APPLICATION OF THE CURRENT DIETARY GUIDELINES FOR PEOPLE WITH DIABETES MELLITUS BY DIETICIANS AND NURSES

by

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Declaration

I hereby declare that the work submitted here is the result of my own independent investigation. I further declare that this work is submitted for the first time at this university/faculty towards a M.Sc degree in Dietetics, and that it has never been submitted to any other university/faculty for the purpose of obtaining a degree. I hereby concede copyright of this product in favour of the University of the Free State.

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H. Taljaard

This dissertation is dedicated to my husband, Pieter Taljaard; as well as Diedelof & Jenny Fourie

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The views expressed in this dissertation are those of the author, and do not necessarily concur with the policies of the South African Sugar Association.

ABSTRACT

Intensive diabetes management resulting in control of blood glucose concentrations will delay the onset and significantly impede the progression of complications from diabetes. Healthcare professionals such as dieticians and nurses are increasingly challenged to help patients with diabetes achieve a desirable body weight, and maintain good metabolic control. Therefore, a clear understanding of current dietary goals and skills to implement these goals when counselling patients with diabetes, is needed. A Position Statement was compiled by an expert group of dieticians in South Africa in 1997 to encourage a uniform approach to the nutritional management of diabetes mellitus. However, application of these dietary recommendations by health professionals has not been established.

The main aim of this study was to assess the current practice trends of dieticians and nurses regarding application of the goals of the Position Statement in the Free State province (FS) and the North West province (NW). To accomplish this aim, dieticians and nurses were asked open-ended questions regarding the dietary goals.

The study was a comparative, multi-centre study. A total of 18 dieticians (n=8 from the FS and n=10 from the NW), registered as Private Practicing Dieticians (PPDs), as well as a randomized, stratified sample of 150 registered nurses (n=100 from the FS and n=50 from the NW) working in all primary health care clinics, were included in the study. The researcher obtained informed consent from each participant.

After the researcher telephonically scheduled appointments with all participants who gave permission to take part in the study, structured personal and telephonic interviews were conducted with dieticians and nurses, respectively. A standardized questionnaire was used to gather the necessary information. Answers were evaluated by scores preset to each answer, classifying them from the most to the least acceptable answer. High scores (from 75% to 100%) gave an indication of good application of the dietary goals, while lower scores (from 65%-74%) indicated that the dietary goals were not properly applied. The lowest scores (below 65%) indicated poor application of the dietary goals.

All dieticians that were included in the study, as well as 64 and 31 nurses in the FS and NW, respectively, received formal letters from the researcher, requesting a copy of nutrition education material (NEM). Total scores were also determined for each NEM. High scores (from 75%-100%) indicated that the information was comparable to the dietary goals, while lower scores (from 65%-74%) gave an indication that part of the information was outdated. The lowest scores (below 65%) indicated that the information was unacceptable or completely outdated.

Eighty-eight percent of the FS PPDs and 70% of the NW PPDs, as well as 87% and 96% of the FS and NW nurses, respectively, gave permission to take part in the study. Although dieticians obtained higher scores than nurses in both the FS and NW, total scores obtained by all health professionals were below 65%. No statistically significant differences were found between the scores obtained by nurses in the FS (mean 28%) and nurses in the NW (mean 29%). Dieticians in the FS and NW obtained mean scores of 64% and 61%, respectively. Although scores obtained by the FS dieticians were 3% higher, no statistically significant differences were found between the scores of dieticians in the two provinces. Mean scores obtained by NEMs from all health professionals were below 65%. No statistically significant differences were found between the scores for NEM from dieticians (mean 35%) and scores for NEM from nurses (mean 33%).

It can be concluded that dieticians and nurses in the FS and NW poorly apply the current dietary recommendations for people with diabetes. Furthermore, most of the NEMs used by both dieticians and nurses in their respective practice settings do not correlate with the 1997 dietary goals. These results indicate that there is a dire need to focus on better education of health professionals who counsel patients with diabetes. More research is needed to identify the possible barriers to effective application of current dietary recommendations by health professionals.

OPSOMMING

Die begin en voortsetting van diabetiese komplikasies kan met goeie kontrole van bloedglukose konsentrasies, dit wil sê, intensiewe diabetiese sorg merkbaar uitgestel word. Die uitdaging word dus al hoe groter vir gesondheisorgwerkers, soos dieetkundiges en verpleegkundiges, om pasiënte met diabetes te help om ‘n ideale liggaamsmasse te bereik en om goeie bloedglukose kontrole te handhaaf. Dit is dus belangrik dat gesondheidsorgwerkers die huidige dieetriglyne verstaan en oor die nodige vaardighede beskik om daardie riglyne te implementeer wanneer pasiënte met diabetes gekonsulteer word. Om ‘n eenvormige benadering tot die voedingbehandeling van diabetes te bewerkstellig, het ‘n groep deskundige dieetkundiges in Suid Afrika in 1997 ‘n stel dieetriglyne saamgestel. Daar is egter nog nie vasgestel of gesonheidsorgwerkers hierdie dieetriglyne wel implementeer en toepas nie.

Die doel van hierdie studie was om te bepaal of die huidige dieetriglyne vir pasiënte met diabetes deur dieetkundiges en verpleegkundiges in die Vrystaat provinsie (V) en die Noordwes provinse (N) toegepas word. Om hierdie doel te verwesenlik, is oop-einde vrae oor die dieetriglyne aan dieetkundiges en verpleegkundiges gestel.

Die studie was ‘n vergelykende, multi-sentrum studie. Agtien dieetkundiges (n=8 van die V en n=10 van die N) geregistreer as Privaat Praktiserende Dieetkundiges (PPDs), asook ‘n gerandomiseerde, gestratifiseerde steekproef wat bestaan uit 150 geregistreerde verpleegkundiges, was by die studie ingesluit. Elke deelnemer het toestemming verleen om aan die studie deel te neem.

Die navorser het vervolgens telefoniese afsprake geskeduleer met elke deelnemer wat toestemming verleen het om aan die studie deel te neem. Gestruktureerde persoonlike en telefoniese onderhoude is met dieetkundiges en verpleegkundiges, respektiewelik, gevoer. ‘n Gestandardiseerde vraelys is gebruik om die nodige inligting in te samel. Antwoorde is geëvalueer deur middel van vooropgestelde punte-tellings wat aan elke moontlike antwoord toegeken is. Hierdie punte-telling het antwoorde geklassifiseer van die mees aanvaarbare tot die minste aanvaarbare antwoorde. Hoë punte-tellings (vanaf 75% tot 100%) was ‘n aanduiding van goeie toepassing van die dieetriglyne, terwyl laer punte-tellings (vanaf 65%-74%) aangedui het dat die dieetriglyne nie voldoende toegepas word nie. Die laagste punte-tellings (onder 65%) was ‘n aanduiding van swak toepassing van die dieetriglyne.

Die navorser het formele briewe aan al die dieetkundiges wat aan die studie deelgeneem het, sowel as aan 64 en 31 verpleegkundiges van die V en N, respektiewelik, gestuur. Hierdie briewe het gesondheidsorgwerkers versoek om ‘n afskrif van die voeding onderrigmateriaal wat hulle gebruik, na die navorser te stuur. Die totale punte-telling is ook vir elke stuk voeding onderrigmateriaal bereken. Hoë punte-tellings (vanaf 75% tot 100%) was ‘n aanduiding dat die inligting vergelykbaar is met die dieetriglyne van 1997, terwyl laer punte-tellings (vanaf 65% tot 74%) aangedui het, dat die inligting verouderd is. Die laagste punte-tellings (onder 65%) het aangedui dat die inligting onaanvaarbaar of totaal verouderd is.

Agt-en-tagtig persent van die V en 70% van die N PPDs, sowel as 87% en 96% van die verpleegkundiges in die V en N, respektiewelik, het toestemming verleen om aan die studie deel te neem. Hoewel die dieetkundiges hoër punte-tellings as die verpleegkundiges behaal het, was die totale punte-tellings van alle gesondheidsorgwerkers onder 65%. Geen statisties betekenisvolle verskille het voorgekom tussen die punte-tellings van verpleegkundiges in die V (gemiddeld van 28%) en van verpleegkundiges in die N (gemiddeld van 29%). Dieetkundiges

in die V en N het ‘n gemiddeld van 64% en 61%, respektiewelik, behaal. Hoewel die punte-tellings van dieetkundiges in die V 3% hoër was, was daar geen betekenisvolle verskille tussen die punte-tellings van dieetkundiges in die twee provinsies nie. Die gemiddelde punte-tellings van die voeding onderrigmateriaal van beide dieetkundiges en verpleegkundiges, was onder 65%. Daar was geen statisties betekenisvolle verskille tussen die punte-tellings van voeding onderrigmateriaal van dieetkundiges (gemiddeld 35%) en voeding onderrigmateriaal van verpleegkundiges (gemiddeld 33%).

Die gevolgtrekking kan gemaak word dat dieetkundiges en verpleegkundiges in die V en N die dieetriglyne vir pasiënte met diabetes swak toepas. Meeste van die voeding onderrigmateriaal wat deur beide dieetkundiges en verpleegkundiges gebruik word, stem nie ooreen met die 1997 dieetriglyne nie. Die resultate van hierdie studie dui aan dat daar ‘n dringende behoefte is om gesondheidsorgwerkers beter te onderrig ten opsigte van voedingriglyne vir pasiënte met diabetes. Verdere navorsing word benodig om moontlike hindernisse te identifiseer wat gesondheidsorgwerkers verhinder om die dieetriglyne wel toe te pas.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADA	**American Diabetes Association**
ADG	**ADSA Dietary Goals**
ADI	**Acceptable Daily Intake**
ADSA	**Association for Dietetics in South Africa**
apo B	**Apo-lipoprotein B**
BDA	**British Diabetic Association**
BMI	**Body Mass Index**
CHD	**Coronary heart disease**
CPD	**Continuing professional development**
CVD	**Cardiovascular disease**
DAIS	**Diabetes Atherosclerosis Intervention Study**
DCCT	**Diabetes Control and Complications Trial**
DE	**Diabetes Educator**
DESSA	**Diabetes Education Society of South Africa**
FDA	**Food and Drug Adminstration**
FPG	**Fasting plasma glucose**
FS	**Free State**
GDM	**Gestational diabetes mellitus**
GI	**Glycaemic Index**
GRASS	**Generally Regarded as Safe Substances**
HbA1c	**Glycated haemoglobin A1c**
HDL	**High-density lipoprotein**
HPCSA	**Health Professions Council of South Africa**

IBW	**Ideal body weight**
IDDM	**Insulin-dependent diabetes mellitus**
IFG	**Impaired fasting glucose**
IGH	**Impaired glucose homeostasis**
IGT	**Impaired glucose tolerance**
IR	**Insulin resistance**
LDL	**Low-density lipoprotein**
MNT	**Medical nutrition therapy**
MUFA	**Mono-unsaturated fat**
NDDG	**National Diabetes Data Group**
NIDDM	**Non-insulin-dependent diabetes mellitus**
NW	**North West**
OGTT	**Oral glucose tolerance test**
PPD	**Private Practicing Dietician**
PUFA	**Polyunsaturated fat**
SASA	**South African Sugar Association**
SEMDSA	**Society of Endocrinology, Metabolism and Diabetes in South Africa**
SFA	**Saturated fat**
SNAP	**Sugar is not a Poison**
TG	**Triglyceride(s)**
UKPDS	**United Kingdom Prospective Diabetes Study**
VLDL	**Very-low-density lipoprotein**
VLEDs	**Very low energy diets**
WHO	**World Health Organization**

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

"Quality health care today requires consistently applied, evidence-based care that leads to positive outcomes for most patients" – Karmen Kulkarni

1.1 PROBLEM STATEMENT AND MOTIVATION FOR THE STUDY

Medical nutrition therapy (MNT) remains the cornerstone of both diabetes management (Franz *et al*., 1995; Franz, 1996; Anderson, 1999; Franz, 2000; Ziemer *et al*., 2003) and diabetes self-management education (ADA, 2003). This includes nutrition education by health professionals, using educational material (Franz, 1996; Franz, 2000) provided by established organizations and disciplines involved in diabetes care (Mensing *et al*., 2000). Although the management of diabetes requires multiple self-care behaviours to achieve and sustain glycaemic control (Savoca & Miller, 2001), effective management cannot be achieved without proper attention to diet and nutritional aspects, regardless of what medical treatment patients receive (Chan, 2003). Appropriate dietary practices can decrease many of the risks and complications associated with diabetes. Consequently, adherence to approved treatment recommendations can restore normal life expectancy (Anderson, 1999), improve glycaemic control and ameliorate related conditions such as dyslipidaemia and hypertension (Pi-Sunyer *et al*., 1999). Goals of nutrition education for people with diabetes are to achieve and maintain a desirable body weight and optimal glycaemic control in order to reduce the morbidity and mortality associated with the disease (The United Kingdom Prospective Diabetes Study Group, 1998). To achieve these goals, all

people with diabetes should receive support by means of proper nutrition education messages, to enable them to manage their own diabetes (Diabetes UK, 2002).

Globally, organizations such as the American Diabetes Association (ADA), the British Diabetic Association (BDA), the Scottish Intercollegiate Guidelines Network, as well as the Association for Dietetics in South Africa (ADSA), are committed to provide quality diabetes care. According to Mensing *et al*. (2000) such organizations must endeavour to compile and provide evidence-based nutrition recommendations to all health professionals involved in diabetes care.

ADSA compiled and published a Position Statement in 1997, containing recommendations regarding the nutritional management of people with diabetes. These ADSA dietary goals (ADG) include recommendations for energy and macronutrient intake (fat, protein and carbohydrate), exercise, alcohol intake, supplementation, special 'diabetic food', as well as recommendations for pregnant and lactating women, and children with diabetes. These set of consensus dietary goals were compiled by a national representative expert group of dieticians, registered as members of ADSA. The Position Statement was published in the light of new research data, after revision of the 1992 recommendations entitled '*Nutritional recommendations for individuals with diabetes mellitus'*.

As part of a joint project of ADSA, the Diabetes Education Society of South Africa (DESSA) and the Society of Endocrinology, Metabolism and Diabetes in South Africa (SEMDSA), these dietary goals were also published in the format of a booklet and were disseminated to primary health care clinics throughout the country.

However, despite improved methods to provide ongoing diabetes education to health care providers, diabetes care continues to be inadequate (Daniels *et al*., 2000). A study conducted by Larme and Pugh (1996) in Texas, USA, investigated what happens to diabetes practice guidelines in real-world clinical settings. They suggested that although evidence-based practice guidelines for diabetes have been widely

disseminated, many physicians fail to implement them (Larme & Pugh, 2001). According to a study by Levitt *et al*. (1996, as referred to by Daniels *et al*., 2000), inadequate management of type 2 diabetes, as well as deficiencies in the organization of health care delivery in the Western Cape was demonstrated. Barriers within the health care system, such as inadequate health care provider practices, lack of significant inter-staff communication, as well as knowledge deficits, implicate poor quality of local diabetes care (Goodman *et al*., 1997). Daniels and co-workers (2000) also conducted a study in the Western Cape to examine the attitudes of health professionals, which included 15 physicians and ten professional nurses in primary healthcare facilities towards diabetes care recommendations. They found that the guidelines were not systematically implemented. These studies clearly show that although nutrition education materials are available to health professionals, some still fail to apply dietary recommendations when they provide nutrition education.

After almost six years since publication of the ADG, it is timely to determine whether health professionals apply these dietary recommendations in real world clinical settings. Since the studies in the Western Cape only included a small sample of physicians and nurses, it was decided to assess application of these recommendations by means of a larger sample, which included dieticians and diabetes educators (DEs) in private practice settings, as well as registered nurses in primary health care settings.

1.2 OBJECTIVES OF THIS STUDY

The main aim of this study was to assess the application of the current South African dietary goals for people with diabetes mellitus by dieticians and registered nurses in the Free State province (FS) and North West province (NW).

To reach this aim, the following sub-aims for each province were:

1.2.1 To assess application of the ADG by

- private practicing dieticians (PPDs)

- DEs working in private hospitals or private practice settings and
- registered nurses working at primary health care clinics

1.2.2 To evaluate the nutrition educational materials that were available in private practices and primary health care clinics in the FS and NW.

1.3 STRUCTURE OF THIS DISSERTATION

Following this introductory chapter, **Chapter 2** presents a literature review on the aetiology and pathogenesis, classification and diagnosis of diabetes, as well as management of the disease through MNT. Further discussion includes the implementation of dietary interventions by health care professionals, as well as evaluation of nutrition educational material used during patient education. A detailed description of methodology used during the study, with specific reference to measuring tools, as well as standardized methods and techniques, are given in **Chapter 3.** The results of the study and a detailed discussion of the results as revealed through personal and telephonic interviews are reported in **Chapter 4** and **Chapter 5**, respectively. This document concludes with **Chapter 6,** in which a summary is given and recommendations provided on how the 1997 ADG could be improved. Areas for future research are also identified.

CHAPTER 2

LITERATURE REVIEW

"Diabetes is a common chronic disease. It also meets all three criteria for a public health disorder: a high disease burden, changing burden suggesting preventability, and fear that things are unknown and out of control" - S. Meltzer

2.1 INTRODUCTION

This chapter provides a literature review, which begins with defining diabetes and discussing the prevalence and epidemiological and nutrition transition of this chronic lifestyle disease. Further discussion includes: classification of diabetes, screening and diagnostic criteria, as well as the nutritional management of the disease. Attention is given to the dietary recommendations for patients with diabetes, with special reference to the 1997 ADG. Furthermore, educational materials used to communicate nutrition information to patients with diabetes are discussed.

2.2 DEFINITION OF DIABETES

Diabetes mellitus is generally defined as a metabolic disorder of multiple aetiology, characterized by chronic hyperglycaemia (elevated blood glucose concentrations) with disturbances of carbohydrate, protein and fat metabolism resulting from defects in insulin secretion, insulin action, or both (SIGN, 2001). According to Franz (2000), diabetes is not a single disease but a group of metabolic diseases, all of which are characterized by hyperglycaemia (ADA,

1999). Diabetes is also described as a chronic lifelong condition, touching almost every part of the individual's life (The National Standards for Diabetes Self-management Education Task Force, 2000).

2.3 PREVALENCE OF DIABETES

According to Motala *et al.* (2003), the crude incidence of diabetes in different populations varies from 1.2 to 30.5/1000 persons per year. In Papua New Guinea Highlanders (Melanesians), Europid Americans and Frenchmen, low incidence (<5/1000 per year) has been reported, intermediate rates (5-15/1000 per year) in Creole and Chinese Mauritians, Maltese, Mexican Americans and rural Samoans, while the highest incidence (>15/1000 per year) has been reported in Pima Indians, rural Wanigelas in Papua New Guinea, Nauruans, urban Samoans and Mauritian Indians. In all these populations higher rates of progression to type 2 diabetes have been reported in subjects who had impaired glucose tolerance (IGT) at baseline (Motala *et al.,* 2003). The incidence of diabetes also varies according to age group: for those 65 years of age or older, it is 18.4%; for those 20 years of age or older, it is 8.2%; and for those younger than 20 years of age, it is 0.16% (Franz, 2000).

2.3.1 World-wide prevalence of diabetes

The incidence of type 2 diabetes is increasing world-wide (Tuomilehto *et al.,* 2001) and is certain to be one of the most challenging health problems of the 21st century (Amos *et al*., 1997). According to Franz (2000), approximately 16 million Americans are being affected with diabetes, and nearly 10.3 million have been diagnosed as having diabetes in 2000. Another 5.4 million remained undiagnosed. In Scotland, of a population of 5.2 million, 122,900 people had confirmed diabetes and a further 87,100 were undiagnosed in 2000 (SIGN, 2001). The prevalence of diabetes in Australia is known to have doubled between 1980 and 2000. The

World Health Organization (WHO) estimated that 136 million people in China, Hong Kong, Japan, Australia, New Zealand, South Korea, Taiwan and Singapore, known as the Asia Pacific region, would have diabetes in 2025 (Handmer, 2003). According to Ginsberg (2003), over 16 million people in China are living with diabetes and will soon become the nation with the largest number of individuals afflicted with this chronic disease. According to Cockram (2000), India and China may each face the problem of dealing with 50 million affected individuals by the year 2025. Furthermore, of particular concern is the increasing trend for type 2 diabetes to develop in young people. In some parts of the Western Pacific region, type 2 diabetes now outnumbers type 1 diabetes by a ratio of 4:1 in children and adolescents.

Amos and co-workers (1997) state that two-hundred-and-twenty million people will have diabetes by the year 2010. According to the WHO, diabetes will become one of the world's main disablers and killers within the next twenty-five-years. Nearly 300 million people will have diabetes in 2025, with people in low- and middle-income countries most at risk, compared to 135 million in 1995 (Louw, 2001; Handmer, 2003). Clearly, diabetes prevalence is a world-wide health concern.

2.3.2 Prevalence of diabetes in sub-Saharan Africa

Numerous investigators conducted cross-sectional population based surveys examining the prevalence of diabetes in sub-Saharan Africa (Levitt *et al*., 2000). A study done in six rural villages in Tanzania confirmed that although diabetes does exist among rural Africans, these rates are much lower than those found in most developed countries (Mclarty *et al*., 1989). Another study conducted in Cameroon by Mbanya *et al*. (1997) showed a low prevalence of diabetes in a rural and an urban community. However, prevalence of IGT suggested an early stage of a diabetes epidemic. Findings of these studies suggested low prevalence of diabetes among communities in these two countries.

The prevalence of diabetes among South Africans has increased remarkably over the last decade (Motala *et al.,* 2003) and differs among the different cultural groups in South Africa (Levitt *et al.,* 2000). Table 1 shows the prevalence of type 2 diabetes in different South African populations (SEMDSA, 2002).

Table 1 Prevalence of type 2 diabetes in different South African population groups (SEMDSA, 2002).

