige vrae vir die navorser as daar enige onsekerhede is.

Wat is die "Prevention of Mother-to-Child Transmission (PMTCT)" program?

Die PMTCT program is 'n wêreldwye program wat daarop fokus om die oordrag van mana haar kind van HIV te verminder. Dit beteken dat die program die hoeveelheid kinders wat deur HIV geïnfekteer word deur hul ma's te verminder.

Hoekom aan die studie deelneem?

Die doel van hierdie studie is om vas te stel of die PMTCT program in die Frances Baard distrik werk. Die studie ondersoek ook die redes hoekom hierdie program werk of nie werk nie. As u aan die studie deelneem, sal u ons help om die PMTCT program in die Frances Baard distrik te verbeter. Dit beteken dat die diens wat aan u gelewer word by die klinieke en hospitale verbeter kan word.

Wat sal van u verwag word as u deelneem?

As u kies om aan die studie deel te neem, sal die navorser vrae aan u vra terwyl 'n vraelys ingevul word. Al die inligting wat u verskaf sal vertroulik hanteer word. Geen persoonlike inligting soos name en woon adresse sal gevra word nie. Die inligting wat u gee sal net vir die doel van hierdie studie gebruik word. U en u kind sal ook geweeg word en lengte gemeet word.

Die vraelys en metings sal so vinnig as moontlik afgehandel word en minder as 'n uur neem. Die studies al u geen geld kos nie en ook nie enige ongerief veroorsaak nie.

Die resultate van die studie mag by akademiese praatjies voorgedra word, alhoewel geen persoonlike inligting van deelnemers deurgegee sal word nie.

Wie kan u kontak vir meer inligting?

U kan die navorser enige vrae vra voor die studie of die navorser Me Myburgh kontak by 053 802 2233.

Die navorser:

Bianca Myburgh (Geregistreerde Dieetkundige)

Tswana:

Botlhokwajwa Policy yathibeloya go fetelagotswago Mmegoya Ngwanengmo Kapa Bokone, Afrika Borwa.

Ke rata go golaletsa go tsaya karolo mosetlhogong se se fa godimo sa di thuto patlisiso.Pele ga o tsaya tshwetso ya go tsaya karolo ka kopo bala tlhaloso ya gore dithuto ke kaga eng legore go tlhokagalang gotswa mo go wena . Phuthuloga go botsolotsammatlesisifa go satlhaloganyesege.

Keeng policy ya go thibela gotswa go Mme goya Ngwaneng?

Ke policy e lefatshekabophara e elebisitsengmo go thibeleng kokwanatlhoko ya HIV gotswa go Mme goya leseaneng .se se raya gore maikaelelo a policy ke go fokotsa dipalopalo tsa bana /masea ba ba amilweng ke mogare wa HIV gotswa go bo Mma bona.

Goreeng ke tshwanetse go tsaya karolo mothutong e?

Maikaelelo a thutoke go sekasekafaele gore policy yago thibela gabotlhokogotswa go Mme goya Ngwaneng eya berekamok gaolongya Frances Baard legontshamabaka a gore goreng eberekakgotsa e sabereke /dira. Faele gore o tsaya karolo mothutong e, o karethusakagoneelanago katokafats a programa/lenaanetema la PMTCT motikologongya Frances Baard . Seo se raya gore tirelo e o e boning momaokelong ledipetlele e katokafala.

Go Solofetsweengmogowenafa o tsaya karolo?

Fa o tlhopile go tsaya karolomothutonge, Mmatlisisiotla go botsadipotsofa antse atlatsadiforomo. Tshedimo setsoyotlhe o neelanangkayona e kannasephiri. Ga gotshedimos e tsokaga wena e etlabodiwang go akaretsamaina le aterese. Tshemodisetso e tladirisiwaf e lamomabakeng a thuto ,wena le ngwanawa ga golotlatsewabo imajwamele leboleele. Gagote kodipetsedika o utlwisangbotlhoko kana tsamaditse ditla dirwang.

Dipotsolotso le dite kanyetso ditlatse wakabonakojo, bokgo nagalang. Dithuto ga di batlemadi/tsheleteebile di kase go tsenyetsietsing/gose itumedise.

Thutopatlisiso e, e katlhagiswakwa Setheong-Segolwane saditlhagiso (Academic presentation) lefa golejalo gagotshedimosetsoya motho o tshotseng karolo e e katlhagiswang mophatlhalatseng.

NkaIkgolagan yale mangka gatshedimoset soenngwe?

O kabotsa Mmatlisise potsoengwe le engwe pele o tsaya karolo mothutong kgotsawaik golaganya le Mmatlisise. Ms Myburgh monomorong e elatelangyamogala -053 8022233.