POPULATION	REGION (NUMBER OF PARTICIPANTS)	PREVALENCE (%)	AGE RANGE (YEARS)	REFERENCE
African	Cape Town, urban (729)	8.0	30+	Diabet Care 1993; 16:601
African	Qwa-Qwa, rural (853) Mangaung, urban (758)	4.8 6.0	25+	S Afr Med J 1995; 85:90
African	Durban, urban (479)	5.3	15+	S Afr Med J 1993; 83:641
Coloured	Cape Town, urban (200)	28.7	65+	S Afr Med J 1997; 87 (suppl 3):364
Coloured	Cape Town, peri-urban (974)	10.8	15-86	Diabet Med 1999;16:946
European	Durban, urban (396)	3.0	15-69	S Afr Med J 1994;84:257
Indian	Durban, urban (2479)	13.0	15+	Diabet Care 1994;17:70

These studies showed intermediate to a moderately high prevalence of type 2 diabetes in peri-urban and urban communities in South Africa. Both Mollentze and

co-workers (1995), as well as Omar and colleagues (1993), found intermediate diabetes prevalence in a rural and urban black population, as well as in an urban black population, respectively. A moderately high prevalence was found in urban Indians (Omar *et al*., 1994) and peri-urban coloured South Africans (Levitt *et al*., 1999), with the highest prevalence in an urban coloured Cape Town population (Levitt *et al*., 1993). These findings suggest that urban South Africans have the highest incidence of diabetes in sub-Saharan Africa.

2.3.3 Epidemiological and nutrition transition

Rising prevalence rates of diabetes appear to be closely associated with westernization, urbanization, and mechanization (Cockram, 2000). Over the last few years in South Africa, large-scale urbanization has been taking place. It had been estimated that 80% of the country's African population would have been urbanized by the turn of the century (Levitt *et al*., 1993; Mollentze *et al*., 1995). Of further importance, given the increasing urbanization of populations globally, is the fact that both type 1 and type 2 diabetes is substantially higher in urban communities than in rural ones (Louw, 2001). Urbanization also implies acculturation, which in turn has implications for food practices and the subsequent nutritional status and well-being of individuals (Van Eeden & Gericke, 1996). It is expected that with increasing urbanization and the adoption of Western lifestyles, morbidity and mortality in urban black South Africans will increase sharply in future (Mollentze *et al*., 1995).

The differences in the prevalence of diabetes across cultural groups in South Africa are probably attributable to an increased prevalence of risk factors associated with urbanization. These include factors such as changes in diet, physical activity, socio-economic status and increased obesity (Louw, 2001). According to Cockram (2000), the risk of developing diabetes appears to result from a combination of genetic predisposition and lifestyle changes. The most important lifestyle changes relate to changes in dietary habits and physical

activity. As a result, the risk of diabetes, particularly in younger individuals, is associated with the development of obesity, and particularly central obesity. According to Anderson (1999), both diabetes and obesity increase progressively as the percentage of energy from fat increases. Therefore, the prevalence of diabetes parallels the increase in obesity.

Today, across cultures, South Africans eat more fat and less fibre than previously (Louw, 2001). Consequently, the average South African diet is becoming less prudent at an accelerated rate. Van Eeden and Gericke (1996) compared habitual food intake and dietary patterns of rural (n=150) and urban (n=225) black home economic students at the Vista University, Pretoria. They found that the urban group had an increased intake of miscellaneous items, which could have a detrimental effect on their health in the long term. While only a small number of urban respondents (7.7%) believed they consumed a traditional diet (high in complex carbohydrate foods and dietary fibre), 19.8% of the urban respondents believed they consumed a westernized diet (high in fat, low in dietary fibre) only. Since coronary heart disease, obesity and diabetes are among the non-communicable diseases associated with affluent populations, the nutrition transition process and its implications should be monitored to address the problems of dietary excess and dietary shortage.

2.4 CLASSIFICATION OF DIABETES

The National Diabetes Data Group (NDDG) published the first accepted systematic categorization of diabetes in 1979. The WHO Expert Committee on Diabetes endorsed the system in 1980. More recently however, many individuals and groups in the diabetes community have expressed the need for the revision of the nomenclature of diabetes, since knowledge regarding the aetiology and pathogenesis of diabetes had grown significantly since that time. In 1995, an international expert committee was established to review the scientific literature,

and to decide whether changes to the 1979 classification of diabetes were warranted. After careful consideration of the data and rationale for what was accepted then, together with research findings of the last 18 years, the expert committee proposed some changes to the NDDG/WHO classification scheme. A committee report was adapted from the American Dietetic Association and published in 1997. The main aim of the document was to define and describe diabetes, as we know it today, as well as to provide a classification scheme that reflects the aetiology and pathogenesis of the disease. At that time a recommendation was also made and accepted by the committee to eliminate the terms “insulin-dependent diabetes mellitus (IDDM)” and “non-insulin-dependent diabetes mellitus (NIDDM)” (The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1997). Instead, the terms type 1 and type 2 diabetes were chosen in place of IDDM and NIDDM, respectively (Franz, 2000). Other less familiar types of diabetes: gestational diabetes mellitus (GDM), impaired glucose homeostasis (IGH) and other specific types of diabetes resulting from different causes (Franz, 2000), have been retained as initially defined by the WHO and NDDG (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999).

2.5 PATHOPHYSIOLOGY

2.5.1 Type 1 diabetes

Destruction of the β-cells of the pancreas characterizes type 1 diabetes and usually leads to absolute insulin deficiency (Franz, 2000). This destruction of β-cells is caused by an auto-immune process (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999) and occurs when a person’s own immune system attacks the β-cells that normally synthesize the hormone insulin (Frances & Eleanor, 2000). Eventually, the pancreas can no longer produce insulin and blood glucose remains elevated after each meal (Cataldo *et al*., 1998;

Eleanor *et al*., 2002). Beta cell destruction occurs at variable rates, being rapid in some individuals (mainly infants and children) and slow in others (mainly adults) (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999). According to the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (1999), it is likely for children and adolescents to present with ketoacidosis as the first manifestation of the disease, while adults in particular may retain residual β-cell function sufficiently to prevent ketoacidosis for many years. Consequently, persons with type 1 diabetes are dependent on exogenous insulin to prevent ketoacidosis and death (Franz, 2000; ADA, 2002). Although type 1 diabetes is less common and may account for only 5% -10% of all diagnosed cases of diabetes, it is the leading chronic disease among children and young adults (Franz, 2000; Frances & Eleanor, 2000; ADA, 2002).

2.5.2 Type 2 diabetes

Type 2 diabetes is the most predominant type of diabetes and may account for 90%-95% of all diagnosed cases of diabetes (Frances & Eleanor, 2000; ADA, 2002). Type 2 diabetes is a-symptomatic in its early stages and can remain undiagnosed for many years (ADA, 1999). The risk of developing type 2 diabetes increases with age, lack of physical activity and obesity (The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999). Both insulin resistance (IR) and relative insulin deficiency characterizes this type of diabetes (Franz, 2000; ADA, 2002). However, the precise elucidation of hormonal and metabolic causes that underlie this association is still incomplete (Daly *et al*., 1997).

Plasma glucose concentrations regulate the physiologic control of insulin secretion (Lebovitz, 2002). In the initial stages of type 2 diabetes, the pancreas synthesizes insulin, that in turn stimulates cells to take up glucose (Eleanor *et al.,* 2002). As the disease progresses, the cells become less and less sensitive to the effects of insulin, and ultimately become insulin resistant. This causes subsequent

hyperglycaemia that again stimulates the pancreas to produce even more insulin, causing blood insulin concentrations to rise abnormally high (hyperinsulinaemia) (Frances & Eleanor, 2000; Cataldo *et al.*, 1998). IR also increases the requirements for insulin and leads to insulin insufficiency in individuals whose β-cells have limited secretory reserves (MPF, 2003). Although auto-immune destruction of β-cells does not occur with type 2 diabetes (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999) the chronic demand for insulin causes exhaustion of the β-cells, with consequent faltering of insulin production as the disease progresses (Cataldo *et al.,* 1998). In the initial stages and most often throughout their lifetime, patients with type 2 diabetes do not need insulin treatment to survive (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999). However, approximately 40% of patients with type 2 diabetes will eventually require exogenous insulin for adequate blood glucose control, and some may require insulin during periods of stress-induced hyperglycaemia (Franz, 2000).

2.5.3 Other specific types of diabetes

2.5.3.1 Gestational diabetes mellitus

GDM is defined as carbohydrate or glucose intolerance of variable severity with onset or first recognition during pregnancy (Franz *et al.,* 1994; ADA, 1999d; Franz, 2000). According to Magee *et al.* (1993), GDM is characterized by the appearance of hyperglycaemia in a pregnant woman previously not known to be diabetic. GDM occurs in approximately 2%-4% (Franz, 2000) of all pregnancies, with as much as 97% (Franz *et al.,* 1994) of all women with GDM returning to normal glycaemia after delivery (Anderson, 1999; Franz, 2000; ADA, 2002). However, 40%-60% of these women may develop type 2 diabetes within the next 15-20 years (Magee *et al.,* 1993; Franz *et al.,* 1994; Anderson, 1999; Franz, 2000) and are at higher risk for developing GDM in subsequent pregnancies (ADA, 2002). According to

Anderson (1999), other risk factors include: family history of diabetes, previous delivery of a macrocosmic infant (birth weight higher than 4000g or above 90th percentile) and maternal obesity (>120% of ideal body weight (IBW)). When women have known diabetes mellitus before pregnancy, they are not classified as having GDM.

GDM is usually diagnosed in the second or third trimester of pregnancy, at which insulin-antagonist hormone levels are increased and IR normally occurs (Franz, 2000). Identification of GDM by performing screening tests is of significant importance to reduce the prevalence of fetal morbidity (Franz, 2000). An oral glucose challenge (which does not have to be preceded by fasting) with a 50g glucose load should be done some time during the 24th and 28th weeks of pregnancy (Franz, 2000). Diagnostic testing is confirmed by an elevated plasma glucose concentration of ≥ 7.8mmol/l one hour later (Franz, 2000). Criteria for the diagnosis of GDM are based on a 100g oral glucose tolerance test (OGTT), which is described in the table below (Franz, 2000).

Table 2 Diagnosis of Gestational Diabetes Mellitus (GDM) (The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1997).

TYPE OF TEST	RESULTS
Screening during pregnancy- a 50g oral glucose challenge (does not have to be fasting) at 24 to 28 weeks gestation.	A plasma glucose level (≥ 7.8mmol/l) one hour later indicates need for further diagnostic testing.
Oral glucose tolerance test (OGTT) with an abnormal screen	After a 100g oral glucose load, GDM may be diagnosed if two plasma glucose concentrations equal or exceed: **Fasting:** 105 mg/dl (5.8mmol/l) **1 hr:** 190 mg/dl (10.5mmol/l) **2 hr:** 165 mg/dl (9.2mmol/l) **3 hr:** 145 mg/dl (8.1mmol/l)

Other maternal complications related to GDM include an increased rate of caesarean delivery and chronic hypertension (The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999). However, GDM is not an indication for caesarean delivery by itself, unless prolongation of gestation past 38 weeks occurs, which increases the risk of fetal macrocosmia. Offspring of women with GDM are at higher risk of developing obesity, glucose intolerance and diabetes and should be monitored closely during adolescents and early adulthood (ADA, 1999).

According to Franz *et al.* (1994), treatment for GDM consists of alleviating metabolic abnormalities associated with GDM through nutritional therapy, exercise and if needed, insulin therapy. Nutritional therapy for GDM promotes appropriate nutrition for both maternal and fetal health (ADA, 2002). The goal is to provide adequate energy levels for appropriate gestational weight gain, achievement and maintenance of normoglycaemia and the absence of ketones (Franz *et al.,* 1994; ADA, 2002). Obese women (Body Mass Index (BMI) > 30kg/m^2) with GDM may benefit from a modest energy restriction of 30% - 33% of the total estimated energy needs (Franz *et al.,* 1994; ADA, 2002). This restriction has been shown to reduce hyperglycaemia (ADA, 2002) without the elevation of free fatty acids, plasma triglycerides (TG) and no increase in ketonuria (Franz *et al.,* 1994; ADA, 2002). Specific nutrition and food recommendations should be based on individual assessment and self-blood-glucose monitoring data (Franz *et al.,* 1994; ADA, 2002). According to Franz *et al.* (1994), carbohydrates should be distributed throughout the day, divided into three small–to–moderate sized meals, and two to four snacks. Since carbohydrate-containing food is generally less well tolerated at breakfast meals (ADA, 2002), less than 30g of carbohydrate is required to prevent excessive elevations of postprandial blood glucose concentrations (Franz *et al.,* 1994).

Regular aerobic exercise has been shown to lower fasting and postprandial glucose concentrations (ADA, 2002), and may be used as a treatment modality

that can assist in overcoming peripheral resistance to insulin and improve maternal glycaemia (Franz *et al.,* 1994; ADA, 2002). Although there is insufficient evidence to recommend any specific type of exercise (ADA, 2002), women with GDM can improve their health and lower their risk for subsequent diabetes with maintenance of a desirable body weight after delivery, and by increasing physical activity (Franz *et al.,* 1994; ADA, 2002).

2.5.3.2 Impaired glucose homeostasis

Franz (2000) defines IGH as metabolic stages of impaired glucose use, intermediate between normal glucose homeostasis and diabetes, which are considered to be risk factors for future diabetes and cardiovascular disease (CVD). Impaired fasting glucose (IFG) has been introduced to classify individuals who have fasting glucose values above the normal range, but below those diagnostic of diabetes (fasting plasma glucose (FPG) ≥ 6.1mmol/l but < 7.0mmol/l) (SIGN, 2002). Another stage of IGH, known as IGT, is identified as a stage of impaired glucose regulation (FPG < 7.0mmol/l and OGTT two-hour value ≥ 7.8mmol/l) (SIGN, 2002). According to Franz *et al.* (1994), IGT comprises two thirds of all glucose intolerances with an estimated 13.4 million Americans with IFG (Franz, 2000). Although neither IFG nor IGT are clinical entities in their own right (in the absence of pregnancy), both are risk factors for future development of type 2 diabetes and cardiovascular disease (The Expert Committee on Diagnosis and Classification of Diabetes Mellitus, 1999; Franz, 2000; SIGN, 2002; Miller, 2003). Well-recognized cardiovascular risk factors such as IR, high insulin concentrations, central and/or overall obesity, hypertriglyceridaemia, low high-density-lipoprotein (HDL) cholesterol concentrations, hyperuricaemia and hypertension usually coexist, and are known as Syndrome X or the IR Syndrome (Schmidt *et al.,* 1996; MPF, 2003). Consequently, IFG and IGT are identified as risk factors correlating with those elements of the insulin resistance syndrome that are known to be cardiovascular risk factors (The Expert Committee on Diagnosis and Classification of Diabetes Mellitus, 1999).

The management of cardiovascular risk factors such as dyslipidaemias and hypertension should, thus, be a high priority for people identified with IGT. This includes prevention of macrovascular disease, as well as progression of IGT to overt diabetes, which can be predicted by high fat consumption in people with IGT. The same nutritional goals and exercise recommendations apply to people with IGT as to people with type 2 diabetes. Physical exercise and lifestyle behaviours to promote a reasonable weight should also be recommended to people with IGT (Franz *et al.,* 1994).

2.6 SCREENING FOR DIABETES

Harris & Modan (1994) define 'screening' as the identification of disease for the purpose of intervention of individuals who are unaware of having the disease.

2.6.1 Screening for Type 1 diabetes

The presence of a variety of auto-antibodies to protein epitopes on the surface or within the β-cells of the pancreas, characterizes type 1 diabetes. Patients at risk can be identified if such markers are present before the development of overt disease (The Expert Committee of the Diagnosis and Classification of Diabetes Mellitus, 1997). At this stage, however, it cannot be recommended to clinically test individuals routinely for the presence of auto-antibodies related to type 1 diabetes (ADA, 1999). Firstly, there are no established cut-off values for some of the immune marker assays for clinical settings. Secondly, there is no consensus as to what action should be taken when a positive auto-antibody test result is obtained. Therefore, people may be identified at risk of developing type 1 diabetes with auto-antibody testing, without any proven measures that might prevent or delay the clinical onset of disease. Lastly, because the incidence of type 1 diabetes is low, testing healthy children may only identify a small number (<0.5%) who at the

moment may be 'pre-diabetic' (The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1997; ADA, 1999). Consequently, screening for pre-type 1 diabetes is not recommended in either the general population or in high risk children and young people (SIGN, 2002). However, various methods of preventing type 1 diabetes in high-risk subjects (e.g., siblings of type 1 diabetes patients) are currently being tested in clinical studies. It is hoped that these studies may uncover an effective means of preventing type 1 diabetes, in which case screening may be appropriate in the future (ADA, 1999).

2.6.1.1 Cystic Fibrosis and diabetes

According to Lanng *et al*. (1995), 20% of patients with cystic fibrosis will develop secondary diabetes by the age of 20 years, which increases thereafter to 80% by the end of age 35. It is currently recommended that patients with cystic fibrosis should be screened annually for diabetes from ten years of age (SIGN, 2002).

2.6.2 Screening for Type 2 diabetes

Screening for type 2 diabetes through blood and urine tests may allow early detection and prompt treatment (Cataldo *et al.,* 1998) and may reduce the burden of type 2 diabetes and its complications (ADA, 1999). However, it appears that clinicians are not actively screening for diabetes, because an estimated 7 million adults may have undiagnosed type 2 diabetes in the United States (Harris & Modan, 1994). According to Harris *et al.* (1992), the onset of type 2 diabetes occurs approximately ten years before clinical diagnosis in populations that are not screened for diabetes. It has been argued that screening for a-symptomatic type 2 diabetes is unnecessary, because there is no proven benefit in its early detection (Harris & Modan, 1994). Other diabetes experts currently consider it premature to recommend screening of all high-risk individuals, because of the lack of high-quality cost-benefit studies (ADA, 1999). Opposed to this opinion, some

expert groups suggested screening high-risk individuals (ADA, 1999) and all individuals, aged 45 years and older (Franz, 2000), at three-yearly intervals. It is also recommended that the decision to screen for diabetes should ultimately be based on clinical judgement and patient preference (ADA, 1999). According to the ADA (1999), it may be appropriate to screen for type 2 diabetes as part of routine medical care, if the patient has one or more of the following major risk factors:

- Family history of diabetes (i.e., parents or siblings with diabetes)
- Obesity (i.e., ≥ 20% over desired body weight or BMI ≥ 27kg/m^2)
- Waist size > 102cm for men or > 89cm for women
- Race ethnicity (e.g., African-Americans, Hispanic-Americans, Native Americans, Asian-Americans, Pacific Islanders)
- Age ≥ 45 years
- Previously identified IFG or IGT
- Hypertension (≥ 130/85 mmHg)
- HDL cholesterol concentration <1.03mmol/l for men or <1.29mmol/l for women and/or a triglyceride concentration ≥1.69mmol/l
- History of GDM or delivery of babies over 4 kg (ADA, 1999; Franz, 2000; Miller, 2003).

Substantial evidence indicated that intervention and treatment improved the prognosis of individuals who were screened and found to have type 2 diabetes. More significantly, it is likely that the clinician will pursue more aggressive treatment programmes for treatment and reduction of micro- and macrovascular risk factors if it is known that the patient has diabetes (Harris & Modan, 1994). Undiagnosed type 2 diabetes significantly increases the risk of coronary heart disease, stroke and peripheral vascular disease (ADA, 1999).

2.7 DIAGNOSTIC CRITERIA FOR DIABETES

According to Franz (2001), early diagnosis and treatment can reduce disease-related mortalities and morbidities. The clinical diagnosis of diabetes is often indicated by the presence of symptoms such as polyuria, polydipsia and unexplained weight loss. Diagnosis of diabetes is confirmed by measurement of abnormal hyperglycaemia (SIGN, 2002). In South Africa three different diagnostic test methods are used to diagnose a patient with diabetes, as recommended by SEMDSA (SEMDSA, 2003). By using any one of the following three tests at a second test date the diagnosis can be confirmed (Franz, 2000; SEMDSA, 2003):

- A confirmed FPG value of greater than or equal to 7.0mmol/l indicates a diagnosis of diabetes (WHO, 1999; Miller, 2003; SEMDSA, 2003). Fasting is defined as no energy intake for at least eight hours (Miller, 2003).
- In the presence of symptoms of diabetes (polyuria, polydipsia and unexplained weight loss) a confirmed non-fasting plasma glucose 'casual' value of greater than or equal to 11.1mmol/l is indicative of diabetes (WHO, 1999; Franz, 2000; Miller 2003; SEMDSA, 2003). 'Casual' refers to any time of the day, without regard to the elapsed time since one's last meal.
- An OGTT involving the administration of 75g of glucose and measurement of the plasma glucose concentration two hours later, can be used for diagnosis, with confirmed glucose values of greater than or equal to 11.1mmol/l indicating a diagnosis of diabetes (WHO, 1999; Miller, 2003; SEMDSA, 2003).

Although all three diagnostic methods can be used to diagnose diabetes, the FPG test is preferred (Franz, 2000). It is also preferred that epidemiological studies, estimates of diabetes prevalence and incidence, should also be based on an FPG concentration of $\geq$ 7.0mmol/l. This recommendation is made to facilitate fieldwork, especially where the OGTT may be difficult to perform, and where the cost and demands of the participants' time may be excessive.

Glycated *haemoglobin A_{1c} (HbA_{1c})* measures average blood glucose concentrations during the previous three months. Although some studies have shown that the frequency distributions for HbA_{1c} have similar characteristics to those of the FPG and the 2-hour postprandial glucose, it is not currently recommended in the diagnosis of diabetes (Franz, 2000). Engelgau *et al*. (1997) compared the ability of fasting and 2-h glucose and HbA_{1c} measurements to detect the presence or absence of retinopathy. They found that the 2-h and fasting glucose measurements performed equally well in detecting retinopathy, with both outperforming $HbA_{1c.}$ As a result, they suggested that the fasting and 2-h glucose measures might by superior to HbA_{1c} for diagnostic purposes. HbA_{1c} and FPG have rather become measurements of choice in the monitoring and treatment of type 2 diabetes, where decisions on the implementation of therapy are often based on the HbA_{1c} (Franz, 2000).