Mmatlisise:

Bianca Myburgh (Registered Dietician)

Addendum H: Author guidelines, South African Journal of Clinical Nutrition (SAJCN)

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Conflict of interest

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Protection of patient's rights to privacy

Identifying information should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives informed written consent for publication. Informed consent for this purpose requires that the patient be shown the manuscript to be published. (**www.icmje.org**)

Ethnic classification

Work that is based on or contains reference to ethnic classification must indicate the rationale for this.

Manuscripts

Short items are more likely to appeal to our readers and therefore to be accepted for publication. Manuscript should not exceed 4000 words in total all contents inclusive.

Original articles of 4 000 words or less, with up to 6 tables or illustrations, should normally report observations or research of relevance to the field of nutrition. References should preferably be limited to no more than 25.

Short reports or scientific letters, which include case reports, side effects of nutrient supplements/drugs and brief or negative research findings should be 1000 words or less, with 1 table or illustration and no more than 6 references.

Editorials, Opinions, Issues in the field of nutrition.should be about 1000 words and are welcome, but unless invited, will be subjected to the SAJCN peer review process.

Review articles are rarely accepted unless invited.

Letters to the editor, if intended for the correspondence column, should be marked 'for publication', signed by all authors and presented in triple spacing. Letters should be no longer than 400 words with only one illustration or table.

Obituaries should not exceed 400 words and may be accompanied by a photograph.

Manuscript preparation

- Please submit your manuscript electronically at www.sajcn.co.za
- Research articles should have a structured abstract not exceeding 250 words (50 for short reports) comprising: Objectives, Design, Setting, Subjects, Outcome measures, Results and Conclusions.
- A second abstract should be written in simple and clear spoken language highlighting the reason(s) that the research work was undertaken, the key findings and the key recommendations **WITHOUT**, overtly or covertly implying or containing any claims of whatsoever nature, but rather explaining how the work will help scientists (and/or lay persons) better understand and address the topic of investigation. The abstract should not exceed an absolute maximum of 75 words. In addition, please also include a < 140 character, “strong” message that can be used for social media.
- Refer to articles in recent issues for guidance on the presentation of headings and subheadings.

- Abbreviations should be spelt out when first used in the text and thereafter used consistently.
- Scientific measurements should be expressed in SI units except: blood pressure should be given in mmHg and haemoglobin values in g/dl.

If in doubt, refer to www.icmje.org/index.html

Illustrations

1. Figures consist of all material that cannot be set in type, such as photographs and line drawings.
2. Tables and legends for illustrations should appear on separate sheets and should be clearly identified.
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4. Figure numbers should be clearly marked on the back of prints and the top of illustrations should be indicated.
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6. A limited number of illustrations are free at the discretion of the editor. Colour illustrations are encouraged but are charged to the author.

A quote will be provided on request. Consider sponsorship.

References

References should be inserted in the text as superior numbers and should be listed at the end of the article in numerical and not in alphabetical order.
Authors are responsible for verification of references from the original sources.

References should be set out in the Vancouver style and approved abbreviations of journal titles used; consult the List of Journals in Index Medicus for these details.

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should be given.

Journal references should appear thus:
1. Price NC .Importance of asking about glaucoma.BMJ 1983; 286: 349-350.

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2. Weinstein L, Swartz MN. Pathogenic properties of invading microorganisms. In: Sodeman WA jun, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974: 457-472.

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Revised manuscript should be resubmitted electronically within 3 weeks of receipt thereof.

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2. The submission file is in Microsoft Word, or RTF file format
3. When available, the URLs to access references online are provided, including those for open access versions of the reference. The URLs are ready to click (e.g., http://pkp.sfu.ca).
4. The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
5. The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines, which is found in About the Journal.
6. If submitting to a peer-reviewed section of the journal, the instructions in Ensuring a Blind Review have been followed.
7. The manuscript has an abstract.
8. The second abstract should be written in simple and clear spoken language highlighting the reason(s) that the research work was undertaken, the key findings and the key recommendations WITHOUT, overtly or covertly implying or containing any claims of whatsoever nature, but rather explaining how the work will help scientists

(and/or lay persons) better understand and address the topic of investigation. The abstract should not exceed an absolute maximum of 75 words. In addition, please also include a < 140 character, “strong” message that can be used for social media.

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Addendum I: Author guidelines, South African Medical Journal (SAMJ)

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Conflict of interest

Authors must declare all sources of support for the research and any association with a product or subject that may constitute conflict of interest.

Research ethics committee approval

Provide evidence of Research Ethics Committee approval of the research where relevant.