As blood glucose concentrations increase with diabetes, the exposed haemoglobin and other proteins cause glucose to attach to the proteins. These glycated proteins, mainly haemoglobin and serum proteins, best reflect the average plasma glucose concentrations over the preceding three months. Assessment of longer-term glycaemic control can thus be done by using results of the glycated haemoglobin test (Franz, 1996), which remains a valuable tool for monitoring glycaemia (The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999). According to SEMDSA (2003), normal HbA_{1c} concentrations should be below 7%. Concentrations of 11% to 12% glycolated haemoglobin indicate poor control of carbohydrates (Mooradian, 2003). High concentrations are also markers for kidney problems. Standardization of the many different methods for the measurement of HbA_{1c} and other glycosylated proteins has also just begun, and it is, therefore, not currently recommended for the diagnosis of diabetes (The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1999).

2.8 COMPLICATIONS OF DIABETES

The complications associated with diabetes impose a heavy burden on health care systems and on quality of life of the patient. The life expectancy of a patient with type 2 diabetes is reduced by eight to ten years (SIGN, 2002). According to the BDA (2002), diabetes is associated with both progressive and life-threatening, potentially devastating consequences for health. Long-term complications include CVD, blindness and nerve damage (Cataldo *et al.*, 1998). People with diabetes are two to four-times more likely to develop CVD, particularly heart disease, stroke and ischaemia of the lower limbs. CVD accounts for 80 per cent of deaths of people with diabetes. This increased risk of CVD is mainly attributable to the fact that people with diabetes have a higher prevalence of other CVD risk factors, such as hypertension, dislipidaemia and obesity (Laing *et al*., 1999).

Miller (2003) explains that chronic exposure to hyperglycaemia leads to irreversible cell dysfunction and induces the microvascular complications that are hallmarks of diabetes. According to Laing *et al*. (1999) these complications include kidney disease (diabetic nephropathy), eye disease (diabetic retinopathy) and foot ulceration. These conditions are often associated with long term damage, dysfunction and failure of various organs, such as kidney failure (ADA, 1999). Conditions such as kidney disease, impaired vision and impaired blood circulation, often necessitating amputation, are caused by blockage or destruction of capillaries that feed the body's organs due to diabetes (Frances & Eleanor, 2000). According to Young *et al.* (1994), the main reason for people with diabetes to be admitted to hospital is amputations. Brancati *et al.* (1997) identified diabetic nephropathy as a major cause of kidney failure and death. Furthermore, the BDA (2002) found diabetic retinopathy as the leading cause of blindness in the working-age population in the United Kingdom. It is also found that pregnancy in women with diabetes has a poorer outcome for the foetus than a non-diabetic pregnancy (SIGN, 2002).

2.8.1 Prevention of diabetes related complications

Although both the United Kingdom Prospective Diabetes Study (UKPDS) and the Diabetes Control and Complications Trial (DCCT) enrolled patients before serious microvascular complications had developed, these studies showed that lowering blood glucose concentrations reduces the incidence of microvascular complications in both type 1 and type 2 diabetes (ADA, 2002d). Even though both studies showed trends in reducing the risk of cardiovascular events, neither study gave a definite answer to the question of whether blood glucose control reduces the risk of cardiovascular complications (Nuttal & Chasuk, 1998; ADA, 2002d). Also, neither study proved that these complications are caused by high blood glucose concentrations. It is hoped that future long-term follow-up studies of both the UKPDS and the DCCT will determine whether intensive treatment will prevent cardiovascular complications. Meanwhile, the UKPDS strongly supports the proposed strategy of the ADA that diabetes should be treated vigorously. It is believed that such treatment strategy can decrease the morbidity and mortality of diabetes, by lowering its chronic complications. It is also believed that aggressive treatment by all health care professionals will impose on patients with diabetes to take the disease with the utmost seriousness (ADA, 2002d).

2.9 THE MANAGEMENT OF DIABETES

The management of chronic diseases requires systematic monitoring of patients' health status to identify problems before they become severe. Although effective management may be time-consuming, and may require many expensive resources, a preventative approach with the expectancy of reduced complications is likely to be more cost effective (Henry & Genuth, 1996).

In the management of diabetes, assessment of health behaviours (e.g. eating habits and exercise) and adherence to treatment regimens that usually include a prescribed diet and medication, should be done (Piette, 1997).

2.9.1 Treatment goals

Broad aims of diabetes treatment include, firstly, to end primary symptoms (often through diet alone in type 2 diabetes) and to minimize risks of hypoglycaemia (mainly type 1 diabetes) (BDA Nutrition Subcommittee, 1992; Franz, 1996). Treatment should provide the individual with the necessary tools (i.e. dietary goals) to achieve the best possible glycaemic control (Franz, 1996), and to maintain blood glucose concentrations as near normal as possible (Franz *et al.,* 1994; Anderson, 1999). Treatment should also minimize micro- and macrovascular complications of diabetes (BDA Nutrition Subcommittee, 1992), as well as the incidence of excess weight gain (Franz, 1996).

2.10 MEDICAL NUTRITION THERAPY IN DIABETES CARE

According to Franz *et al.* (1994) optimal nutritional care can lead to reduction of risk factors associated with diabetes and improved overall health.

2.10.1 Introduction

Although MNT is a strong foundation (Chan, 2003) and the cornerstone of diabetic control for people with diabetes (Anderson, 1999; ADA, 2002), it is recognized as one of the most challenging and traumatic aspects of diabetes care and diabetes self-management education (BDA Nutrition Subcommittee, 1992; Franz *et al.,* 1994; Franz, 1996; Savoca & Miller, 2001). Perhaps the challenge of MNT resides in learning and adapting specific nutrition recommendations (Franz *et al.,* 1994).

Another problem concerning nutrition and diabetes in clinical practice is that nutrition recommendations without any support or evidence have been, and still are being communicated to persons with diabetes (BDA Nutrition Subcommittee, 1992; ADA, 2002). In the light of these findings, the ADA published an evidenced based position statement in 2002 (ADA, 2002). This position statement provides principles and recommendations classified according to the level of evidence available using the ADA's evidence grading system (ADA, 2002). The primary goal of evidence-based recommendations is to improve the quality of clinical judgements and to facilitate cost effective care (Franz *et al.,* 2002) Ideally, any recommendations to change eating habits should be made based only on sound scientific evidence (BDA Nutrition Subcommittee, 1992).

However, no matter how good the available evidence; individual circumstances, preferences and lifestyle changes the individual can make and maintain should still be considered (BDA Nutrition Subcommittee, 1992; Anderson, 1999; ADA, 2002; Franz *et al.,* 2002). Furthermore, consideration of cultural, social and ethnic preferences (especially in South Africa) is of prime importance to facilitate compliance to dietary recommendations (Anderson, 1999; Franz *et al.,* 2002). Effective MNT and self-management education thus require an individualized approach (Franz, 1996; Franz, 2000), appropriate for the personal lifestyle and management goals of the diabetic individual (Anderson, 1999).

It is well recognized that adherence to meal planning principles often involves difficult life-style changes (Franz, 1996). Accordingly, compliance to diabetic dietary recommendations has been notoriously poor. This is probably because the degree of difficulty involved in making permanent changes to entrenched eating habits is still greatly underestimated. To better understand current issues regarding nutritional management of diabetes, the evolution of dietary recommendations is discussed in more detail hereafter (Nuttal & Chasuk, 1998).

2.10.2 Evolution of nutrition recommendations for people with diabetes

Prior to the discovery of insulin in 1921 (Anderson, 1999), dietary control was the only treatment of diabetes (Nuttal & Chasuk, 1998; Anderson, 1999). The famous ***'Allen starvation treatment'*** developed by Frederick M. Allen in 1912 succeeded in sustaining the lives of a few young men until insulin became available. This low-carbohydrate, semi-starvation regimen included a 3200kJ diet with 10g carbohydrates (Anderson, 1999). Some other dietary regimens were also proposed. After the reduction of carbohydrates failed to effectively lower and eliminate urine glucose, protein restriction was introduced. Motivation for the reduction of proteins resided in the conversion of dietary protein into glucose through gluconeogenesis. Eventually, total food energy was restricted either continually or intermittently, if the elimination of both carbohydrates and proteins was ineffective. Consequently, compliance was a great problem, because this energy-restricted diet was insufficient for weight maintenance and could not be tolerated indefinitely.

Hereafter, the post-insulin era (availability of insulin) followed. During this stage a liberalized carbohydrate content of 35%-40% of total food energy in the diet was acceptable. This diet was strict in regard to total food energy, the proportion of food types, timing of meals taken throughout the day, and careful weighing of every food portion. However, difficulty regarding food weighing called for revision of this meal planning system. Consequently, in 1950 a joint committee, consisting of the ADA and the Diabetes Section of the United States' Public Health Service, (Anderson, 1999), developed a system using food exchange lists, in an effort to standardize diets. This system categorized all foods into one of six food groups: milk, vegetable, fruit, bread, meat and fat. Every food portion in an exchange group was designed to provide more or less the same amount of carbohydrate, fat, and protein as all the other portions within that group (Kendall & Jansen, 1990; Cataldo *et al.,* 1998; Anderson, 1999). Still compliance was very poor. After

concern that high-fat diets may lead to the development of atherosclerosis, fat content was decreased and an increase of the total amount of carbohydrates of up to 45% was recommended by the ADA in 1971. Further liberalization of carbohydrate content in the range of 50%-60% of total food energy of the diet was suggested in 1979. Corresponding fat reduction was proposed, prompted by concern that dietary fat might accelerate atherogenesis.

The BDA was one of the first diabetes associations to accept more liberalized carbohydrate diets in the early 1980's. Many other countries followed with the introduction of similar policies (BDA Nutrition Subcommittee, 1992). In 1987, the ADA's Food and Nutrition Committee once again recommended that the carbohydrate content should be increased to between 55%-60% of the total food energy for all people with diabetes. A corresponding decrease in fat content, as well as, a reduction of protein in the diet, was once again recommended (Nuttal & Chasuk, 1998).

The ultimate change to nutrition recommendations was made in 1994. The ADA's 'Nutrition recommendations and principles for people with diabetes mellitus' provided a new direction to treat diabetes (Tinker *et al.,* 1994). The concept of a specific diabetic diet was abandoned and replaced by individualization of dietary recommendations for patients with diabetes. These recommendations suggested that the nutritional needs of people with diabetes are fundamentally the same as for those without diabetes, and special 'diabetic' foods are not required. Also, dietary recommendations should be as flexible as possible, provided that they are compatible with acceptable plasma glucose control. Lastly, diet and meal planning should be highly individualized (Nuttal & Chasuk, 1998).

The 1994 recommendations do not specify what percentage of the total food energy should come from carbohydrates and fat. The recommended amounts are based on the patient's glucose and lipid concentrations, together with his weight and eating habits. Focus on the type of carbohydrate was shifted to the total

amount taken (Wilson, 1995). With little evidence available, it is rather difficult to determine whether compliance with diabetic dietary recommendations is better or worse after liberalization of carbohydrates than during the era of carbohydrate-restriction. However, some advantage may be seen from the modern approach, since it is compatible with healthy eating guidelines advocated for the whole population. This approach might also remove the inevitable dietary stigma of diabetes, which in the past isolated people with diabetes from their peers (BDA Nutrition Subcommittee, 1992).

2.10.3 Current dietary recommendations for people with diabetes - An overview

Since 1994, most countries developed specific dietary recommendations for the management of diabetes, but the dietary recommendations of the ADA and the BDA have been particularly widely quoted. The 1997 ADG for people with diabetes (ADSA, 1997) are in broad agreement with those of the United States and United Kingdom, and are summarized in Table 3.

2.10.3.1 Type 1 and Type 2 diabetes: different dietary recommendations?

It has been documented that the nutritional management of both type 1 and type 2 diabetes is, in principle, the same. However, optimal management may involve different emphases, and practically attainable targets may have to be different (BDA Nutrition Subcommittee, 1992). Although nutrition plays a key role in achieving recommended lipid concentrations in both types of diabetes (Franz *et al.,* 1994), restriction of saturated fat should be more emphasized in type 2

diabetic patients, where lipid abnormalities are more common and more clearly related to cardiovascular disease (BDA Nutrition Subcommittee, 1992). Since cardiovascular disease remains one of the major causes of mortality in type 2 diabetes (BDA Nutrition Subcommittee, 1992; Franz *et al.,* 1994), goals to reduce serum triglycerides should also be focused more on type 2 diabetes patients (Franz *et al.,* 1994). According to SEMDSA (2003), TG should be less than 1.5mmol/l. Then again, attempts to modify the progression of microvascular disease, such as by restriction of protein, should be directed more strongly to type 1 diabetes patients. It is currently unlikely that drastically different diets would be used for type 1 and type 2 diabetes patients. A clear and consistent dietary policy for all patients would rather be the most credible approach amongst patients, health care members and the general public (BDA Nutrition Subcommittee, 1992).

2.10.3.2 Current South African dietary recommendations for people with diabetes

With publication of the ADG in 1997, ADSA aimed to provide a uniform approach to the nutritional management of diabetes in South Africa. According to ADSA (1997), the ADG apply to all population groups and should be tailored to individual needs, circumstances and preferences. ADSA also highlighted that application of the goals would vary according to intake of traditional (indigenous), ethnic and cultural foods.

The main objectives of the ADG are to:

- achieve optimal blood glucose and blood lipid concentrations
- provide appropriate energy for reasonable weight, normal growth and development, as well as during pregnancy and lactation
- prevent, delay and treat nutrition-related complications
- improve health through optimal nutrition

The ADG, together with diabetic nutrition recommendations from other countries are critically discussed in sections 2.12 to 2.17.

2.10.4 Food guides used to explain dietary recommendations to patients with diabetes

It is currently believed that no single approach to diet therapy meets everyone's needs. Health care professionals use several approaches (food guides) to help patients with diabetes achieve blood glucose control (Cataldo *et al.,* 1998). According to Davis *et al.* (2001), food guides are a translation of dietary standards and recommendations into simple, nutrition education tools. Love (2002) explained that food guides provide practical advice on the types, and sometimes quantities, of various foods needed for optimum health. Food guides are generally used to classify foods into basic groups according to similarity of nutrient content (e.g. carbohydrate-rich and protein-rich food groups), function (e.g. energy and body building foods), or food type (e.g. grains and grain products, meats and meat alternatives). Food guides generally used by health professionals are the food exchange lists, the plate model, and food guide pyramid.

2.10.4.1 The food exchange lists

More than ten years ago, the most commonly used diet planning method or food guides used for patients with diabetes in the United States was the traditional food exchange lists for meal planning (Kendall & Jansen, 1990). By using an exchange diet, the patient may choose a certain number of items from each food group daily. As a result, this approach provides a varied diet, because each exchange group includes many different foods (BDA Nutrition Subcommittee, 1992). In spite of this, some nutritional experts (Anderson, 1999), European countries, and some centres within the United Kingdom, no longer use formal carbohydrate exchange lists (BDA Nutrition Subcommittee, 1992). Nelson *et al.* (2000) conducted a study in

1997 to survey dieticians involved in diabetes care regarding the provision for patients with diabetes across the United Kingdom. They found that only 17% of the 391 dieticians who responded continue to use carbohydrate exchange lists. However, all of them combined use of this food guide with other approaches (Nelson *et al.,* 2000). Also, the Diabetes Atherosclerosis Intervention study (DAIS) found that dieticians from 11 different centres in four countries, i.e. Canada, Finland, France and Sweden, used various food guides to provide practical dietary advice to people participating in the study. The food exchange system was primarily used in the Canadian Centers (Camelon *et al.,* 1998).

The BDA Nutrition Subcommittee (1992) as well as Anderson (1999) consider carbohydrate exchange lists as unnecessary for most routine management. Although carbohydrates are important in all meals and snacks, the optimum amount included must be calculated from blood glucose profiles (BDA Nutrition Subcommittee, 1992). One should also remember that the blood glucose response to food is governed by many factors, including fat content, dietary fibre, the presence of resistant starch, the physical form of the food, water content, temperature and how much it is chewed (further discussion follows in section 2.13.1.3). Further critique against carbohydrate exchange lists is that the composition of foods in standard tables is only likely to be accurate within 10% or 20%. Thus, detailed and over-precise carbohydrate exchange lists can be misleading (BDA Nutrition Subcommittee, 1992).

However, though Kendall and Jansen (1990) questioned the food exchange lists, this approach remained the most acceptable, universal method of meal planning, since it had been released in 1950 by the ADA (Anderson, 1999). Kendall and Jansen (1990) were concerned that this food guide might be less effective in promoting proper nutrition and dietary changes than is desirable, since it focuses on what to eat, rather than why it is important to eat appropriately. Together with other researchers, they recommended a nutrient-based approach as an effective way to teach nutritional goals to patients, where the patient plans and evaluates

his own diet according to prudent dietary recommendations. The impetus behind the researchers' belief was that the evaluation of the planned or consumed diet against specific nutrient goals might improve the desirable behaviour among patients with special nutritional needs.

Kendall and Jansen (1990) then conducted a study to compare the effectiveness of a nutrient-based diet evaluation method with the traditional diabetic diet evaluation method, using the food exchange lists as food guide for meal planning. They found that a group of patients with type 2 diabetes could learn in a group setting how to use a sophisticated nutrient-based method of meal planning, in the same time as the traditional food exchange lists method. Some participants considered the nutrient-based approach more flexible for meal planning than the food exchange lists, while others were uncomfortable by the latitude in diet planning provided by using this method. In the latter case, participants who tended to be less sure of their ability to make good food choices wanted someone to tell them what they should eat, and when they should eat it. The researchers suggested that further studies should investigate patient characteristics to assess who are most likely to benefit from a quantitative nutrient-based approach, and those who are most likely to prefer a food group approach (Kendall & Jansen, 1990). According to Love (2002), nutrient based dietary guidelines might be a reason why many South Africans face the burden of over- and under-nutrition. Over the last decade, many countries have focused on the development of country-specific food based dietary guidelines in order to promote appropriate diets and healthy lifestyles (Love, 2002).

2.10.4.2 The plate model

Contrary to Canadian Centres in the DAIS, the primary food guide used in Finland is the plate model (Camelon *et al*., 1998), also advocated by the Swedish Diabetic Association and the Community Nutrition Group of the British Dietetic Association (BDA Nutrition Subcommittee, 1992). These Diabetic Associations perceive the

plate model system as an attractive, simple approach to meal planning (BDA Nutrition Subcommittee, 1992). This visual method promotes healthful eating and delivers the nutrition message by visual pictures, graphs, charts and food replicas of healthful meals consistent with the patient's general food preferences (Camelon *et al*., 1998).

2.10.4.3 The food guide pyramid

The food guide pyramid is another food guide that illustrates nutrition guidelines and nutrient needs, and can be a useful aid for persons with diabetes, as well as for their family members (Anderson, 1999; Franz, 2000). The food guide pyramid offers a pattern for daily food choices based on 'servings' from the five major food groups. Each of these food groups provides some, but not all the nutrients a person needs. Foods in one group cannot replace those in another, and no food group is more important than another (Earl & Borra, 2000).

2.11 DIABETES NUTRITION RECOMMENDATIONS

Although genetic factors, age and obesity have been described as major risk factors for type 2 diabetes, there has been great interest in the role of other potentially modifiable risk factors. These factors include physical activity, smoking, alcohol consumption, as well as dietary factors, especially those that might increase IR or insulin demand (Salmeron *et al.,* 1997). Dietary factors generally discussed in nutritional goals for people with diabetes include recommendations regarding energy requirements, macro- and micro-nutrients in the diet, as well as the use of sweeteners and special 'diabetic' foods (ADSA, 1997; DNSG, 2000; ADA, 2002).

2.12 ENERGY

According to ADSA (1997), the energy content of the diet refers to the amount of energy prescribed to patients with diabetes. Since the majority of patients with type 2 diabetes are overweight or obese (ADA, 2002; Chan 2003), most countries agree that energy intake should be prescribed in order to achieve and/or maintain a reasonable body weight (Chan, 2003; ADA, 2002; ADSA, 1997). In the United Kingdom and Europe, patients with diabetes are expected to achieve and maintain a BMI of 19-25 kg/m^2 and 18.5-25 kg/m^2, respectively (Lean, 1998; DNSG, 2000). An optimal BMI of less than 25kg/m^2 is recommended by SEMDSA (SEMDSA, 2003). There is also a broad agreement that energy recommendations for children and adolescents should be adequate to maintain normal growth and development (ADA, 2002; ADSA, 1997).

2.12.1 Correlation between diabetes and obesity

Obesity is a major contributor to the development and maintenance of the diabetic state (Anderson, 1999). The presence of obesity may also aggravate high blood glucose concentrations (Anderson, 1999; Chan, 2003) and other co-existing clinical conditions, such as hyperlipidaemia and hypertension (McGough, 2000; ADA, 2002). When the amount of energy consumed is not equivalent to the amount of energy expended, an increase in body fat (adiposity) occurs (Franz *et al.,* 1994). Increased body adiposity also leads to increased IR (ADA, 2002). Visceral or central obesity (in which the proportion of adipose tissue in the abdominal cavity is increased) is according to Daly *et al*. (1997) the most common condition associated with IR, hyperinsulinemia and type 2 diabetes (Franz *et al.,* 1994). Although most people with type 2 diabetes have central obesity and IR (Franz *et* al., 1994), not all centrally obese people develop type 2 diabetes (Zimmet, 1992). Waist circumference is a good indication of visceral adipose tissue, and thus IR (MPF, 2003). According to SEMDSA (2003) the optimal waist circumference for men is less than 94 centimetres and for women less than 82

centimetres. It is believed that the direct release of free fatty acids from visceral adipose tissue into the portal circulation and the liver may be an important mechanism in causing IR (MPF, 2003). IR is also identified as one of the earliest detectable abnormalities in at least some people in whom type 2 diabetes develops later on (Daly *et al*., 1997; MPF, 2003).

2.12.2 Weight reduction strategies

Since obesity affects IR, weight loss is an important therapeutic objective for people with type 2 diabetes (ADA, 2002; Chan, 2003). Weight loss is associated with improved measures of glycaemia, decreased IR, dyslipidaemia and hypertension (Franz *et al.,* 1994; DNSG, 2000). However, losing weight can be difficult, since most obese individuals who complete community weight-loss programmes, behavioural modification programmes and very low-energy programmes, regain all the weight they lost within 2-5 years (Nuttal & Chasuk, 1998; Anderson, 1999; ADA, 2002).

Long-term weight maintenance usually fails due to complex interactions between genetic and environmental factors, which are considered to be the primary cause of obesity (Franz *et al.,* 1994). Genetic factors apparently influence the central nervous system, which in turn regulates energy intake, energy expenditure, and thereby body weight (ADA, 2002). Furthermore, environmental factors influence food choices, appetite regulation and physical activity and make losing weight difficult for those genetically predisposed to obesity (Franz *et al.,* 1994; ADA, 2002). Consequently, weight loss cannot be sustained if not accompanied by access to long-term counselling about lifestyle changes important for weight maintenance (Anderson, 1999). Ultimately, structured, intensive lifestyle programmes involving patient education, individualized counselling, reduced dietary fat and energy intake, regular physical activity and frequent patient contact, are necessary to produce successful long-term weight loss (Franz *et al.,* 1994; Anderson, 1999; ADA, 2002). The healthcare team should therefore set the stage

for effective weight loss, providing empathy and support. However, the obese individual must be committed to losing weight before nutrition counselling can be effective (Anderson, 1999).

2.12.3 Low energy and very-low energy weight-reduction programmes

Numerous studies have shown that weight loss improves glycaemic control in obese patients with type 2 diabetes (Wing *et al.,* 1994; DNSG, 2000). Nevertheless, even before weight loss can be effective, energy restriction rapidly leads to an improved metabolic state and elimination of primary diabetic symptoms (BDA Subcommittee report, 1992). Significant reductions in fasting glucose and great improvements in insulin sensitivity were found on low energy (hypocaloric) diets (Wing *et al.,* 1994; Franz *et al.,* 1994). The use of hypocaloric diets should be strongly encouraged in newly diagnosed patients with diabetes, and those with a moderate elevation in fasting blood glucose concentrations. Although many patients can lose as much as 10% of their initial weight on low energy diets, the majority regain the weight they have lost, unless other components of an intensive lifestyle programme are encouraged (Nuttal & Chasuk, 1998).

Very-low energy diets (VLEDs) provide less than 3400 kJ per day and produce a more rapid weight loss initially (Franz *et al.,* 1994). Rapid improvements in glycaemia and hyperlipidaemia are also seen in patients with type 2 diabetes, following VLEDs. However, when VLEDs are discontinued and self-selected meals are introduced, weight gain is common (ADA, 2002). The use of VLEDs should be restricted to special cases (appropriate in individuals with BMI > 35 kg/m^2) and with experienced medical supervision (Franz *et al.,* 1994; DNSG, 2000).

2.12.4 The role of physical activity in weight reduction programmes

Although exercise by itself has only a modest effect on weight loss (Franz *et al.*, 2002), it is identified as a predictor for successful long-term weight maintenance (Franz *et al*., 1994; Chan, 2003). According to Nelson and co-workers (2002), appropriate use of diet and exercise can improve insulin sensitivity and glycaemic control, and decrease the need for oral medications or insulin. While routine exercise is important for all people, diabetics prosper in several ways (Anderson, 1999). Exercise programmes can acutely lower blood glucose concentrations in patients with diabetes, and may also improve their cardiovascular status (Anderson, 1999; Franz *et al.*, 2002). Physical activity may also be of benefit in improving glucose tolerance, helping to influence the lipid profile favourably and maintaining muscle mass (DNSG, 2000). An increased lean body mass (muscle mass), which is associated with exercise, increases daily energy expenditure (Franz, *et al.,* 1994). Dietary advice should always take into consideration the practice of regular physical activity, at least 3-5 times per week (DNSG, 2000). Although the most beneficial exercise programme differs for each person, walking is best for obese individuals. According to Anderson (1999), the best way to ease into an exercise regimen is to start walking 10 to 20 minutes once or twice each day. Over a few weeks' time, the exercise should be increased gradually to 30 minutes of brisk walking at moderate intensity (Anderson, 1999; Chan, 2003).

The safety of exercise programmes for patients with diabetes is of the utmost importance. Diabetics should monitor their blood glucose concentrations regularly before, during and after exercise. Food intake and insulin adjustments should be determined accordingly (Anderson, 1999).

2.12.5 Exercise goals for people with diabetes

According to Franz (2000), the key to understanding safety and how exercise affects diabetes control, is self-monitoring blood glucose, pre-and post-exercising. Frequent post-exercise testing may be of special importance. According to the ADG (ADSA, 1997), blood glucose concentrations should be maintained before, during and after exercise. In type 1 diabetes, exercise can commence when blood glucose concentrations are between 4mmol/l and 14mmol/l (ADSA, 1997). Blood glucose monitoring can be used to guide insulin and carbohydrate adjustments. Franz (2000) explains that the choice between increasing carbohydrates or decreasing medication depends on the individual and his or her diabetes management goals.

According to Franz (2000), it is generally recommended that one hour of increased exercise requires an additional 15g of carbohydrates, either before or after exercise. For even more strenuous exercise, 30g of carbohydrates per hour may be needed. The ***Diabetes Manual***, compiled by a diabetes-and-diet workgroup from ADSA, SEMDSA & DESSA (2000) confirm these recommendations. The recommended dietary carbohydrate intakes before and during exercise are given in Table 4 adapted from the ***Diabetes Manual*** (ADSA, SEMDSA & DESSA, 2000). Although a small snack may be needed if blood glucose concentrations are below 4.4mmol/l (ADSA, SEMDSA & DESSA, 2000), Franz (2000) suggests that moderate exercise for less than 30 minutes rarely requires any additional carbohydrates or insulin adjustments. According to Wasserman and Zinman (1994), insulin dosage may need to be adjusted when strenuous activity lasts more than 45-60 minutes. A modest decrease of approximately 10%-20% in the insulin component corresponding to the period of exercise is sufficient to prevent hypoglycaemia. A larger decrease in the total daily insulin dosage by as much as one third to one half may be necessary to prevent repeated hypoglycaemia for prolonged vigorous exercise (Wasserman & Zinman, 1994).

Table 4 Recommended carbohydrate intakes before and during exercise (ADSA, DESSA & SEMDSA, 2000).

EXERCISE INTENSITY AND DURATION	BLOOD GLUCOSE (mmol/l)	DIETARY CARBOHYDRATES (g)	SUGGESTED FOOD TO USE
Brief, high intensity (<30 min.) e.g. weight lifting, sprints	6-10	No food required	
Light e.g. walking 30 min., easy pace aerobics 60 min	<6 >6	15 No food required	1 bread exchange
Moderate (<45 min.) e.g. swimming, jogging, tennis, basketball	<6 6-10 10-14 14+	30-45 15 No food required Exercise not advised	2-3 bread exchanges or 3-4 fruit exchanges 1 bread exchange
Moderate (>60 min.) e.g. football, cycling	10-14 plus reduced insulin dosage >13-14 plus ketones >17 (no ketones)	10-15g/h Exercise contraindicated Exercise not advised	1 fruit or bread exchange
Strenuous (<60 min.) e.g. triathlon, marathon, canoeing, cycling	<6 6-10 10-14 14+	45 30-45 15-30 Exercise not advised	3 bread exchanges 3-4 bread exchanges 2-3 bread exchanges
Strenuous (>60 min.) e.g. triathlon, marathon, canoeing, cycling	<6 6-10 10-14	50g/h 25-30g/h 10-15g/h	500 ml Coke or fruit juice diluted (⅔ juice + ⅓ water)/h 250ml-300 ml Coke or diluted fruit juice/h 100-150ml Coke or diluted fruit juice/h

2.13 MACRONUTRIENTS

Existing dietary goals for people with diabetes from most countries are nutrient-based (ADA, 2002; Chan, 2003; DNSG, 2000; ADSA, 1997). Carbohydrates,

proteins and fats are the macronutrients generally included when nutrition recommendations are made. According to Marshall and co-workers (1997), modification of the macronutrient composition of the diet is an intervention that has been advocated by many to improve diabetic control.

2.13.1 Dietary carbohydrates

2.13.1.1 Terminology

'Complex' and 'simple' carbohydrates are commonly used to categorize carbohydrates into two main groups (Nuttal & Chasuk, 1998; Anderson, 1999). However, research over the last decade has shown that carbohydrate classification is far more compound than this. These terms are vague and produce an over-simplified classification of carbohydrates (Nuttal & Chasuk, 1998). According to the ADA (2002), these terms are confusing and should be abandoned. The preferred terms when referring to carbohydrate foods are sugars and starches (ADA, 2002).

2.13.1.2 Classification

Figure 1 represents a schematic presentation of the classification of carbohydrates (FAO/WHO, 1997).

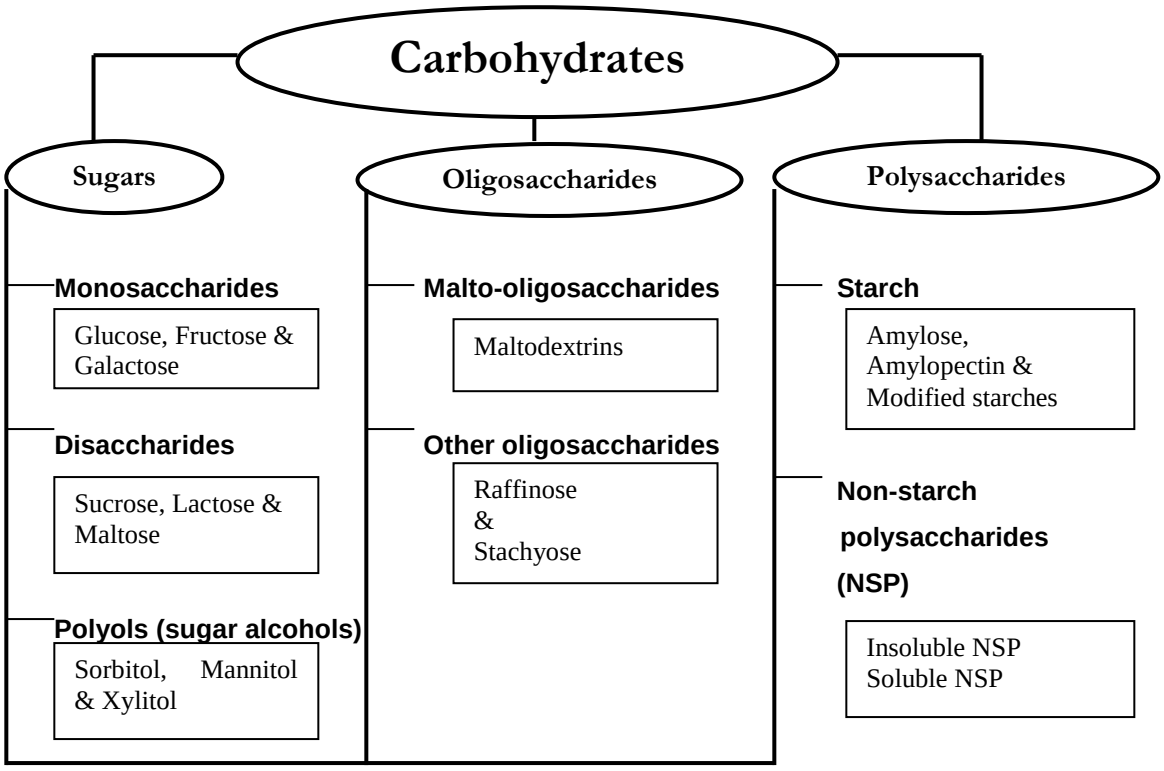


Figure 1 Schematic presentation of the classification of carbohydrates

The classification of carbohydrates *(as seen in figure 1)* is based on their degree of polymerization (molecular weight) (FAO/WHO, 1997). According to this classification system, carbohydrates are initially divided into three principal groups, namely sugars, oligosaccharides and polysaccharides (ADA, 2002). Most dietary carbohydrates are consumed in the form of starches, disaccharides and monosaccharides; mainly found in fruit, vegetables, whole wheat cereals, grains, legumes, bran, sugar, honey and milk- and malt products (Beyer, 2000). Many researchers have studied the role of fructose, sucrose, sugar alcohols, nutritive and non-nutritive sweeteners, as well as resistant starch and dietary fibre in the management of diabetes (Franz *et al.,* 1994; Malerbi *et al.,* 1996; Nuttal & Chasuk, 1998; Gillespie, 1996; Perlstein *et al.,* 1997; Anderson, 1999; Frances & Eleanor, 2000; ADA, 2002). These dietary carbohydrates will be discussed in short hereafter.

- **Monosaccharides**

  - **Fructose**

Fructose is a common, naturally occurring monosaccharide and is somewhat sweeter than sucrose (Anderson, 1999). Almost 33% of dietary fructose comes from fruit, vegetables and other sources in the diet, with nearly 67% from food and beverages to which fructose have been added (Franz *et al.,* 2002). Malerbi *et al.* (1996) substituted up to 20% of daily energy intake, in well-controlled normolipidaemic, non-obese type 2 diabetic patients, as either sucrose or fructose. Anderson (1999) incorporated 50g to 60g of fructose/day in a prudent diet for subjects with diabetes for 24 weeks. Results from both studies have shown no significant consistent effect on blood glucose control or serum lipids (Malerbi *et al.,* 1996; Anderson, 1999). However, according to Bantle *et al.* (1992) fructose may increase fasting total and low-density-lipoprotein (LDL) cholesterol concentrations in patients with diabetes. Therefore, fructose may have adverse effects on plasma lipids (Franz *et al.,* 2002) and has no significant advantage over sucrose for people with diabetes (McGough, 2000). It is, however, suggested that inclusion of fruits containing fructose in accordance with the dietary guidelines for all people, two to four servings per day, should provide balance and variety in the diabetic individual's diet (Tinker *et al*., 1994; Anderson, 1999).

- **Disaccharides**

  - **Sucrose**

Sucrose is composed of a molecule of glucose attached to a molecule of fructose (Franz *et al.,* 2002) and is the major carbohydrate found in table sugar, fruits, fruit juices, soft drinks and non-starch vegetables (Nuttal & Chasuk, 1998). The traditionally held view that the metabolic effects of carbohydrates can be predicted by classifying them as either 'simple' or 'complex' carbohydrates has been challenged since the 1930s (Perlstein *et al.,* 1997). 'Simple' carbohydrates

included both added sucrose and foods containing sucrose (such as candy, cookies, ice cream, cola), and naturally occurring sugars (fruits and fruit juices) (Franz, 1993). For the largest part of the 1900s, the most widely held belief about the dietary treatment of diabetes has been that 'simple' sugars should be replaced with 'complex' carbohydrates (Gillespie, 1996). The impetus behind this belief was that sucrose and other sugars were more rapidly digested and absorbed and thereby aggravated hyperglycaemia (Franz *et al.,* 2002). Instead, 'complex' carbohydrates or starches such as breads, cereals, potatoes and rice were recommended, because they would take longer to be absorbed and would result in a slower and more moderate rise in blood glucose concentrations (Franz, 1993). However, more recent studies and scientific evidence does not support this assumption (Franz *et al.,* 2002).

Studies conducted by various researchers showed that the intake of sucrose as part of a meal consumed by both normal and diabetic subjects did not aggravate postpandrial hyperglycaemia (Marchini *et al*., 1996; Gillespie, 1996; Nuttal & Chasuk, 1998). According to Nadeau *et al.* (2001) and the ADA (2002), dietary sucrose did not increase glycaemia more than isocaloric amounts of starch, within a balanced meal in both type 1 and type 2 diabetes patients. The BDA Nutrition Subcommittee (1992) allowed added sucrose of 25g, provided it was part of a diet low in fat and high in fibre. Marchini *et al.* (1994) also found no deleterious effects when a small amount of sucrose (30g) was added to three daily meals. Wheeler *et al.* (1996) found that sucrose-containing foods, such as pre-sweetened cereals, are not detrimental to persons with well-controlled type 1 diabetes. A more recent study done in South Africa by Hunter *et al.* (2003) demonstrated that subjects with type 2 diabetes could safely include a moderate amount (15% of the total energy) of sucrose in a balanced diet.

It seems that there is enough evidence that current dietary recommendations for people with diabetes should not restrict the intake of sucrose and sucrose-containing foods because of concerns about aggravating hyperglycaemia (ADA,

2002). However, if sucrose is part of the food or meal plan, it should be substituted for other carbohydrate sources such as starches, milk or fruit, and may not simply be added as extras (Gillespie, 1996). Other nutrients such as fat, often ingested with sucrose-containing foods, should be taken into account (Franz *et al.,* 2002). The addition of sucrose to the diets of people with diabetes might help this earlier isolated population to better comply with their dietary regimen (Marchini *et al*., 1994). Currently, most countries recommend sucrose intake of <10% of the total daily energy intake (MgGough, 2000; DNSG, 2000; Chan, 2003) or limited amounts as part of a balanced diet, substituted for other carbohydrates (ADA, 2002; ADSA, 1997).

- **Sugar alcohols**

Sugar alcohols include polyols such as sorbitol, mannitol and xylitol (Franz *et al.,* 1994). Frances and Eleanor (2000) add isomalt as a relative newcomer to the sugar alcohol list. Polyols are acceptable in modest amounts in the diabetic meal plan, but excessive amounts may have laxative effects (Anderson, 1999; Frances & Eleanor, 2000). Sugar alcohols have lower available energy values and produce a lower postprandial glucose response than fructose, sucrose and glucose (Franz *et al.,* 1994; Anderson, 1999; ADA, 2002). However, they have no significant advantages over other nutritive sweeteners for people with diabetes (Franz *et al.,* 1994; Anderson, 1999).

- **Nutritive sweeteners**

Other than sucrose and fructose, nutritive sweeteners include corn sweeteners such as corn syrup, fruit juice, or fruit juice concentrate, honey, molasses, dextrose and maltose. All these nutritive sweeteners contribute energy and must be accounted for in meal planning (Franz *et al.,* 1994; Gillespie, 1996). Although the ADG recommends that nutritive sweeteners may be used as part of an

appropriate energy-controlled, high-fiber, low-fat diet (ADSA, 1997), later recommendations from other countries such as Europe, China and the United Kingdom discourages the use of nutritive sweeteners in the diabetic diet (DNSG, 2000; Chan, 2003; MgGough, 2000).

- **Non-nutritive sweeteners**

Saccharin, aspartame, acesulfame K (potassium) and sucralose are the four non-nutritive sweeteners that have been approved by the Food and Drug Administration (FDA) (Anderson, 1999; Frances & Eleanor, 2000; ADA, 2002). The FDA determines an acceptable daily intake (ADI) for all non-nutritive sweeteners (Franz *et al.,* 1994; Frances & Eleanor, 2000). The ADI can be defined as the amount of food additive that can be safely consumed on a daily basis over a person's lifetime without having adverse effects (Franz *et al.,* 1994). Table 5 summarizes the ADI for non-nutritive sweeteners (Frances & Eleanor, 2000). According to Anderson (1999), these alternative sweeteners are an acceptable means of checking the amounts of excess refined sugars in the diet, since they are energy-free (Frances & Eleanor, 2000). Non-nutritive sweeteners are safe for people with diabetes when consumed within the ADI levels (ADA, 2002; Chan, 2003). According to the ADG (ADSA, 1997), the use of non-nutritive sweeteners is acceptable in the management of diabetes, while recommendations from Europe (DNSG, 2000) consider non-nutritive sweeteners useful in drinks.

Table 5 ADI for non-nutritive sweeteners (Frances & Eleanor, 2002).

NON-NUTRITIVE SWEETENER	ADI	RECOMMENDED INTAKE
Saccharin	No set ADI	≤ 1000mg per day (adults) ≤ 500mg per day (children)
Acesulfame K	15mg/kg of body weight	
Aspartame	50mg/kg of body weight (USA) 40mg/kg body weight (Canada)	
Sucralose	5mg/kg body weight (all ages)	

- **Resistant starch**

According to the ADA (2002), resistant starch is not digested and, therefore, not absorbed as glucose in the small intestine. Legumes are the major food source of resistant starch in the diet, containing 2g-3g resistant starch per 100g cooked legumes. According to Englyst and co-workers (1996), it has been suggested that ingestion of resistant starch produces a lesser increase in postprandial glucose than digestible starch, and correspondingly lower insulin concentrations. Consequently, it has been proposed that food containing naturally occurring resistant starch (cornstarch) may modify postprandial glycaemic response, prevent hypoglycaemia and reduce hyperglycaemia. However, long-term studies have not consistently confirmed these results (Noakes *et al*., 1996; Behall & Howe, 1995). The ADA (2002) currently recommends that resistant starch has no established benefit for people with diabetes.

- **Dietary fibre**

Water insoluble fibre is primarily found in wheat, vegetables and most grain products, while soluble fibres are found in fruits, especially apples, unrefined oats, barley and legumes (Anderson, 1999). Soluble fibre contributes little to faecal bulk and prolongs the rates of gastric emptying and intestinal transit. Contrary, insoluble fibre is poorly metabolized and increases stool volume (Franz *et al.,* 1994; Nuttal & Chasuk, 1998). The mechanism of action of insoluble fibre in diabetes remains obscure (Jenkins, *et al.,* 2002). However, soluble fibre has been shown to reduce serum total cholesterol and LDL cholesterol concentrations (Nuttal & Chasuk, 1998; Hung *et al*., 1996), which are known risk factors for CVD (Jenkins *et al*., 2002).