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Ethical classification

References to ethnic classification must indicate the rationale for this.

Manuscripts

Shorter items are more likely to be accepted for publication, owing to space constraints and reader preferences.

Research articles (previously 'Original articles') not exceeding 3 000 words, with up to 6 tables or illustrations, are usually observations or research of relevance to clinical medicine and related fields. *References should be limited to no more than 15.* Please provide a structured abstract not exceeding 250 words, with the following recommended headings: *Background, Objectives, Methods, Results,* and *Conclusion.*

Scientific letters will be considered for publication as shorter ***Research articles***.

Editorials, Opinions, etc. should be about 1000 words and are welcome, but unless invited, will be subjected to the *SAMJ* peer review process.

Review articles are rarely accepted unless invited.

Letters to the editor, for publication, should be about 400 words with only one illustration or table, and must include a correspondence address.

Forum articles must be accompanied by a short description (50 words) of the affiliation details/interests of the author(s). Refer to recent forum articles for guidance. Please provide an accompanying abstract not exceeding 150 words.

Book reviews should be about 400 words and must be accompanied by the publication details of the book.

Obituaries should be about 400 words and may be accompanied by a photograph.

Guidelines must be endorsed by an appropriate body prior to consideration and all conflicts of interest expressed. A structured abstract not exceeding 250 words (recommended sub-headings: *Background, Recommendations, Conclusion*) is required. Sections and sub-sections must be numbered consecutively (e.g. 1. Introduction; 1.1 Definitions; 2.etc.)and summarised in a Table of Contents. References, appendices, figures and tables must be kept to a minumum.

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Manuscript preparation

Refer to articles in recent issues for the presentation of headings and subheadings. If in doubt, refer to 'uniform requirements' -**www.icmje.org**. Manuscripts must be provided in **UK English**.

Qualification, affiliation and contact details of ALL authors must be provided in the manuscript and in the online submission process.

Abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.

Scientific measurements must be expressed in SI units except: blood pressure (mmHg) and haemoglobin (g/dl). Litres is denoted with a lowercase 'l' e.g. 'ml' for millilitres). Units should be preceded by a space (except for %), e.g. '40 kg' and '20 cm' but '50%'. Greater/smaller than signs (> and 40 years of age'. The same applies to ± and º, i.e. '35±6' and '19ºC'.

Numbers should be written as grouped per thousand-units, i.e. 4 000, 22 160...

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Illustrations and tables

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Wherever possible, references must be accompanied by a digital object identifier (DOI) link and PubMed ID (PMID)/PubMed Central ID (PMCID). Authors are encouraged to use the DOI lookup service offered by **CrossRef**.

Journal references: Price NC, Jacobs NN, Roberts DA, et al. Importance of asking about glaucoma. Stat Med 1998;289(1):350-355. [http://dx.doi.org/10.1000/hgjr.182] [PMID: 2764753]

Book references: Jeffcoate N. Principles of Gynaecology. 4th ed. London: Butterworth, 1975:96-101. *Chapter/section in a book:*Weinstein L, Swartz MN. Pathogenic Properties of Invading Microorganisms. In: Sodeman WA jun, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974:457-472.

Internet references: World Health Organization. The World Health Report 2002 - Reducing Risks, Promoting Healthy Life. Geneva: World Health Organization, 2002. http://www.who.int/whr/2002 (accessed 16 January 2010).

Other references (e.g. reports) should follow the same format: Author(s). Title. Publisher place: publisher name, year; pages. Cited manuscripts that have been accepted but not yet published can be included as references followed by '(in press)'. Unpublished observations and personal communications in the text must not appear in the reference list. The full name of the source person must be provided for personal communications e.g. '...(Prof. Michael Jones, personal communication)'.

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2. The submission has not been previously published, nor is it before another journal for consideration.
3. The text complies with the stylistic and bibliographic requirements in **Author Guidelines**.
4. The manuscript is in Microsoft Word or RTF document format. The text is single-spaced, in 12-point Times New Roman font, and contains no unnecessary formatting.
5. Illustrations/figures are high resolution/quality (not compressed) and in an acceptable format (preferably TIFF or PNG). These must be submitted individually as 'supplementary files' (not solely embedded in the manuscript).
6. For illustrations/figures or tables that have been published elsewhere, the author has obtained written consent to republication from the copyright holder.
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9. The research was approved by a Research Ethics Committee (if applicable)
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Addendum J: Author Guidelines, Social Science & Medicine

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If your article includes any Videos and/or other Supplementary material, this should be included in your initial submission for peer review purposes.

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Summary

Introduction

Human Immunodeficiency Virus (HIV) infection in children is mainly caused by Mother-to-Child Transmission (MTCT). The Prevention of Mother-to-Child Transmission (PMTCT) policy has been implemented in South Africa to reduce the rate of MTCT. Even though this policy has been in place for more than ten years and despite the reduction in MTCT, the challenge remains to eliminate MTCT completely. This study investigates the factors that may influence the effectiveness of the PMTCT policy.

Methods

Four clinics in the Frances Baard District, South Africa, where PMTCT services are rendered were included. A hundred mothers-child-pairs, where the mother is HIV infected and breastfed her child, but has stopped breastfeeding and the six week post cessation of breastfeeding HIV test was done on child, were included in the study. A questionnaire was completed by the researcher during an interview with the mother and anthropometric measurements of both mother and child were taken. The clinic files of mothers were also used to collect data.

Ethical approval to conduct this study was obtained from the Ethics Committee, Faculty of Health Sciences, University of the Free State and the Northern Cape Department of Health Research Ethics Committee. Mothers provided informed consent before interviews were conducted.

The Department of Biostatistics, University of the Free State performed the statistical analysis of data.

Results

All mothers included in this study attended antenatal clinics. Mothers who were not known to be HIV infected were tested antenatal and CD4 cell counts and HIV stages were indicated in all files. Twenty two mothers visited the antenatal clinic less than four times as recommended and 23 mothers visited for the first time during their third trimester.

Only one mother reported that she received no counselling on feeding practises, and even though mothers were mostly knowledgeable about feeding practices, only 58 mothers

introduced solids at the correct age and 31 mothers mixed fed their children.The number of counselling sessions did not affect breastfeeding duration (95% CI: [-2; 3]) or the age of introduction of solids (95% CI:[-2; 1])

Knowledge about MTCT was poor as most mothers (82%) only knew that MTCT could occur during breastfeeding. Younger mothers were more knowledgeable (95% CI: [0.17; 5.56]). The number of counselling sessions did not affect the knowledge of the mother (p=0.12).

Five children and eight mothers never started with any antiretroviral therapy (ART). Thirteen children and 27 mothers defaulted their ART treatment.

No children tested HIV infected at six weeks but three children tested HIV infected at the 18 month test.

Mothers with HIV infected children had a more advanced stage of HIV infection (95% CI: [23.5%; 87.1%]), lower CD4 cell count (p=0.03) and defaulted their ART during breastfeeding (95% CI: [21.5%; 85.4%]) compared to mothers with HIV uninfected children. All three children that tested HIV infected were of mothers with Stage 2 HIV infection, with a CD4 cell count of less than 350 cells/mm^3 and defaulted their ART during breastfeeding.

Conclusions and recommendations

Using the 2010 and 2013 PMTCT policies as benchmark, the PMTCT programme is implemented relatively well in this district although improvements still need to be made. The knowledge of the mothers about feeding practices and MTCT should be addressed by means of counselling by properly informed health care professionals. Missed opportunities for training resulted, as mothers did not attend antenatal clinic as soon and as often as recommended.

Mothers should be motivated to improve ART adherence as this can affect CD4 cell count and HIV progression, all factors that contributed to MTCT. Counselling should be focussed on ART adherence and MTCT. Shortages of ART at clinics should be addressed to eliminate this reason for ART defaulting. All women of childbearing age should also be made aware of the importance of early antenatal attendance.

The rate of HIV transmission in this district is below the national reported rate but it remains a challenge to eliminate MTCT completely

Key words

Human Immunodeficiency Virus (HIV), Acquired Immunodeficiency Syndrome (AIDS), Prevention of Mother-to-Child Transmission (PMTCT), Mother-to-Child Transmission (MTCT), Anthropometry, Breastfeeding, Risk factors, Antiretroviral Therapy (ART), Social Grants

Opsomming

Inleiding

Menslike Immuniteitsgebrek Virus (MIV) infeksie in kinders kan grootliks toegeskryf word aan Moeder-na-Kind Oordrag (MNKO). Die Voorkoming van Moeder na Kind Oordrag (VMNKO) beleid is geïmplementeer in Suid Afrika om MNKO teverlaag. Hierdie beleid is al langer as tien jaar geïmplementeer, maar alhoewel MNKO verminder het, bly die uitdaging om MNKO totaal uit te skakel. Hierdie studie stel ondersoek in na die faktore wat moontlik die effektiwiteit van die VMNKO beleid kan beïnvloed

Metode

Vier klinieke in die Fraces Baard Distrik, Suid Afrika waar VMNKO dienste gelewer word is ingesluit in die studie. ‘n Honderd moeder-kind pare, waar die ma MIV besmet is en haar kind geborsvoed het, maar opgehou borsvoed het en die ses weke MIV toets na die staking van borsvoeding uitgevoer is op die kind, is ingesluit by hierdie studie. ‘nVraelys is deur die navorser tydens ‘n onderhoud met die moeder voltooi en antropometriese metings van beide moeder en kind is geneem. Die kliniek lêers van ma’s is ook gebruik om data te versamel.