The dietary fibre hypothesis is probably the most recent stimulus to focus attention specifically on the carbohydrate component of the diet of people with diabetes (Jenkins *et al.,* 2002). According to Howard *et al.* (1997), low-fat high-

carbohydrate diets are recommended, since the higher fibre content of a high-carbohydrate diet may retard glucose absorption, and, therefore attenuate the rise in blood glucose concentrations. However, the traditionally held belief regarding high-fibre diets suggested that differences in the nature of digestible and indigestible carbohydrate components would guarantee freedom from a range of disease, including diabetes. Early studies focused on the effect of viscous soluble fibre in flattening the postprandial blood glucose profile (Jenkins *et al.,* 2002). Today people with diabetes are still encouraged to choose a variety of soluble fiber-containing foods (Nuttal & Chasuk, 1998; ADA, 2002). However, the potential role for high-fibre carbohydrate food in the treatment and possible prevention of diabetes is still controversial. Although Franz *et al.* (1994) suggested that there is no direct correlation between daily fibre intake and the risk of developing diabetes, Salmeron and colleagues (1997) found that diets with a low cereal fibre content were positively associated with risk of type 2 diabetes. Marshall and co-workers (1997) also found that diets low in starch and fibre were significantly associated with fasting hyperinsulinaemia. Currently, most studies on healthy subjects and those at risk for type 2 diabetes, support the importance of including food containing carbohydrates from whole grains, fruits and vegetables, as well as from low-fat milk products in the diet (ADA, 2002). Furthermore, Astrup and colleagues (2000) suggest that a high-fibre diet content may improve the satiating effect of the diet.

- **The amount of dietary fibre**

Daily intakes of 20g-35g of fibre (Anderson, 1999; Chan, 2003), or 3g dietary fibre per 1000kJ (ADSA, 1997) is generally recommended. According to the ADA (2002), large amounts of fiber (50g/day) may have beneficial effects on glycaemia, insulinaemia and lipaemia. However, it is not known if such high levels of fibre intake can be maintained on the long term (ADA, 2002). According to Jenkins and co-workers (2002), attention should be paid to minimally processed whole grain

cereals relatively high in insoluble fibre, which may usefully replace saturated fats in the diet.

The process of digestion and absorption of different carbohydrate foods is discussed in more detail hereafter.

2.13.1.3 Digestion and absorption of carbohydrates

Digestion of dietary carbohydrates in the upper gastrointestinal tract provides glucose, fructose and galactose for intestinal absorption (Ettinger, 2000), from where they are carried in the blood stream to the liver (Beyer, 2000). Cellulose, hemicelluloses, pectins, gums and other forms of high fibre carbohydrates pass relatively unchanged to the colon, where bacteria in the colon partially ferment these fibres. Legumes and whole grains contain large amounts of protein and fibre and are resistant to digestion (Beyer, 2000).

Glucose and galactose are absorbed by active transport, while fructose is more slowly absorbed by facilitated diffusion. Both galactose and fructose are converted to glucose in the liver. Although some glucose is stored in the liver and muscle as glucogen, most of it is transported from the liver to body tissue in order to provide energy for the body (Beyer, 2000). The rate at which glucose then enters the bloodstream (or the glycaemic response to food) is influenced by various factors (Ettinger, 2000). According to Jenkins *et al.* (2002), these characteristics influence the physiological effects of food, such as postprandial glycaemia and insulinaemia. It is generally agreed that the following factors influence the glycaemic response to food (ADA, 2002; Perlstein *et al*., 1997; Jenkins *et al*., 1984; Jenkins *et al*., 2002):

- **the amount of carbohydrate**
- **type of sugar** (glucose, fructose, sucrose, lactose)
- **nature of the starch** (amylose, amylopectin, resistant starch)

- **cooking and food processing** (degree of starch gelatinization, particle size, cellular form)
- **food structure**
- **other food components** (fat and natural substances that slow digestion - lectins, phytates, tannins and starch-protein and starch-lipid combinations)

According to Franz (2000), the glycaemic effect of carbohydrate foods varies, but cannot be predicted by their structure (i.e. starch versus sugar). Numerous studies have shown no adverse effect of sucrose on glycaemia (refer to section 2.13.1.2-Disaccharides). According to Van Amelsvoort and Weststrate (1992), the nature of the starch present in a food influences the glycaemic response. A higher ratio of amylose to amylopectin produces a slower rate of digestion due to the extensive bonding of amylose. Ettinger (2000) describes that while the presence of nonabsorbable oligosaccharides and viscous dietary fibre reduces enzyme hydrolysis, starch granules subjected to moisture, heat and subsequent cooling become dense and less available to enzyme action. Both these factors slow the rate at which glucose enters the bloodstream (Ettinger, 2000).

Although various starches have different glycaemic responses, priority should be given to the total amount of carbohydrates consumed, rather than the source (Franz, 2000).

2.13.1.4 The Glycaemic Index and diabetes

Today, the rate at which carbohydrate foods are absorbed is generally classified by the Glycaemic Index (GI) concept. In 1981, Jenkins and co-workers (1981) introduced the GI, which is a numeric physiological classification of carbohydrate foods based on the rate of carbohydrate absorption. The GI provides a standardized comparison of the 2-hour postprandial glucose response of a

carbohydrate with that of white bread or glucose (Frost & Dornhorst, 2000). Low-GI carbohydrates have lower 2-hour areas under the glucose curve than white bread, while high-GI foods have higher areas (Frost & Dornhorst, 2000). A wide range of glycaemic responses is produced by different foods, independently of their chemical composition (Marchini *et al.,* 1994).

Jenkins and co-workers (1982) found a positive relationship between the rate at which carbohydrate foods liberate their products of digestion and the degree to which they raise blood glucose concentrations. They suggested that improvement in diabetic control might result from altering either the nature or the amount of carbohydrate foods eaten. In the late eighties, Jenkins *et al.* (1988) showed that the inclusion of low-GI foods into the diets of patients with diabetes favourably influenced carbohydrate metabolism without increasing insulin demand. Lower-GI foods present a more attenuated insulin response than higher-GI foods. The pattern of insulin secretion caused by different carbohydrates reflects their different intestinal transit times (Frost & Dornhorst, 2000). Jenkins *et al.* (1982) also demonstrated that foods which raise blood glucose concentrations least after feeding in normal or diabetic subjects, release their carbohydrate products more slowly. The frequency of gastric emptying also influences the GI, with lower-GI foods being retained in the stomach for longer periods than high-GI foods (Frost & Dornhorst, 2000).

2.13.1.5 Carbohydrate metabolism

For more than a decade, interest in dietary management of people with diabetes has intensified, associated with heightened efforts to normalize carbohydrate and lipoprotein metabolism (Hollenbeck & Coulston, 1991). Abnormalities in carbohydrate metabolism are present in both type 1 and type 2 diabetes. According to Ettinger (2000), some individuals are especially susceptible to diet-induced abnormalities of glucose metabolism. The nature of these abnormalities varies considerably though (Hollenbeck & Coulston, 1991). According to Grundy

(1991), an increased secretion of plasma glucose may be present in some diabetic patients after a high carbohydrate meal has been eaten. However, comparing patients with type 2 diabetes with non-diabetic individuals, the compensatory response to a high carbohydrate meal may not be sufficient to offset an increased intake of carbohydrates. Moreover, the extent to which a patient can compensate for an increased carbohydrate intake is dependant on the stage of type 2 diabetes. Hollenbeck and Coulstan (1991) explain that the primary cause of hyperglycaemia in patients with type 1 diabetes is related to insulin deficiency, due to the destruction of β-cells. Contrarily, hyperglycaemia in type 2 diabetes is rather caused by reduced insulin sensitivity of peripheral tissue, than reduced insulin secretion (Salmeron *et al.,* 1997). Although it is possible that a high carbohydrate diet might induce a limited increase in insulin sensitivity, it is unlikely that it will overcome resistance to peripheral insulin action (Hollenbeck & Coulstan, 1991).

According to Frost and Dornhorst (2000), various epidemiological and experimental studies have linked GI to postprandial glucose metabolism, IR and cardiovascular risk factors. Consequently, there is evidence that the GI is relevant to human metabolism (Frost & Dornhorst, 2000). A reduced risk of type 2 diabetes and cardiovascular disease were seen in individuals who habitually consumed a diet in slowly digested carbohydrates (low-GI foods) (Salmeron *et al.,* 1997). Frost *et al.* (1998) found that IR can be favourably modified by lowering the GI of the diet *in vivo* and *in vitro*. The GI of habitual diets was also found to be an important determinate of HDL cholesterol and other cardiovascular risk factors (Frost *et al.*, 1999).

2.13.1.6 Dietary carbohydrates and insulin sensitivity

- **Introduction**

Decreased insulin sensitivity, or IR, develops when the normal amount of insulin in an individual is not able to maintain normal plasma glucose concentrations

(Lebovitz, 2002). All dietary carbohydrates stimulate insulin secretion through both direct stimulation of the pancreatic β-cells, and indirectly through their secreting effect (Frost & Dornhorst, 2000). In the presence of normal insulin sensitivity, it takes modest insulin secretion to maintain normal glucose metabolism. However, with decreased insulin sensitivity (decreased insulin action) it requires increasingly greater insulin secretion to maintain normal glucose metabolism. Compensatory insulin secretion increases until the plasma glucose concentrations return to normal. Consequently, diabetes occurs when insulin secretion is below the fifth percentile for that degree of IR (Lebovitz, 2002). Figure 2 illustrates the physiological control of insulin secretion.

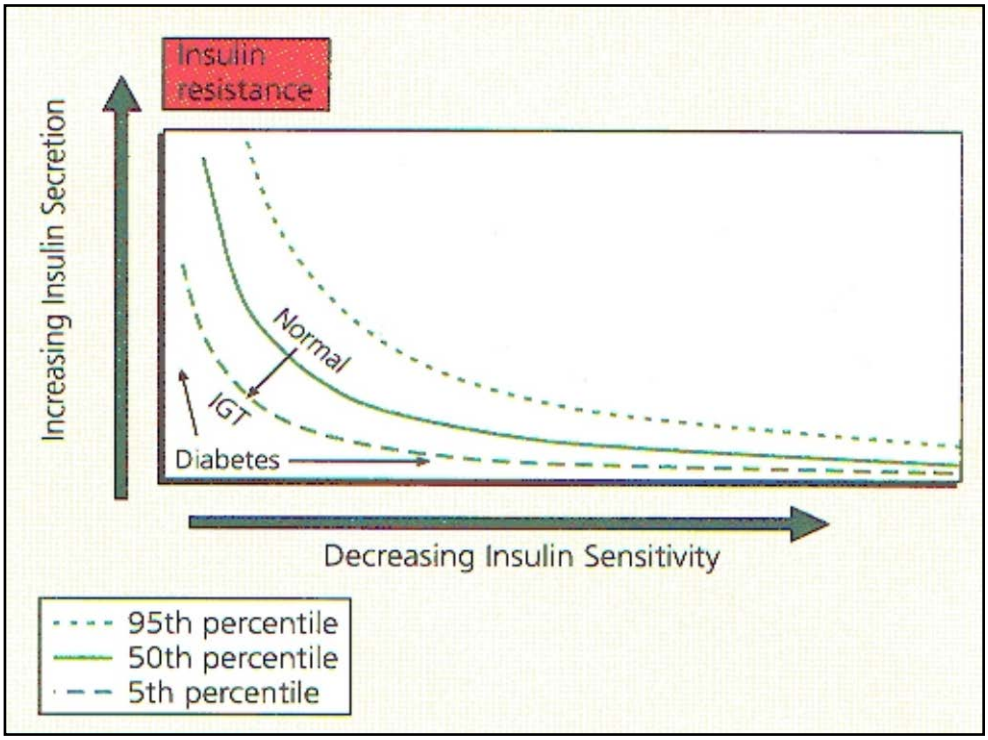


Figure 2 Physiological control of insulin secretion (Lebovits, 2002).

Determinants of insulin sensitivity

Himsworth (1935) was the first of many researchers exploring the concept of insulin sensitivity. He also developed the first method for its measurement and proposed the idea that diet might affect glucose tolerance by altering insulin sensitivity. Although environmental influences on insulin sensitivity are incompletely understood, physical exercise has particular strong beneficial effects on insulin sensitivity. Obesity however, has a strong adverse effect (Daly *et al.,* 1997). Some intervention studies advocate modification of the macronutrient composition of the diet to improve insulin sensitivity (Marshall *et al.,* 1997). These interventions deliberately change one or more components of the diet and compare individual insulin sensitivity responses (Daly *et al.,* 1997). Slabber *et al*. (1994) compared the effects of a low-insulin-response energy restricted diet to a conventionally balanced diet on weight loss and plasma insulin concentrations in obese females. They found significant reductions in serum insulin concentrations and weight in subjects who followed the low-insulin-response diets, which included only low-insulin-response carbohydrates. Other researchers tested diets reduced in total fat, saturated fat (SFA) and sucrose, as well as relative increases in intakes of polyunsaturated fat (PUFA) and mono-unsaturated fat (MUFA) (Marshall *et al*., 1997). While most of the evidence suggests that high-fat intake is likely to reduce insulin sensitivity, the effects of dietary carbohydrates are more controversial (Daly *et al.,* 1997).

Various investigators claim that high-carbohydrate diets improve glucose tolerance in type 2 diabetes patients. Such an action might be seen from either an enhancement in insulin secretion or an increase in sensitivity of peripheral tissues to insulin. Contrary to this, other researchers found an increased secretion of plasma glucose after a high-carbohydrate meal in patients with diabetes. In this case, the average glucose concentration throughout the day is often higher than on a high-fat diet (Grundy, 1991).

There is, however, one inherent problem when the proportion of energy from one macronutrient, e.g. carbohydrate, is changed. The contribution by one or more other components is inevitably affected. When the diet of a person is changed from one providing 40% of energy as carbohydrate, 40% as fat, and 20% as protein, to a diet providing 60% as carbohydrate, 20% as fat and 20% as protein, fat content is decreased by 50%. If an increase in insulin sensitivity is detected, it cannot be concluded that this is due to a change in carbohydrates alone. Instead, if the intake of a sub-component, e.g. unrefined sugar, is changed without changing the total intake of carbohydrates, conclusions can be drawn from the effects of insulin sensitivity (Daly *et al.,* 1997).

- **Assessment of insulin sensitivity**

The most basic method of assessing insulin sensitivity is to measure fasting insulin concentrations (Daly *et al.,* 1997). Marshall *et al*. (1997) tested the hypothesis that diets high in total and SFA and low in fibre were associated with hyperinsulinaemia in a geographically based sample of non-diabetic subjects. The results suggested that diets enriched with unrefined carbohydrates are associated with lower fasting insulin concentrations. No adverse effects of sucrose were revealed in this study of subjects with normal glucose tolerance when energy intake alone was kept constant. However, a significantly positive association between sucrose intake and fasting insulin concentrations was seen when holding both energy and carbohydrate intake constant. In spite of findings that sucrose has no harmful effects on diabetic control, this result suggests that substituting sucrose for other carbohydrates may have deleterious effects on fasting insulin concentrations. Of further interest is the finding that people with a higher BMI were observed to have less beneficial effects from the addition of unrefined carbohydrates and fibre to the diet than leaner subjects. This finding suggests that the presence of obesity might alter the effect of dietary factors on insulin concentrations, because of obesity's strong effect on insulin concentrations (Marshall *et al*., 1997). However, Hunter *et al.* (2003) found improved long term

glycaemic control in class I obese subjects with type 2 diabetes, when moderate amounts of sucrose (15% of the total energy) were included in their meal plan.

2.13.1.7 The amount of dietary carbohydrate

From as long ago as 1550 BC, carbohydrates have been the main focus of diabetes nutrition management (Perlstein *et al.,* 1997). Various studies in healthy individuals and those at risk for type 2 diabetes support the importance of including foods containing carbohydrates (ADA, 2002). Carbohydrates are necessary to maintain a steady supply of glucose (Cataldo *et al.,* 1998), and should provide most of the total daily energy intake, ranging from 50% - 60% (BDA Subcommittee Report, 1992; Anderson, 1999). ADSA (1997) recommends an intake of carbohydrates from a variety of sources, constituting 65% of the total energy intake. According to Anderson (1999), highly committed individuals can tolerate greater amounts up to 70%, but generally this is not recommended for most people with diabetes. The DNSG (2000) also recommend an intake of carbohydrate-containing foods that are rich in dietary fibre or have a low GI. The intake of high-carbohydrate diets is widely recommended. Improved glycaemic control (Howard *et al.*, 1991) and lower fasting insulin concentrations (Marshall *et al.,* 1997) are associated with high-carbohydrate diets and diets enriched with dietary fibre.

2.13.1.8 Carbohydrate counting

According to Franz (2000), carbohydrate counting is a very popular approach to meal planning, since it can be used as a basic meal planning approach. Several carbohydrate counting education tools are available in the United States (Franz, 2000). However, in SA the most familiar and, most probably, the only carbohydrate counting education tool is the *Exchange lists for meal planning*. The exchange list approach to meal planning was discussed previously in section 2.10.4.1.

2.13.1.9 Meal spacing

Although there are no firm recommendations regarding the optimum frequency of meals and snacks (DNSG, 2000), patients treated with insulin (and some oral hypoglycaemic agents) must take regular meals (BDA Nutrition Subcommittee, 1992). Regular self-monitoring of blood glucose concentrations might be helpful in determining the most appropriate timing of food intake and optimal food choices. The timing and dose of insulin should match the amount and time of the carbohydrate-containing food intake, to avoid both hypoglycaemia and excessive postprandial hyperglycaemia (DNSG, 2000). One important management aim is to minimize daily fluctuations in blood glucose concentrations, in order to reduce the frequency and severity of hypoglycaemia (BDA Nutrition Subcommittee, 1992).

Most people with diabetes will have three meals a day and up to three snacks (DNSG, 2000). In order to boost the proportion of carbohydrates in the total diet, snacks can be used if they are based on foods such as bread or fruit. Other reasonable alternatives include milk and milk-based drinks, provided reduced-fat milk is used and the protein content is borne in mind (BDA Nutrition Subcommittee, 1992). Although some insulin-treated patients may require food every two to three hours throughout the day (BDA Nutrition Subcommittee, 1992), individual preferences and the needs of different treatment regimens are the main determinants of meal frequency (DNSG, 2000). Flexible regimens for insulin administration have allowed a return to more frequent injections of smaller doses of insulin. This type of regimen is best matched by more frequent consumption of smaller amounts of food. However, the dose of insulin required to maintain near-normoglycaemia after main meals, is usually such that hypoglycaemia would intrude before the next main meal, unless a snack is taken (BDA Nutrition Subcommittee, 1992). It is also important to ingest an adequate amount of carbohydrate food, preferably rich in fibre, before going to bed in order to reduce the risk of nocturnal hypoglycaemia in insulin treated patients (DNSG, 2000).

2.13.2 Dietary fat

2.13.2.1 Introduction

Dietary fat is stored in adipose (fat) cells located in depots in the human body, and is essential for the digestion, absorption and transport of fat soluble vitamins A, D, E and K (Beyer, 2000). Today, there is a vast array of fat types in the diet, coupled with the growing realization that the type of dietary fat consumed may have important consequences for general health. Ettinger (2000) suggests that recommendations about dietary fat consumption must consider fat *type* as well as fat *amount.* Dietary fats are generally derived from three different sources, which include land animals, marine animals and plants. Land animals store their fats as saturated as possible, (but still liquid) at body temperature. Thus, while foods of land animal origin primarily contain SFA, marine animals must maintain their fat in liquid form as polyunsaturated oils. However, plants growing in temperate climates such as corn and soybeans, also form and store PUFA in their seeds; while some tropical plants such as coconut, cocoa and palm, store SFA. MUFA is found in olive oil, canola oil, peanut oil, peanuts, pecans, almonds and avocados. Although omega-3 PUFA primarily comes from marine sources, vegetable precursors can be obtained from flaxseed and canola oils, as well as from green leafy sources (Ettinger, 2000).

2.13.2.2 Total amount of fat

According to the ADG, dietary fat intake refers to the percentage of fat derived from the total energy intake (ADSA, 1997). Dietary recommendations from the United States, China and South Africa agree that total fat intake should comprise <30% of the total daily energy intake (ADA, 2002; Chan, 2003; ADG, 1997). In Europe and the United Kingdom, an acceptable range of fat intake between 25%-35% of the total energy intake is currently recommended, depending on individual

assessment (Tinker *et al.,* 1994; DNSG, 2000). However, the upper limit intakes should be applied with careful consideration, and can be used for non-obese individuals with acceptable serum TG values, if the additional fat comes from monounsaturated sources such as canola or olive oil (Anderson, 1999).

Since fat is energy dense and provides 38kJ of energy per gram, humans are able to obtain adequate energy within reasonable daily consumption (Ettinger, 2000). The primary goal regarding dietary fat intake in patients with diabetes, is to decrease intake of saturated fat and cholesterol (Franz *et* al., 2002). However, according to Rodriguez and Castellanos (2000), 34% to 40% of the total daily energy intakes of people with diabetes are consumed as fat. Clearly, reducing dietary fat intake is a challenge for many people with diabetes. High intakes of fat may increase the risk of IR, obesity and high cholesterol (Rodriguez & Castellanos, 2000). Furthermore a high percentage of total energy consumed in the form of fat increases the risk for several chronic diseases (Grundy *et al.,* 2002). Harding and colleagues (2001) also confirmed positive associations between the risk for type 2 diabetes and total fat intake.

Although *ad libitum* low-fat dietary interventions (Astrup *et al.,* 2000) are generally suggested as healthy guidelines to people with diabetes, the ADA lately recommended that either low-SFA high-carbohydrate diets or high-MUFA diets could be advised to patients with diabetes (Garg, 1998). To better understand how the main components of dietary fat (i.e. SFA, PUFA, MUFA and omega-3 PUFA) influence diabetes, each component is further discussed in the section below.

2.13.2.3 Saturated fat

According to Ettinger (2000), SFAs are known to increase plasma lipids. Furthermore, Feskens and co-workers (1995) found positive associations between risk for type 2 diabetes or hyperglycaemia and SFA intake. According to Harding *et al*. (2001), a number of potential mechanisms have been proposed that may link

dietary fat intake and glycaemia. It has been proposed that the dietary fatty acid profile has been shown to affect the fatty acid profile of skeletal muscle lipids (Storlien *et al*., 1996). The proportion of SFA in muscle phospholipids was then positively associated with IR (Borkman *et al.,* 1993). According to Storlien and co-workers (1996), the composition of dietary fat may be particularly important, since the mechanisms involved in glycaemia and IR results from high-fat diets. Harding and co-workers (2001) found a positive association between SFA intake and HbA_{1c} concentrations. Hereby, further evidence was provided for the adverse effect of high total fat and SFA intakes on glycaemia and the risk of type 2 diabetes. It is currently recommended that SFA should comprise <10% (ADG, 1997; ADA, 2002, Chan, 2003) of the total energy intake as fat *(*Refer to Table 3).

2.13.2.4 Polyunsaturated fat

Only a few studies investigated the effects of PUFA on plasma lipid concentrations and glycaemic control in type 2 diabetic subjects (Franz *et al.,* 2002). Heine and colleagues (1989) compared a diet high in total fat and PUFA with a diet high in total fat and SFA. They found that the diet high in total fat and PUFA resulted in lower plasma total and LDL cholesterol, than the diet high in total fat and SFA. However, when Madigan *et al.* (2000) compared a diet high in PUFA to a diet high in MUFA, higher plasma lipid totals and LDL cholesterol, fasting glucose and insulin concentrations were found. It is currently recommended that PUFAs, with their tendency to lower HDL cholesterol concentrations, and their susceptibility to oxidation, should be kept under 10% (Anderson, 1999), preferably 6%-8% of the total energy intake as fat (ADSA, 1997).

2.13.2.5 Mono-unsaturated fat

Today there is growing consensus that diets for diabetic individuals could include moderate-to-high levels of MUFA (Anderson, 1999), with SFA being replaced by MUFA (Astrup *et al.,* 2000). Several studies showed that MUFA resulted in

desired decreases in total and LDL cholesterol concentrations, without the deleterious effects of hyperglycaemia, hyperinsulinaemia, hypertriglyceridaemia and reduced HDL cholesterol concentrations (Anderson, 1999; Chan, 2003; Carg, 1998; Berry, 1997). According to Carg (1998), fasting plasma triacylglycerol and very-low-density-lipoprotein (VLDL) cholesterol concentrations were reduced by 19% and 22% respectively, on a high MUFA diet. A modest increase in HDL cholesterol concentrations, without adversely affecting LDL cholesterol concentrations, was also demonstrated. Although total dietary fat is associated with IR, Parillo *et al.* (1992) found reduced IR when diets were enriched with MUFA. Marshall *et al*. (1997) also found no positive association between MUFA and fasting insulin concentrations. However, liberalized intakes of MUFAs up to 20% of the total energy intake may enhance IR, and in obese individuals, may aggravate obesity (Anderson, 1999; ADA, 2002).

2.13.2.6 Dietary fatty acids in the management of diabetes

According to Hodgson *et al*. (1993), it was generally accepted in the past that high-PUFA diets were without side effects. However, more recent data suggest otherwise with regard to obesity, hyperinsulinaemia and coronary artery disease. According to Berry (1997), both omega-6 and omega-3 fatty acids increase the tendency for LDL to be oxidized whereas MUFA may reduce it. In addition, Berry (1997) also suggests that diabetes prevalence may be correlated with the dietary ratio of omega-6 to omega-3 fatty acids. Vessby (2000) confirms that the omega-6:omega-3 ratio might be important in determining insulin sensitivity.

Berry (1997) explains that high concentrations of linoleic acid and low concentrations of arachidonic fatty acids (both omega-6 fatty acids) may impair insulin activity and promote the complications of diabetes. Also, relative insulin deficiency as in type 2 diabetes, or absolute deficiency as in type 1 diabetes, leads to an increased fatty acid fluctuation from adipocytes. These fluctuations interfere with glucose utilization. Furthermore, insulin deficiency leads to a relative

decrease in arachidonic acid, which itself is necessary for the stimulus-secretion coupling of insulin release (Berry, 1997).

In contrast with possible deleterious effects of omega-6 rich diets, evidence suggests that omega-3 diets may be beneficial for many metabolic derangements associated with type 2 diabetes (Berry, 1997; Montori *et al*., 2000; ADA 2002). Phillipson and co-workers (1985) have found reduced plasma TG concentrations in diets supplemented with omega-3 fatty acid. Although, omega-3 fatty acids may inhibit lipolysis and prevent triacylglycerol production, the accompanying rise in LDL cholesterol concentrations is of concern (Franz *et al.,* 2002). Therefore, plasma LDL cholesterol should be closely monitored if omega-3 fatty acid supplements are used (Westerveld *et al.,* 1993). According to Friedberg *et al.* (1998), omega-3 supplements may be most beneficial in the treatment of severe hypertriglyceridaemia. Although Malasanos and Stacpoole (1991) suggested that omega-3 fatty acids may aggravate hyperglycaemia in type 2 diabetes by impairing insulin secretion, Franz *et al.* (2002) confirm that glucose metabolism is not likely to be adversely affected with the use of omega-3 supplements.

2.13.2.7 Cholesterol Intake

Although cholesterol intake is less influential on serum lipid concentrations than saturated fats, its intake should be limited (Anderson, 1999). Meat and dairy products are cholesterol-rich animal foods. High intakes can increase blood cholesterol concentrations, adding to the risk of cardiovascular disease (Wilson, 1995). Several researchers recommend that cholesterol intakes should be held under 300mg per day (BDA Subcommittee report, 1992; Wilson, 1995; Chan, 2003). However, others recommend cholesterol intakes of less than 200mg per day (Cataldo *et al.,* 1998; Anderson, 1999). By using low-fat and non-fat milk and lean meats, cholesterol intakes can be reduced (Cataldo *et al.,* 1998).

2.13.2.8 Dietary fat and diabetic dislipidaemia

Although diabetes is usually categorized as a disease of carbohydrate metabolism, abnormalities of lipoprotein metabolism and adipose tissue distribution are also common (Franz *et al.,* 1994). According to Franz *et al.* (2002), dyslipidaemia consisting of abnormal lipid concentrations, lipoprotein composition, or both, is often found in individuals with both type 1 and type 2 diabetes. People with diabetes, compared to age and sex-matched non-diabetic individuals, have a two to threefold increase in the prevalence of dyslipidaemia. Franz *et al.* (1994) reported that although patients with uncontrolled type 1 diabetes often present with elevated plasma lipids, adequate insulin therapy usually restores lipid concentrations to normal. Insulin treated patients usually have increased plasma cholesterol, VLDL cholesterol, LDL cholesterol and TG concentrations similar to those of the general population with the same age and sex. However, these patients have higher than normal HDL cholesterol concentrations (Franz *et al.,* 1994). Lipid abnormalities most frequently found in patients with type 2 diabetes are hypertriglyceridaemia, increased VLDL cholesterol, and reduced HDL cholesterol concentrations (Franz *et al.,* 1994). Increased LDL cholesterol is identified as the primary target for cholesterol-lowering therapy in both type 1 and type 2 diabetes patients (Franz *et al.,* 1994). According to SEMDSA (2003) LDL cholesterol should be ≤ 3.0mmol/l, HDL cholesterol should be > 1.2mmol/l and TG concentrations should < 1.5mmol/l.

According to Grundy (1991), patients with diabetes should eat a low-fat high-carbohydrate diet, primarily to reduce the risk for coronary heart disease (CHD). To achieve this goal, Franz *et al.* (1994) recommend a reduction in high dietary intakes of cholesterol-raising fatty acids, such as SFA, trans fatty acids and cholesterol. Trans unsaturated fatty acids contribute a relatively small proportion of total energy compared with saturated fatty acids. However, their particularly adverse effect on lipoproteins resulting in increased LDL (ADA, 2002) and decreased HDL cholesterol concentrations, as well as the documented

association with CHD, justifies the emphasis on reduced intake (DNSG, 2000). Some studies showed that replacing SFA with carbohydrates in type 2 diabetic patients with mild-to-moderate elevations of plasma TG and low HDL cholesterol, resulted in improvements in LDL cholesterol, and beneficial or neutral effects on HDL cholesterol concentrations (Franz *et al.,* 2002). A study conducted by Howard *et al.* (1991), showed that specific substitution of high-carbohydrates for SFA, beneficially affected LDL cholesterol concentrations. Although Grundy (1991) reported that high-carbohydrate diets might often raise serum TG levels primarily by increasing VLDL-TG concentrations, Howard *et al.* (1991) confirmed no stimulation of VLDL-TG or apolipoprotein B (apoB) production. It is true that people with hypertriglyceridaemia might be sensitive to dietary carbohydrates, but a meal plan high in MUFA is one way to reduce SFA intake without increasing carbohydrate intake. Reasonable intakes of sources high in MUFA such as nuts, avocado and olive oil are feasible to achieve (Tinker *et al*., 1994).

2.13.2.9 Association between dietary fat intake and obesity

For almost a decade there has been considerable debate regarding the use of low-fat/high carbohydrate diets for patients with diabetes (Howard *et al.* 1991). According to Willett (2002), the percentage of dietary energy from fat has been suggested to be an important determinant of body fat, and this presumed effect has been invoked to justify the general promotion of low-fat diets. Therefore, efforts to reduce the incidence of obesity have focused on the fat content of the diet (Saris *et al.,* 2000). Several studies provide an array of evidence suggesting the possibility that the incidence of obesity positively relates to high fat consumption (Zimmet, 1992). Marshall *et al*. (1994) found, among individuals with similar baseline levels of obesity, that a 40g increase in fat intake is associated with a six-fold excess risk of developing type 2 diabetes. This result added support to previously reported findings that a high-fat/low-carbohydrate diet is associated with the onset of type 2 diabetes. According to Franz *et al*. (1994), several studies suggested that restriction of energy from fat resulted in a decrease in body weight,

without restriction of energy from carbohydrates or proteins. Bray and Popkin (1999) also found that a high fat content in the diet strongly contributes to weight gain. Tinker *et al*. (1994) found that a low-fat, low-energy diet, providing 20% of energy from fat in obese persons with type 2 diabetes, lost more weight after 16 weeks than a control group consuming a low-energy intervention. Another randomized controlled trial conducted by Saris *et al.* (2000), also demonstrated that an *ad libitum* diet low in fat and high in complex carbohydrates reduced body weight by 2.6kg and fat mass by 2.4kg, relative to a moderate-fat control diet.

It is known that high-fat diets are energy dense and may lead to an increase in energy intake and consequent overweight (Saris *et al.,* 2000). However, within the United States, a substantial decline in the percentage of energy from fat during the last two decades has corresponded with a massive increase in obesity, and similar trends are occurring in other affluent countries (Saris *et al.,* 2000; Willett, 2002). Thus, not only should the reduction of foods high in fat be emphasized, but also the reduction of energy dense foods (DNSG, 2000).

2.13.2.10 Fat replacers

Dietary fat intake can be reduced by either reducing the amount of high-fat food in the diet, or to provide lower fat or fat-free versions of food and beverages. The latter can be accomplished by removing some fat, or by using fat replacers which mimic the properties of fat, with significantly less energy than fat (Franz *et al.,* (2002). According to Kelly *et al.* (1998), the majority of fat replacers has been approved by the FDA as Generally regarded as safe substances (GRASS). However, a few replacers, such as olestra, have been approved as food additives. Franz *et al.* (2002) explain that approval for food additives requires both demonstration of safety and pre-market approval.

Two short-term studies on fat replacers have been reported (Franz *et al.,* 2002). Rodriguez and Castellanos (2000) found that reasonable amounts of fat replacers

(i.e. five low-fat or fat-free products per day) produced a small decrease in dietary fat, SFA and cholesterol intake. Cotton and colleagues (1996) found that higher intakes of fat replacers might lead to a significant decrease in energy intake. However, long-term studies are needed to assess the effects of food containing fat replacers on the macronutrient content of diets of patients with diabetes (Franz *et al.,* 2002).

2.13.3 Dietary protein

2.13.3.1 Dietary protein metabolism

It is well established that insulin deficiency and IR have a less stern affect on abnormalities of protein metabolism than they have on abnormalities of glucose metabolism in people with type 2 diabetes (Henry, 1994; ADA, 2003). However, in the presence of moderate hyperglycaemia, increased turnover of protein may occur in these patients (Franz *et al.*, 2002). Gougeon *et al.* (1997) found an increase in whole-body nitrogen fluctuation and a higher rate of protein synthesis and breakdown during moderate hyperglycaemia, when comparing obese type 2 diabetic patients to non-diabetic obese patients. They also found that although a high-protein/low-energy diet was capable of maintaining nitrogen balance in obese non-diabetic patients, it did not prevent negative nitrogen balance in diabetic subjects, despite weight loss and improved glycaemic control. Further studies by Gougeon *et al.* (2000), showed that the increased protein turnover could only be restored to normal by using either oral glucose-lowering agents or exogenous insulin. According to Franz *et al.* (2002), people with type 2 diabetes thus have an increased need for protein during moderate hyperglycaemia. However, there is insufficient evidence to support either higher or lower protein intakes for people with diabetes than for the general population (Franz *et al.,* 1994).

2.13.3.2 Dietary protein and renal insufficiency

The restriction of protein in the diets of people with diabetes with established nephropathy remains a controversial issue, since there is no evidence that restricting protein will prevent or delay the onset of renal insufficiency (Nuttal & Chasuk, 1998). Concern regarding protein deficiency was confirmed by Brodsky *et al.* (1992), who reported incidence of protein under-nutrition, with protein intake of 0.6g/kg body weight per day. Although it has been suggested that there is an association between dietary protein intake and the development of renal disease, protein intake in the usual range does not appear to be associated with the development of diabetic nephropathy (Franz *et al.,* 2002). Moreover, protein intake of no more or less than 0.8g/kg body weight per day (~10% of total daily energy intake) is highly recommended at onset of nephropathy (Tinker *et al.,* 1994; Franz *et al.,* 1994; ADSA, 1997; Cataldo *et al.,* 1998; Anderson, 1999; DNSG, 2000). Although the long term effects of consuming > 20% of energy as protein on the development of nephropathy has not been determined, it is suggested that high-protein intake may have detrimental effects on renal function (Franz *et al.*, 2002; ADA, 2003).

2.13.3.3 Dietary protein and blood glucose control

Although as much as 50%-80% of ingested protein can be converted to glucose (Nuttal & Chasuk, 1998), the amount of glucose from ingested protein does not appear in the general circulation (ADA, 2003). Several studies have demonstrated that ingested dietary protein does not increase plasma glucose concentrations (Nuttal & Chasuk, 1998; Franz *et al.,* 2002). Gannon *et al.* (2001) found only 2g of glucose in the circulation of subjects who ingested 50g of protein in the form of very lean meat, which in theory could yield 11g-13g of glucose. In patients with type 2 diabetes, protein and glucose ingestion has an equal effect on the stimulation of insulin secretion (Nuttal & Chasuk, 1998; Frantz *et al.,* 2002). Moreover, ingested protein stimulates both insulin and glucagon secretion, which

is considerably greater in subjects with type 2 diabetes than in non-diabetic subjects (Nuttal & Chasuk, 1998). The ratio of insulin to glucagon determines the net effect on glucose output by the liver (Franz *et al.,* 2002). Furthermore, the same peak glucose response is found when carbohydrates alone and carbohydrates with proteins are ingested. This finding suggests that protein does not slow down the absorption of carbohydrates (ADA, 2003)

2.13.3.4 Total amount of dietary protein

Normal growth, development and maintenance of body protein stores are dependent on adequate dietary protein intake (Franz *et al.,* 1994). Dietary protein is also needed for growth requirements, and current nutritional status; taking into account the age, body weight, and the specific therapeutic needs of the individual (ADSA, 1997). Animal and plant proteins are the main sources of dietary protein. Protein intake is mostly considered in the context of the maintenance of lean body mass, or the amount necessary to maintain nitrogen balance (Nuttal & Chasuk, 1998). The continuous turnover of body proteins being synthesized and degraded is an estimated 280g per day. However, the recycling process for resultant amino acids from protein degradation is incomplete. An approximate daily 32g or 0.45g/kg of body weight of dietary protein is necessary to replace lost amino acids and for the maintenance of lean body mass (Nuttal & Chasuk, 1998). It is currently recommended that people with diabetes should follow prudent protein intakes of ~10% - <20% of total daily energy intake (Tinker *et al.,* 1994; Franz *et al.,* 1994; ADSA, 1997; Cataldo *et al.,* 1998; Anderson, 1999; DNSG, 2000; ADA, 2003). High biological value proteins should comprise 65% of the total protein energy intake (Tinker *et al.,* 1994). Both animal and vegetable sources of protein should be included in the diet (ADSA, 1997).

2.14 ALCOHOL AND DIABETES

2.14.1 Alcohol metabolism

Chronic consumption of alcohol in people with type 2 diabetes may lead to deterioration in both short and long-term glucose metabolism. Careful metabolic control should be monitored and maintained if alcohol is an important component of a patient's diet (Franz *et al.,* 2002). The alcohol in alcoholic beverages is ethanol (Franz *et al.,* 1994), the by-product of the oxidation of sugars by yeast enzymes (fermentation) (Franz *et al.,* 2002). One alcoholic drink is commonly defined as a 360ml beer, a 150ml glass of wine, or a 45ml shot of ~80-proof spirits (i.e. whisky, scotch, vodka, gin, rum), each of which contains ~12 to ~15g of alcohol (Tinker *et al.,* 1994; Franz *et al.,* 1994; Anderson, 1999; Franz *et al.,* 2002). Alcohol metabolism and oxidation occurs mainly in the liver at a slow, average rate of 0.1g/kg of body weight per hour (Franz *et al.,* 1994). Alcohol is directly absorbed from the stomach, duodenum and jejunum, and does not require insulin to be metabolized (Anderson, 1999). Consequently, excessive alcohol enters the general circulation, where it becomes part of all body fluids (Franz *et al.,* 1994) and exerts its effects on the central nervous system (Anderson, 1999). People with diabetes who use alcohol may experience either hypoglycaemic or hyperglycaemic effects. The amount of alcohol acutely ingested, consumption with or without food, and chronic and/or excessive use, are the main determinants for these effects (ADA, 2002). Fasting hypoglycaemia is induced through the inhibiting effect of alcohol on gluconeogenesis (Anderson, 1999), by preventing the liver from synthesizing glucose (Wilson, 1995). Hypoglycaemia may even occur in occasional drinkers who have missed or delayed food intake (Franz *et al.,* 1994). Hyperglycaemia occurs in the fed state and during the late course of alcohol intake. At this stage, plasma concentrations of alcohol are declining and plasma glucose concentrations rise, because of liver glucogenolysis and peripheral IR (Franz *et al.,* 1994). This hyperglycaemia is followed several hours later by a rapid fall in blood glucose to below the fasting concentrations (Menzel *et*

al., 1991). Moderate amounts of alcohol can enhance the glucose-lowering action of exogenous insulin, and have been reported to blunt the awareness of hypoglycaemia in patients with type 1 diabetes (ADA, 2002).

2.14.2 Recommended alcohol intake

Precautions regarding alcohol intake that apply to the general public also apply to people with diabetes (Tinker *et al.,* 1994; DNSG, 2000; ADA, 2002). However, under normal circumstances, blood glucose concentrations will not be affected by moderate alcohol consumption in well-controlled diabetics (Franz *et al.,* 1994; ADSA, 1997). Moderate drinking is defined as “no more than one drink a day for most women, and no more than two drinks for most men” by the United States Department of Agriculture and the United States Department of Health and Human Services (Franz *et al.,* 1994). Anderson (1999), the DNSG (2000) and the ADA (2002), also recommend no more than 2 drinks (30g alcohol) per day for men, and no more than 1 drink (15g alcohol) per day for women. Women are more susceptible to the effects of alcohol, since comparable amounts of alcohol have shown to result in higher blood ethanol concentrations in women than in men (Franz *et al.,* 2002). The ADG advocates that alcohol intake should not exceed 6%-10% of the total daily energy intake, and must always be taken in combination with a meal (ADSA, 1997; Anderson, 1999; ADA, 2002). When a person with diabetes drinks alcohol on an empty stomach, it can cause hypoglycaemia that can last from 8 to 12 hours (Wilson, 1995; DNSG, 2000). Anderson (1999) suggests that alcohol is best substituted as a fat exchange in the diet of type 2 diabetic patients (one alcoholic beverage equals two fat exchanges). Abstention from alcohol should be advised for women during pregnancy, and people with medical problems such as pancreatitis, advanced nephropathy, severe hypertriglyceridaemia, or alcohol abuse (ADSA, 1997; ADA, 2002).

2.15 MICRONUTRIENTS

The role of micronutrients in the diet of people with diabetes must be considered in the context of total dietary intake (Franz *et al.,* 1994). There is generally no need for supplementation of vitamins and minerals when a person with diabetes is under good metabolic control and dietary intake is adequate (Nursing, 1995; ADSA, 1997). Adequate dietary intake refers to conformed intake of the overall recommendations for total nutrient content in terms of maintenance energy needs and appropriate diet composition (Franz *et al.,* 1994). However, multivitamin preparations could be beneficial, if deficiencies of vitamins and minerals are identified (Franz *et al.,* 2002). Moreover, certain groups of a population may be at potentially higher risk for developing deficiencies, such as the elderly, pregnant or lactating women, strict vegetarians, when a person follows a VLED, and in uncontrolled diabetes (Franz *et al.,* 1994; ADSA, 1997; Franz *et al.,* 2002).

2.15.1 Vitamins and antioxidants in diabetes

The importance of consuming adequate amounts of vitamins from natural food sources, as well as the potential toxicity of mega-doses of vitamin and mineral supplements, should be discussed when educating patients with diabetes (Franz *et al.,* 2002; Chan, 2003). Although theoretical reasons give support to prescribing antioxidant vitamins to people with diabetes undergoing increased oxidative stress (Franz *et al.,* 1994; DNSG, 2000), no protective role has been demonstrated against CVD, diabetes or cancer by consuming mega-doses of antioxidants (Nuttal & Chasuk, 1998; Franz *et al.,* 2002). Vitamin C, vitamin E, selenium, beta-carotene and other carotenoids are the most familiar dietary antioxidants found in fresh fruit and vegetables. Therefore, daily consumption of a range of vegetables and fresh fruit (five or more servings per day), should rather be encouraged (DNSG, 2000). Although the role of vitamins B_1, B_6 and B_{12} in the treatment of

diabetic nephropathy has not been established, folate supplementation is widely accepted in preventing birth defects (Franz *et al.,* 2002).