Etiesegoed keuring om die studie uit te voer is vanaf die Etiekkomitee, Fakulteit Gesondheidswetenskappe van die Universiteit van die Vrystaat asook die Noord-Kaap Departement van Gesondheid se Navorsingsetiekkomitee ontvang. Alle ma’s het ingeligte toestemming verleen voordat die onderhoude gevoer is.

Die Departement Biostatistiek, Universiteit van die Vrystaat het die statistiese ontleding van die data gedoen.

Resultate

Al die ma’s in die studie het die voorgeboorte kliniek bygewoon. Al die ma’s met onbekende HIV status is tydens die kliniek besoek getoets en CD4 sel telling en HIV stadium is in alle leers aangedui. Twee en twintig ma’s het die voorgeboortekliniek minder as die voorgestelde vier keer besoek en 23 ma’s het die kliniek vir die eerste keer tydens hul derde trimester besoek.

Slegs een ma het aangedui dat sy geen onderrig by die kliniek aangaande voiding ontvang het nie. Al het ma's redelike kennis oor voiding praktyke getoon, het slegs 58 ma's vaste kosse op die regte ouderdom ingesluit en 31 ma's het gemengde voedings gegee. Die hoeveelheid onderrig sessies wat die ma ontvang het, het nie die duur van borsvoeding (95% CI: [-2; 3]) of die ouderdom waarop vaste voedsel ingesluit is (95% CI:[-2; 1]) beïnvloed nie.

Kennis oor MNKO was swak en die meeste ma's kon net aandui dat MNKO deur borsvoeding geskied. Jonger ma's het meer kennis gehad (95% CI: [0.17; 5.56]). Die hoeveelheid onderrig sessies het nie die kennis van die ma's beïnvloed nie (p=0.12).

Vyf kinders en agt moeders het nooit op enige antiretrovirale terapie (ART) begin nie. Dertien kinders en 27 ma's het versuim om hul ART daagliks te neem.

Geen kinders het MIV besmet getoets op ses weke nie, maar drie kinders was MIV besmet tydens die 18 maande toets.

Ma's met MIV besmette kinders het 'n meer gevorderde MIV stadium gehad (95% CI: [23.5%; 87.1%]), 'n laer CD4 sel telling (p=0.03) en het hul ART versuim tydens borsvoeding (95% CI: [21.5%; 85.4%]) in vergelyking met ma's met MIV onbesmette kinders. Al drie MIV besmette kinders se moeders het 'n MIV stadium van 2 gehad, 'n CD4 sel telling van minder as 350 selle/mm^3 en het hul ART versuim tydens borsvoeding.

Gevolgtrekking en aanbevelings

In vergelyking met die 2010 en 2013 VMNKO beleid is die VMNKO program relatief goed geïmplementeer in die distrik alhoewel daar steeds verbetering aangebring kan word. Kennis van ma's aangaande voedingspraktyke en MNKO sal moet verbeter deur onderrig deur behoorlik opgeleide gesondheidsorgwerkers. Geleenthede vir opleiding is verbeur, aangesien ma's nie voorgeboorte klinieke so vroeg en gereeld as aanbeveel besoek het nie.

Ma's moet veral onderrig word oor die gebruik van ART soos voorgeskryf, wat hul CD4 sel telling en MIV stadium beïnvloed, aangesien hierdie faktore bygedra het tot MNKO. Onderrig moet op ART nakoming en MNKO toegespits word. Tekorte van ART by klinieke moet aangespreek word aangesien dit gedeeltelik verantwoordelik was vir ART versuiming. Alle vroue moet bewusgemaak word oor die belangrikheid van vroeë voorgeboorte kliniek besoeke.

Die MNKO koers in hierdie distrik is laer as die gerapporteerde nasionale koers, maar dit bly ‘n uitdaging om MNKO totaal uit te skakel.

Sleutelwoorde

MenslikeImmuniteitsgebrek Virus (MIV), VerworweImmuniteitsgebrek Sindroom (VIGS), Voorkoming van Moeder Na Kind Oordrag (VMNKO), Moeder-Na-Kind Oordrag (MNKO), Antropometrie, Borsvoeding, Risikofaktore, Anti-retrovirale Terapie (ART), MaatskaplikeToelaes