2.15.2 Minerals and diabetes

It is possible that deficiencies of certain minerals, such as potassium, magnesium, chromium and zinc, may aggravate carbohydrate intolerance (Franz *et al.,* 2002). Although chromium supplementation improved glucose tolerance in patients with IGT after they have consumed a chromium deficient diet for 4 weeks (Anderson,1999; Polansky & Canary, 1991), other well-designed studies have failed to demonstrate any significant benefit from chromium supplementation (Nuttal & Chasuk, 1998; Anderson, 1999; Franz *et al.,* 2002). Although magnesium deficiency may play a role in IR, carbohydrate intolerance and hypertension, magnesium repletion should only be encouraged in patients at high risk of magnesium deficiency. Patients who take diuretics may benefit from potassium supplementation (Anderson, 1999). It is recommended that the diets of patients with diabetes should provide 1000mg-1500mg of calcium each day, especially in older patients where this recommendation is likely to reduce osteoporosis (Franz *et al.,* 2002). Currently, there is no clear evidence of benefit from routine vitamin and mineral supplementation in people with diabetes, who do not have deficiencies (ADSA, 1997; Nuttal & Chasuk, 1998; Franz *et al.,* 2002).

2.16 PREGNANT AND LACTATING WOMEN WITH DIABETES

Successful pregnancy outcomes for women with diabetes depend on adequate dietary intake, frequent glucose monitoring, maintenance of optimal blood glucose concentrations, correct insulin management and prevention of ketosis and hypoglycaemia (ADSA, 1997). A favourable pregnancy outcome has been defined as a gestational duration of 39-41 weeks, and a live birth weight of 3kg-4kg (Franz

et al., 1994). Excellent glucose control prior to conception and during early pregnancy is necessary to reduce the risks of poorly controlled diabetes that may threaten the health of the mother and safety of the foetus and newborn (Anderson, 1999).

The goals of nutrition during pregnancy and lactation are similar for women with and without diabetes (Franz *et al.,* 2002; ADA, 2002). Requirements for most nutrients increase with pregnancy, and are similar for diabetic and non-diabetic women (Anderson, 1999). However, for pregnant diabetic women, nutrition therapy should attempt to achieve and sustain optimal blood glucose control (Franz *et al.,* 2002). Three meals and three snacks will supply energy requirements necessary to prevent hypoglycaemia (Anderson, 1999). In addition to adequate energy intake, pregnant women need to eat a healthy diet with adequate protein (0.75g/kg/day + an additional 10g/day) (ADA, 2002). Energy and carbohydrate distribution should be based on the woman's food and eating habits and blood glucose records (ADA, 2002; Franz *et al.,* 2002). Although a balanced diet generally supplies all the vitamins and minerals needed for pregnancy (Franz *et al.,* 2002), supplementation of 400µg/day of folic acid is recommended for the prevention of neural tube defects (ADA, 2002).

Diabetic women should be encouraged to breast-feed their infants (Anderson, 1999). However, successful lactation requires planning, since breastfeeding lowers blood glucose. Insulin-treated women may therefore require a carbohydrate-containing snack either before of during breastfeeding (ADA, 2002).

2.17 SPECIAL 'DIABETIC' FOODS

According to the DNSG (2000), there are no known grounds for encouraging specially formulated 'diabetic' or 'dietetic' foods. There is also no evidence that the so-called diabetic specialty foods or drinks offer any advantage to people with

diabetes, compared with conventional products (Anderson, 1999). However, Nelson *et al.* (2000) found in a dietetic provision survey of nearly 400 dieticians, that 20% are still advising the use of diabetic foods. Luxury-type diabetic foods contain large amounts of sorbitol or fructose, and provide similar energy to the conventional equivalent (BDA, 1992). ADSA (1997) highlights that only a limited number of foods may claim that they are suitable for people with diabetes, according to legislation. Many of these foods are high in fat and energy (DNSG, 2000) and are often more expensive than regular products (Anderson, 1999; DNSG, 2000). McGough (2000) also underscores that these foods are as high in fat and energy as standard products, and their continued promotion undermines rather than promotes balanced eating. It is therefore recommended that foods currently marketed as being suitable for people with diabetes are not essential in their diet, and should be used with discretion (ADSA, 1997).

2.18. EFFECTIVE NUTRITION EDUCATION

According to the ADA (1996) effective nutrition education can be defined as a communication process that goes beyond information dissemination. The process of effective nutrition education aims at producing nutritionally literate, motivated people who are willing and able to apply their nutrition knowledge in order to create sustained behavioural change, contributing to overall health and well-being.

It seems that successful nutrition education therefore not only depends on compliance of the patient (McGough, 2000), but also relies upon the incumbent health care system to provide the necessary resources (ADA, 2002), as well as quality health care, promoting adaptive lifestyle changes in behaviour (Schrock, 1998).

2.18.1 Perceived barriers in the way of effective nutrition education

Schrock (1998) identifies cost of providing nutrition education, as well as, difficulties of scheduling education at a time compatible with the patient's schedule as challenges to health care providers. Budgetary constraints, overcrowded clinics, poor patient record charts and shortage of medical staff provide further limitations on effective nutrition education by health professionals (Daniels *et al*., 2000). However, nutrition education presents many more challenges.

Healthcare professionals can contribute to failure of nutrition education, not only through irresponsible attitudinal behaviour, but also by having a limited technical and conceptual knowledge of dietary principles (Brown *et al.*, 1998). In order for health professionals to be effective diabetes educators, they must be adequately knowledgeable about the disease and its management (Drass *et al.,* 1989; Franz, 1996; ADA, 2002). According to Brown *et al.* (1998), dieticians must achieve a clear understanding of current nutrition principles and employ techniques that will motivate clients to commit to change. Early studies concluded that a great deal of patients' lack of understanding about their disease and its management was a result of health professionals' lack of understanding the disease (Scheiderich *et al.,* 1983). McGough (2000) underscores that a significant level of experience and skill is required if dietary behaviour is to be appropriately and effectively modified. However, Daniels *et al*. (2000) found that health professionals in primary healthcare settings in the Western Cape lack confidence of their ability to promote behavioural changes, since they have little training in these aspects of management.

Furthermore, effective nutrition education depends not only on the motivation of the patient to act on the knowledge transferred, but also on the *accuracy* of the information provided (Jayne & Rankin, 1993). Physicians and nurses can no

longer depend on preprinted, outdated diet sheets to provide nutrition education (Tinker *et al.,* 1994). Lately, concern has emerged that recent changes and rapid advances in technology over the last few years, related to diabetes management, might have progressed beyond the knowledge base of many health professionals involved in the education of patients with diabetes (Drass *et al.,* 1989; Jayne & Rankin, 1993). It is also possible that health professionals' perception of diabetes knowledge might be greater than their actual level of knowledge (Drass *et al.,* 1989). Lorenz *et al.* (2000) suggests that health professionals involved in diabetes care, should be retrained. According to the ADA, nutrition education is an essential component of the curricula for the majority of health professionals (Touger-Decker *et al.,* 2001). Continuing professional development is essential to update knowledge and to be able to provide a high quality service. Since patients are likely to receive information on diet from a number of different sources, all members of the health care team need to undergo ongoing training to ensure that nutrition education is consistent and up to date (McGough, 2000).

Another issue of growing concern among diabetes researchers is how to effectively translate research findings *(apply dietary guidelines)* into improved clinical care (i.e. using the right tool for the job) (Larme & Pugh, 2001). Since food guides (nutrition education tools) are a translation of dietary guidelines into simple practical advice (Love, 2001), health professionals should be able to effectively educate patients. However, according to Love (2001), the majority of nutrition messages and food guides remain professional-based. This means that food guides primarily assist the professional and usually reflect their own understanding and perceptions, rather than those of the patient. Such food guides are inconsistent with patients' perceptions of foods, and tend to be ineffective educational tools. Daniels *et al.* (2000) confirms that effective communication between health professionals and patients is hampered by the dearth of appropriate educational material. Of further concern is that patients are faced with a multitude of nutrition messages (Love, 2001). Many different educational materials exist providing several sets of dietary guidelines for people with

diabetes. However, this information is often conflicting. For example, patients with diabetes are currently allowed to include 10% of the total energy intake as sucrose (ADSA, 1997). This information is in total confliction of earlier recommendations which, instructed patients with diabetes to avoid sucrose and sucrose-containing foods. Since dietary guidelines cannot be revised annually, many outdated nutrition messages are still communicated to patients with diabetes (Truswell, 1998).

2.19 SUMMARY

From this chapter it is clear that nutritional intervention plays an important role in diabetes care. It is also of great significance that all health professionals involved in diabetes nutrition education, is knowledgeable about the latest research findings and able to apply current dietary recommendations when educating patients with diabetes. Nutrition education strategies should focus on promoting adaptive lifestyle changes and sustained behavioural changes.

Table 3 Dietary Recommendations for Diabetes Mellitus (Chan, 2003; Franz *et al.,* 2002; DNSG, 2000; ADSA, 1997).

ADVICE	SOUTH AFRICA	UNITED STATES	UNITED KINGDOM	EUROPE	CHINA
ENERGY	Achieve and maintain a reasonable weight	Maintain or attain reasonable weight	Aim for BMI: 19-25 kg/m^2	Aim for BMI: 18.5-25 kg/m^2	Achieve or maintain a desired body weight
PROTEIN	10-20% of total energy, from a variety of foods (0.8g/kg/day if any nephropathy present)	10-20% of total energy, from a variety of foods (0.6-0.8g/kg/day if any nephropathy present)	10-20% of total energy (0.7-0.9g/kg/day if any nephropathy present)	10-20% of total energy (0.6-0.8g/kg/day if any nephropathy present)	15-20% of total energy
FAT					
Total Fat	<30% of total energy	<30% of total energy (older than 2 years)	<30% of total energy	25-35% of total energy	<30% of total energy
Saturated Fat	<10% of total energy	<10% of total energy	<10% of total energy		<10% of total energy
Cholesterol		<300mg/day		≤300mg/day	<300mg/day
CARBOHYDRATES	50-65% of total energy, from a variety of foods	60-70% divided between carbohydrates and monounsaturated fat	50-60% of total energy, especially those rich in soluble fibre of low GI	55-60% of total energy, high GI foods should be substituted with low GI	Include carbohydrates from whole grain foods
Sucrose	Limited amounts, as part of a balanced diet	Should be substituted for other carbohydrates	<10% of total energy, must not replace high fibre foods	<10% of total energy	<10% of total energy
FIBRE	3g/1000kJ, from a variety of foods	20-35g/day, from a variety of foods	Emphasis on sources of soluble fibre	Emphasis on high fibre and low GI foods	20-35g/day, especially soluble fibre
SODIUM		<2000-2400mg/day		<6g/day	
ALCOHOL	10% of total energy, ingested with a meal (unless contra-indicated e.g. pregnancy)	1-2 alcoholic beverages/day (abstain during pregnancy or other medical complications)	1-2 alcoholic beverages/day, ingested with carbohydrate-rich foods	15g/day for women and 30g/day for men, ingested with carbohydrate foods	1 drink/day adult women 2 drinks/day adult men
VITAMIN & MINERAL SUPPLEMENTS	Not needed with adequate diet - only when deficiency can be demonstrated	Not needed with adequate dietary intake	Not needed with adequate dietary intake	Emphasis on foods rich in dietary antioxidants and whole grain foods	Not needed with a well-balanced diet with a variety of food choices
NON-NUTRITIVE SWEETENERS	Limited amounts allowed	Approved by FDA: saccharin, aspartame, acesulfame K, sucralose	Saccharin, cyclamate, aspartame, alitame, sucralose	May be helpful when used in drinks	Safe for use: saccharin, aspartame and acesulfame K
'DIABETIC PRODUCTS'	Not essential and to be used with discretion		Not essential	No known grounds to encourage use	
EXERCISE	Regular, monitor blood glucose levels before, during and after	An increase in physical activity is recommended	Physical activity may be needed to achieve acceptable BMI	Moderate level of activity, at least 20-30 minutes most days	Regular, at least 30 minutes/ day at moderate intensity
MEALS	Minimum 3/day; must correlate with peak action of medication	Eat at consistent times, synchronized with medication		Determined by individual prefe-rence and treatment regime	

CHAPTER 5
DISCUSSION OF RESULTS

"Dietary guidelines have to be disseminated and used, and they must be looked after: defended when trivial research findings seem to negate them and added to or revised if major research findings change the underlying theories" – Stewart Truswell

5.1 INTRODUCTION

This chapter comprises a discussion regarding application of dietary guidelines by dieticians and nurses in different practice settings. The results of this study are compared to those of other matching studies, and furthermore, possible explanations for the results are given.

5.2 PARTICIPANTS' CHARACTERISTICS

Daniels *et al*. (2000) emphasized that the process of education of health professionals is accompanied by the number of years since graduation, age of the health professional, and participation in postgraduate education. In the next section, the age and level of education of the dieticians and nurses included in this study are discussed.

5.2.1 Age

The most advanced ages of dieticians in the FS and NW were 44 and 43.2 years, respectively, whereas the most advanced ages of nurses in the FS and NW were 62.7 and 58.4 years, respectively. The proportion of nurses which fell in the age

category between 50 and 60 years was 21% and 13.3% in the FS and NW, respectively. The population of nurses in both the FS and NW giving nutrition education to patients with diabetes is, therefore considerably older than the population of dieticians. Drass and co-workers (1989) found that test scores (testing nurses' knowledge of diabetes) decreased with the number of years employed. The results of this study confirmed that the population of older nurses obtained lower scores than dieticians, who had graduated more recently and, therefore, were considered updated on the latest research developments.

Furthermore, all health professionals registered with the Health Professions Council of South Africa (HPCSA) should retain registration by performing continuing professional development (CPD) activities, and in terms of Act 56 of 1974, should keep themselves abreast of the latest developments (Mkhize, 2003). However, Daniels *et al.* (2000) recognized that many changes in the health system prevent health professionals from attending opportunities for continuing medical education, which is geared towards addressing knowledge, attitudes and behavioural modification. According to Mkhize (2003), the HPCSA has received concerns from a wide range of professionals who feel that the Department of Health and Provincial Departments of Health do not accord them sufficient time to meet the CPD requirements. The HPCSA, therefore, in the interest of nurses in the employ of the Department of Health, requested some kind of mechanism that could accommodate the training time required for CPD purposes in future. Although one would expect that dieticians involved in private practice could more easily arrange their time to attend to CPD activities, they still did not obtain scores, which indicated that they were up-to-date with the ADG.

5.2.2 Level of education

According to the ADA (1995), education, experience and credentials determine the level at which dietetics professionals provide and implement MNT. Anderson and co-workers (1991) found that, among other factors, post-graduate education might

contribute to the adoption and ultimate application of guidelines by health professionals. All the dieticians included in this study obtained at least a four-year Bachelors degree in dietetics, and 3% obtained a Masters degree in dietetics. Only 15% of the total population of nurses included in this study obtained a four-year Bachelors degree in nursing, while none of them obtained a post-graduate degree. As expected, dieticians who were involved in post-graduate education, although only a small percentage (3%), obtained higher scores than nurses. Further investigation is needed to determine the best way to meet the educational needs of nurses.

5.3 APPLICATION OF DIETARY GOALS FOR DIABETES

The meaning of 'application' is compliance or obedience. It can be assumed that, if health care professionals obeyed or complied with dietary guidelines, patient outcomes would be satisfactory. There are, however, many barriers to optimal diabetes care (Larme & Pugh, 2001). Lack of up-to-date knowledge, as well as negative attitudes of some health care professionals, have been identified as barriers to application of dietary guidelines (Daniels *et al*., 2000; Larme & Pugh, 2001). Jayne and Rankin (1993) found that nurses who believed they were competent in caring for diabetic patients and were considered to have a positive attitude, scored higher on a test of knowledge about diabetes than those nurses who did not believe they were competent. Therefore, it can be assumed that negative attitudes will prevent health professionals from applying their knowledge. A study by Daniels *et al*. (2000) confirmed this latter statement, where one physician claimed that application of guidelines could increase inconvenience to patients by prolonging the consultation. Furthermore, adherence to the guidelines would increase the workload of the health professional (Daniels *et al*., 2000). Some health professionals also believe that complex conditions, such as diabetes, cannot be managed by guidelines (Daniels *et al*., 2000). These findings clearly demonstrate that health professionals' attitude towards applying dietary guidelines could result in situations where nutrition education merit no priority.

The aim of this study was to assess current practice trends (i.e. application of the ADG) by dieticians and nurses in the FS and NW, and did not investigate their level of knowledge about the ADG, nor their attitudes. Mean scores obtained by dieticians were 64% and 61% for the FS and NW, respectively, indicating improper application of the ADG. Moreover, mean scores obtained by nurses, 28% and 29% for the FS and NW, respectively, demonstrated poor application of the ADG, in spite of dissemination of the ADG to all primary health care clinics in the format of a booklet. The results of this study are consistent with international experience that the practice of passive dissemination of guidelines to provide continuing medical education on diabetes, is ineffective (Daniels *et al*., 2000; Larme & Pugh, 2001).

The results of each of the dietary guidelines in the ADG will be discussed in the following paragraphs.

5.3.1 Use of specific nutrition education tools

Effective communication between a patient and health care professional can only take place if appropriate nutrition education tools are utilized in order to bridge the education gap between them (Daniels *et al*., 2000). Nutrition education tools represent simple dietary standards and recommendations (Davis *et al*., 2001), and can assist health care professionals in educating patients with diabetes, particularly concerning diet. Recently, a unique country-specific nutrition education tool for the South African population has been developed, namely the South African food-based dietary guidelines (Love, 2003). Previously, no such tool existed and health professionals were obligated to use nutrition education tools, imported from other, mostly developed countries (Love, 2002). At the time when this study commenced, development of the South African food-based dietary guidelines was still in progress. For this reason, the expert panel of dieticians agreed that the plate model and/or food guide pyramid would be more appropriate nutrition education tools than the exchange list. Nelson and co-workers (2000) also prefer a broad view of the diet to the older system based on exchange lists.

Results of the question regarding nutrition education tools indicated that 85% and 57% of the dieticians in the FS and NW, respectively, used the exchange lists. This finding is in direct contrast with the finding of Nelson and co-workers (2000), who found that only 17% of a sample of 377 dieticians used exchange lists as a method to impart dietary advice. Most of the nurses, in both provinces, used the three main food groups to explain the diet to patients with diabetes. The fact that there were no standardized South African nutrition education tools at the time when the interviews were conducted is clearly revealed by the results of this study. Dieticians and nurses used different nutrition education tools, and might have communicated conflicting and confusing nutrition education messages. Moreover, since nurses have relied more on the three-food group approach (which generally divides foods into *building* foods, *protecting* foods and *energy* foods), indicates a possible need for more basic, understandable nutrition education messages in primary health care clinics in the FS and NW. According to Larme and Pugh (2001), efforts to educate low-income patients in South Texas were hampered by a lack of culturally appropriate and low-literacy teaching aids. Daniels and co-workers (2000) identified the same problem in primary health care clinics in the Western Cape. Love (2001) also underscored the importance of culturally and socio-economically appropriate nutrition education messages.

The South African food-based dietary guidelines were developed to influence dietary choices toward healthier diets, associated with optimal nutritional status and low risk of diet-related disease (Vorster, 2003). Nuttal and Chasuk (1998) state that the nutritional needs of people with diabetes are fundamentally the same as for those without diabetes. It seems as if the food-based dietary guidelines could be an equally useful nutrition education tool for the diabetic population in future. However, there has been critique against the South African food-based dietary guidelines (Van Velden & Mansvelt, 2003). Apparently, careful considerations would be needed if the guidelines were implemented for people with diabetes.

The South African food-based dietary guidelines work group authorized to adapt the finalized guidelines for children under the age of 5 years, and persons with special dietary requirements (such as the elderly, pregnant and lactating women, people with HIV/AIDS, and the chronically ill) (Love *et al.,* 2001). This might be the starting point of a process where the current food-based dietary guidelines are adapted to address the dietary requirements of people with diabetes. Additional information might be needed for some of the food-based dietary guidelines.

The guideline: "*make starchy foods the basis of most meals"* might be supplemented by information regarding the glycaemic index of carbohydrate food, as well as the inclusion of small amounts of sugar. Portion sizes and information regarding intake of fruit juice might be added to the guideline: *"eat plenty of fruits and vegetables everyday"*. The guideline regarding legumes *("eat legumes regularly")* might be a welcome newcomer to diabetic nutrition recommendations, due to the very low GI of legumes and their cholesterol lowering effect. The importance of foods high in MUFA, omega-3 fatty acids and PUFA should be added to the guideline *"Use fat sparingly"*. Furthermore, it is suggested that the guidelines regarding salt intake *("use salt sparingly")* and alcohol *("if you drink alcohol, drink sensibly")* are accompanied by information regarding hypertension and possible effects on normo-glyceamia, respectively.

Although further investigations are needed, it is possible that the current food-based dietary guidelines might be successfully adapted for people with diabetes.

5.3.2 Meal frequency

The type and timing of the administration of medication or insulin should be considered before meals are taken (ADSA, 1997). In this study, 57% of FS dieticians and 36% of FS nurses advised patients to either eat three meals plus three snacks a day, or three meals and a late night snack, depending on their medication intake. In the NW, 71% of dieticians told patients to eat three meals

with snacks in-between, and 60% of the nurses either told patients to eat small, frequent meals, or only three meals a day. These results are consistent with international recommendations that there are no firm recommendations regarding the optimum frequency of meals and snacks (DNSG, 2000; ADA, 2002). However, for type 1 diabetic patients the timing and dose of insulin should match the amount and time of carbohydrate-containing food intake. Therefore, flexible insulin regimens and individualized food and meal planning should be considered, rather than specific amounts of meals and snacks during the day (ADA, 2002).

5.3.3 Energy intake

The ADG recommend that energy intake should be prescribed, in order to achieve and/or maintain a reasonable body weight (ADSA, 1997). Reasonable body weight is defined as that level of weight individuals and health care professionals acknowledge as achievable and maintainable (Franz *et al*., 1994). Since the majority of patients with type 2 diabetes are overweight (ADA, 2002; Chan, 2003), they should be encouraged to lose weight in order to maintain blood glucose control and to improve blood pressure. The DNSG (2000) emphasized that advice concerning the reduction of energy-dense foods, will usually help to achieve weight loss, without the need for precise energy prescription. Results of the question regarding energy intake showed that 71% of the FS dieticians and 57% of the NW dieticians encouraged overweight patients to lose weight in order to reduce diabetes complications, such as hyperglycaemia and hypertension, without any precise energy prescription. Dieticians, therefore, obtained high scores for the question regarding body weight, which indicated good application of the energy intake guideline. It may be possible that dieticians are more aware of the energy content of the diet of patients with diabetes, since they are directly involved in diet planning.

Nurses in the FS and NW obtained 70% and 71% for the question regarding energy intake, respectively. Nurses in both provinces mostly told patients to lose

weight, but reasons for weight loss were seldom explained to patients. It could be speculated that nurses in the FS and NW have limited counselling skills, as was found by Daniels *et al*. (2000), concerning nurses in the Western Cape. According to Daniels and co-workers (2000), nurses often used judgemental comments, such as 'you are too fat' or 'you don't stick to your diet'. Such an approach lacks motivational strategies to enhance behavioural changes. Judgemental comments were not used by any of the nurses in this study, as indicated during the interviews. However, motivational strategies, such as simple reasons for improving glycaemic control and hypertension, were lacking. Another possibility of nurses' reluctance to give proper advice regarding body weight, is their cultural perception that being overweight is associated with health and beauty (Venter *et al*., 2000).

5.3.4 Carbohydrate intake

Carbohydrate-rich foods form the basis of the diet for the majority of the South African population (Vorster, 2003). It is recommended that patients with diabetes should include vegetables, legumes, fruit and cereal as the preferred sources of carbohydrate food in their diet, since these foods are rich in fibre, micronutrients and vitamins (DNSG, 2000). The ADG also underscore the importance of high fibre carbohydrate foods, such as whole wheat bread, brown rice, high fibre breakfast cereals and whole-wheat pasta (ADSA, 1997). Dieticians in both the FS and NW advised patients to increase fibre intake by replacing refined carbohydrates with unrefined carbohydrates, and to divide their carbohydrates evenly throughout the day. Most of them also explained the GI to patients. Nelson *et al*. (2000) also found that most dieticians routinely advise an increase in fibre consumption. Nurses, on the other hand, obtained low scores, indicating poor application of this guideline. As much as 53% of FS nurses and 33% of NW nurses either gave no advice on carbohydrate intake, or did not recommend restrictions on carbohydrate intake. This finding was unexpected, since the diet of rural black South Africans is closest to meeting dietary guidelines for carbohydrate intake, and staple foods such as maize meal porridge, dried corn, samp, rice and mealie-rice, are eaten on a daily

basis (Love, 2002). More information is required to elucidate the reluctance of nurses to advise on the intake of carbohydrate-rich foods.

5.3.5 Fat intake

The high rates of coronary heart disease in people with diabetes provide justification for the strong recommendation concerning the reduction of dietary fat, especially saturated fat intake (DNSG, 2000). Results of the question regarding fat intake indicated that 85% of FS dieticians and 71% of dieticians in the NW told patients either to reduce animal fat, or to follow a low fat diet. This finding is concordant with the finding of Nelson and co-workers (2000), who have found that most dieticians advise a reduction in total fat consumption, but only a minority routinely advises the use of mono-unsaturated fats in preference to saturated or poly-unsaturated fats. Most of the nurses, with 64% and 73% in the FS and NW, respectively, advised patients to avoid fatty foods. Daniels and co-workers (2000), however, found that physicians and nurses in the Western Cape are reluctant to give advice regarding fat intake, since they believe patients prefer fatty foods, and may ignore recommendations about a low-fat diet.

5.3.6 Protein intake

For people with diabetes, there is no evidence to suggest that usual protein intake should be modified if normal renal function is maintained. However, diets high in protein (more than 20% of the total energy intake) are not recommended (ADA, 2002). Most of the dieticians in the FS and NW mainly advised patients either to be cautious of protein foods high in fat, or that small protein portions were sufficient to supply daily requirements. Nurses, on the other hand, put more emphasis on the importance of daily inclusion of dietary protein. The fact that dieticians in private practice settings advise patients to reduce daily protein intake, may be attributed to patients from a higher socioeconomic-class making use of the services of PPDs. Meat and ‘braaivleis’ is part of these patients’ daily dietary intake. Results of this

study indicated that nurses in the FS and NW encouraged patients to use protein-rich foods more readily. This phenomenon might be attributed to the fact that patients in primary health care clinics generally come from communities with a lower socioeconomic class, where protein foods are considered luxuries and are seldom part of their daily dietary intakes.

5.3.7 Vitamins, minerals and trace elements

Patients with diabetes should be advised that the intake of natural foods like fruit and vegetables, high in dietary antioxidants and other vitamins and minerals, are more important than taking daily supplements (DNSG, 2000; ADA, 2002). Furthermore, the ADG state that there is no need for vitamin and mineral supplementation of patients with diabetes who are under good metabolic control (ADSA, 1997). Dieticians in the FS and NW obtained 43% and 48%, respectively for this question, while nurses in the FS and NW obtained 13% and 19%, respectively. This finding indicates that the information provided to patients did not correlate with the ADG. It might be possible that dieticians in private practice consider information regarding supplements as unnecessary, since the patients they consult with are usually not obviously malnourished. Still, a vast amount of money is spent annually on vitamins and mineral supplements (ADA, 2002). There was, however, a practice trend under nurses that information regarding supplements is considered unnecessary. Responses of nurses included: “I do not tell patients anything about supplements, because they cannot afford any”. Further information is needed on the perceived knowledge and attitudes of health professionals regarding the use of daily supplements for patients with diabetes.

5.3.8 Sweeteners

The ADG advise patients with diabetes that limited amounts of nutritive and non-nutritive sweeteners, as well as limited amounts of sugar, can be included in their diet (ADSA, 1997). Today, however, it is well established that people with diabetes

can include less than 10% of their total energy intake as sugar (DNSG, 2000; Franz *et al*., 2002; Chan, 2003). Furthermore, a recent study by Hunter *et al*. (2003) demonstrated that subjects with type 2 diabetes could safely include a moderate amount (15% of the total energy) of sucrose in a balanced diet. Concerns about aggravating hyperglycaemia urged the ADA (2002) to recommend that current dietary recommendations for people with diabetes should not restrict the intake of sucrose and sucrose-containing food.

Health professionals are, however, skeptical whether this may be advisable for all the patients they consult with (Daniels *et al*., 2000). This skepticism was confirmed by the findings of this study. An unexpectedly high number of health professionals, 36% and 67% of all the dieticians and nurses included in the study, respectively, were still encouraging patients to totally exclude sucrose from their diet. Twelve percent of the nurses did not even know what sweeteners were. The fact that so many dieticians and nurses still discourage the use of limited amounts of sucrose may be attributed to the assumption that sugar and sugar-containing foods might have a deleterious effect on postprandial glycaemia. However, the liberalization of sucrose is not recent news, and the disbelief of dieticians and nurses is puzzling. Additional training might be needed for most practicing dieticians and registered nurses. A programme similar to the ‘Sugar is not a Poison’ (SNAP) programme of the ADA, might be helpful to overcome the reluctance of dieticians and nurses to advise patients on sucrose intake (Lorenz, 2000).

The 1997 guideline regarding sucrose intake should be rigorously examined. It is suggested that sucrose intake should be discussed as part of the recommendations regarding carbohydrate intake. Furthermore, specific amounts of sucrose intake should be advised.

5.3.9 Alcohol intake

Precautions regarding alcohol intake that apply to the general public also apply to people with diabetes (Tinker *et al*., 1994; DNSG, 2000; ADA, 2002). In patients with well-controlled diabetes, blood glucose concentrations will not be affected by moderate alcohol consumption (Franz *et al*., 1994; ADSA, 1997). All dieticians in the FS and 57% of dieticians in the NW, gave precautionary advice to patients regarding the use of alcohol; while 89% and 93% of nurses in the FS and NW, respectively, advised patients to totally avoid alcohol. It is possible that alcohol abuse, which is more common among patients with a lower socio-economic status, can be attributed to responses from nurses.

5.3.10 Physical activity

Routine exercise is important for all people (Anderson, 1999). For people with diabetes, exercise improves insulin sensitivity, lowers blood glucose concentrations and assists in long-term maintenance of weight loss. Furthermore, physical activity can improve cardiovascular status and glucose tolerance (Anderson, 1999; Franz *et al*., 2002). Results of the question regarding exercise indicated that 71% of dieticians in both provinces advised patients with diabetes to ‘exercise on a regular basis’; or to ‘maintain normal blood glucose concentration before, during and after exercise’; or that ‘exercise should not be too strenuous or for too long’. Most of the nurses in the FS and NW (75% and 73%, respectively), mainly told patients to ‘exercise’; or that ‘exercise can improve their diabetic status’. In this study, dieticians in both provinces provided patients with more didactic information than the nurses. However, both dieticians and nurses should put more emphasis on the frequency and duration of physical activity, as well as optimum blood glucose concentrations, before, during and after exercise.

5.3.11 Pregnant and lactating women with diabetes

Successful pregnancy outcomes for women with diabetes depend on adequate dietary intake, frequent glucose monitoring, maintenance of optimal blood glucose concentrations, correct insulin management and prevention of ketosis and hypoglycaemia (ADSA, 1997). Dietary guidelines are similar for diabetic and non-diabetic pregnant women (Anderson, 1999). Results of this guideline showed that only 43% of the dieticians in the NW advised pregnant women to eat frequent meals (three meals and three snacks), with carbohydrates evenly divided throughout the day; and to monitor their blood glucose concentrations carefully. However, 57% of the NW dieticians failed to provide similar advice to lactating women with diabetes. In the FS, 71% and 57% of the dieticians failed to give any dietary advice to pregnant and lactating women, respectively. Differing recommendations regarding meal frequency and division of carbohydrates for type 1 diabetic patients are given by various gynaecologists (Slabber, 2004). Such differing recommendations might account for differences among recommendations given by dieticians who are working closely with gynaecologists. Results also indicated that 97% of FS nurses and 98% of NW nurses did not give any advice regarding dietary guidelines to either pregnant or lactating women with diabetes. It is possible that dieticians and nurses do not counsel pregnant and lactating women on a regular basis, thus preventing them from being familiar with the current dietary guidelines. However, more information is needed to clarify possible reasons for poor application of dietary guidelines for pregnant and lactating women with diabetes.

5.3.12 Children with diabetes

Parental support and family communication with the child with diabetes should be encouraged (SIGN, 2001). General aspects of dietary advice should have potential benefits for the whole family and be acceptable to them (DNSG, 2000). However,

this might not be true for every patient with diabetes. Daniels and co-workers (2000) found that the preferences of family members without diabetes might dominate food choices and preparation. Results of this study showed that dietary advice given to mothers and caretakers of children with diabetes by dieticians and nurses in the FS and NW, was unsatisfactory. The fact that some of the dieticians and nurses indicated that they did not counsel children with diabetes on a regular basis, may have resulted in poor application of dietary guidelines for children with diabetes.

5.3.13 Special diabetic food

There are no grounds for encouraging specially formulated ‘diabetic foods’ (DNSG, 2000). These foods are generally more expensive than regular products (Anderson, 1999) and are both high in fat and energy-dense (DNSG, 2000). According to ADSA (1997), foods currently marked as suitable for people with diabetes are not essential in their diet, and should be used with discretion. Most of the dieticians in the FS (71%) advised patients with diabetes that ‘special diabetic food’ is unnecessary. However, only 29% of NW dieticians told patients that ‘special diabetic food’ is unnecessary and more expensive than ordinary products. Of all the nurses, 77% and 85% in the FS and NW, respectively, gave outdated or inadequate information to patients, such as ‘you can buy it, if you can afford it’ or ‘diabetic products are very expensive’. A negative trend was observed among most nurses, because they felt that patients should use ‘special diabetic foods’, but were unable to buy any, since it was very expensive. Furthermore, it is possible that dieticians and nurses are not knowledgeable about the latest legislation in South Africa, prohibiting companies from making claims on food products such as, ‘diabetic chocolate’. Health professionals should be educated about recent recommendations regarding the use of ‘special diabetic food’.

5.4 NUTRITION EDUCATION MATERIALS

The fact that only 50% of the dieticians and ten nurses from 95 clinics returned a copy of nutrition education material, is evident of a lack of such information in both private practices and primary health care clinics. Daniels and co-workers (2000) confirm that culturally appropriate nutrition education materials are in short supply in primary health care clinics in the Western Cape. Results of this study indicated that nutrition education materials, compiled by dieticians, did not correlate with the ADG and obtained mean scores of 35%. It was surprising to find that dieticians still use guidelines such as 'avoid the intake of sucrose and sucrose-containing food'. Mean scores of nutrition education materials from nurses were 33%, were outdated and did not correlate with the dietary guidelines outlined in the ADG. None of the nutrition education materials consisted of guidelines for pregnant and lactating women with diabetes.

Since many pharmaceutical companies, as well as SASA, distribute free hand-outs of dietary guidelines for patients with diabetes to different health care facilities, it was unexpected to find that such information is lacking in so many primary health care clinics. Further research is needed to clarify what happen to these nutrition education materials in the different practice settings.

5.5 SUMMARY

There is an expectation that dieticians, considered as nutrition experts, as well as registered nurses, should be knowledgeable and able to apply current dietary guidelines for people with diabetes when they counsel patients. However, findings of this study indicated that dieticians in the FS and NW are only applying dietary guidelines regarding meal frequency, energy intake and exercise. Nurses, on the other hand, did not apply any of the ADG. This might be attributed to attitudinal barriers such as ignorance, or contextual barriers such as lack of time and

shortage of personnel at clinics. However, it is speculated that dieticians and nurses in the FS and NW are simply not knowledgeable enough, or up-to-date with the ADG, and are therefore unable to apply these guidelines. Nevertheless, further investigation is needed to identify potential barriers that might prevent dieticians and nurses in the FS and NW from applying the ADG. This might be important to ensure the application of dietary guidelines in future. This study also showed that there is a short supply of up-to-date, culturally appropriate NEMs in both private practice and primary health care settings. Whether or not the findings of this study can be generalized, it is speculated that the same phenomenon will be found in other Provinces of the country.

CHAPTER 3

METHODOLOGY

"Dietary guidelines are never carved in stone" – Penelope Love

3.1 INTRODUCTION

The methodology and techniques that were used for the execution of this study are discussed in this chapter. The specific measurement tools are defined and reliability and validity of the measurement tools are discussed. The selection of the study sample population, study procedures, as well as methods used in the statistical analysis of the data is described. Furthermore, the limitations of the study are discussed.

3.2 DEFINITION OF VARIABLES

For the purposes of this study different variables were measured. Independent variables were the dietary goals and the different nutrition education materials that were assessed in this study. Dependent variables included application of the dietary goals and the assessment of the nutrition education materials.

3.2.1 Independent variables

For the purposes of this study the following independent variables were defined:

3.2.1.1 Dietary Goals

- Dietary goals refer to the ADG that were published in a Position Statement (ADSA, 1997) by a committee consisting of 13 dieticians with expertise in counselling patients with diabetes.

3.2.1.2 Nutrition education materials

- Nutrition education materials refer to leaflets, posters, booklets and other printed material that are distributed by dieticians and nurses in clinical settings to patients with diabetes who were included in the study sample.

3.2.2 Dependent variables

For the purposes of this study, the following dependent variables were defined:

3.2.2.1 Application of the ADG

- The application of the ADG refers to the degree to which dieticians and nurses apply the ADG when counselling patients with diabetes. In order to assess the application of the ADG by dieticians and nurses included in the study, questions regarding the ADG were asked and were used to develop a standardized questionnaire (Appendix A). In order to classify the degree of application of the ADG by dieticians and nurses included in the study, categories for total scores obtained for the questionnaire were identified by using an interval scale. This was done as follows:

- The range of possible responses for each criterium was limited to the recommendations given in the ADG.
- To be able to code all the possible responses for each criterium an interval scale was used to identify different response categories.
- Responses for each criterium were listed in a questionnaire memorandum (Appendix B).

- Numeric values were assigned to responses in each category, classifying them from the most to the least acceptable response. The numbers three (3) and two (2) were assigned to the most acceptable and acceptable answers, respectively, while the number value one (1) was assigned to a less acceptable answer. The number value (0) was assigned to least acceptable answers and did not necessarily mean that the respondent gave no answer.
- Total scores obtained by dieticians and nurses were then converted to percentages and used to assess the degree of application of the ADG.

The following percentage categories were used to define the degree of application of the ADG:

  - High scores (from 75% to 100%) gave an indication of good application of the dietary goals
  - Lower scores (from 65% to 74%) indicated that the dietary goals were not properly applied
  - Low scores (below 65%) indicated unsatisfactory application of the dietary goals.

3.2.2.2 Assessment of nutrition education materials

- In order to assess the nutrition education materials, the degree of correlation between nutrition messages conveyed in the leaflets, posters, booklets and other printed material and the ADG was determined. Nutrition education

materials were assessed by means of a nutrition education checklist (Appendix C). Assessment of nutrition education materials was done by means of correlation categories, and was identified as follows:

- The range of possible nutrition messages that might be conveyed in educational material for each recommendation in the ADG was listed in the nutrition education checklist (Appendix C). This range of nutrition messages was limited to the recommendations given in the ADG.
- An interval scale was used to identify different correlation categories.
- Numeric values were assigned to nutrition messages in each category. The numbers three (3) and two (2) were assigned to nutrition messages that were equivalent and comparable to the ADG, respectively. The number value one (1) was assigned to nutrition messages that did not completely correlate with the ADG and that were partly out-to-date. The number value (0) was assigned to nutrition messages that did not correlate with the ADG or that were completely out dated.

The following correlation categories were then used to define the degree of correlation between the nutrition messages and the ADG:

- A high score (from 75% to 100%) indicated that the information is comparable and equivalent to the ADG.
- Lower scores (from 65% to 74%) gave an indication that the information is incomplete or part of it is out-of-date.
- Low scores (below 65%) indicated that the information is unacceptable and/or completely outdated.

3.2.3 Defining definitions applicable to the study

3.2.3.1 Dieticians

Dieticians refer only to those who are affiliated with ADSA, who are also registered as PPDs, which included dieticians working in private practice settings and/or at private hospitals in the FS and NW.

3.2.3.2 Nurses

Nurses refer to professional nurses who are registered at the South African Council of Nurses and who are working at primary healthcare clinics in the FS and NW.

3.2.3.3 Diabetes Educators

DEs refer to dieticians and nurses who have completed a specialist diabetes education course and who are registered members of DESSA; working in private hospitals or in private practice settings in the FS and NW.

3.3 STUDY SAMPLE

A sample can be defined as any subset of measurements selected from a population, while the population is defined as the set of all measurements of interest to the sample collector (Ott & Longnecker, 2001). According to Leedy (2001), the sampling procedure depends on the purpose of the sampling and a careful consideration of the parameters of the population. In order to control the type of data admitted in research, these parameters must be narrowed so that they will fall within certain special limits. Therefore, to ensure the integrity of

research, the data must meet certain standards. These standards and limitations are known as inclusion and exclusion criteria. The choice of study sample, inclusion and exclusion criteria, as well as the size of the study sample will be discussed hereafter.

3.3.1 Identification of suitable areas for sample selection

After the initial study protocol was submitted to the South African Sugar Association (SASA) who financially sponsored the study, SASA suggested that the study be conducted in multiple centres, which included the following cities: Bloemfontein, Cape Town, Johannesburg, Pretoria, Durban, Potchefstroom, Nelspruit, George and Port Elizabeth (which are located in seven of the country's provinces). Since these cities excluded a major part of the rural areas, the Evaluation Committee, appointed by the Faculty of Health Sciences, advised the researcher rather to include two provinces, which encompassed both urban and rural areas. The Evaluation Committee had to evaluate the merits of the study prior to execution. This committee consisted of members from three Departments of the Faculty of Health Sciences at the University of the Free State, namely Professor A. Dannhauser from the Department of Human Nutrition, Professor Y. Botma from the School of Nursing, and Professor G. Joubert from the Department of Biostatistics. SASA agreed to this suggestion and identified Kwa-Zulu Natal and the FS to be included in the study, because the head office of SASA is situated in the former province and the researcher is studying at the University of the Free State, in the latter province. After the Director of Health of Kwa-Zulu Natal, Dr. C.A. Pieterse, refused to accommodate the study, SASA then suggested the inclusion of the NW, since it is the nearest to the FS, and would involve less financial burden to the study. The researcher approached the Head of Health, Dr. V. Lithlakanyane, from the FS, and the Deputy Director General, Dr. H. Gosnell, from the NW, through formal letters (Appendix D) for approval to conduct the study in all primary health care clinics in both provinces. Both granted permission to conduct the study in primary healthcare clinics in the FS and NW.

3.3.2 Sample selection

Due to the fact that three different population groups from two provinces were identified to be included in the study sample, different sample selection methods were used for each population. Sample selection for each population, which included dieticians, registered nurses and DEs will be discussed respectively.

3.3.2.1 Dieticians

It was decided to include only PPDs in the sample, because many patients with diabetes receive nutrition education from dieticians in private hospitals or are referred to dieticians in private practice settings.

- **Identifying the target population**

The ADSA Private Practitioner Directory (2002) was used to identify the population of PPDs in the FS and NW.

3.3.2.2 Registered nurses

Registered nurses at primary health care clinics, working with diabetes, were included in the sample, because most diabetic patients receive nutrition education from nurses at primary healthcare level. Also, the broad community of diabetes patients in rural areas is restricted to primary healthcare services only.

- **Identifying the target population**

Since the only existing list of primary healthcare clinics and their employees for all provinces had been updated in 2000, the researcher had to compile a new list of names of clinics and their employees for both provinces (Appendix E).

o Towns and cities situated in each region of the two provinces were identified.

o An alphabetical list of all towns and cities was compiled, using telephone

directories; containing the names and telephone contact numbers of all the primary healthcare clinics.

- Each primary healthcare clinic in the identified towns and cities were telephonically contacted in order to acquire information regarding employees.
- A complete list was then compiled, containing names of all the primary healthcare clinics, nurses currently employed at the clinics, as well as their contact numbers.

The researcher had to keep in mind that the distribution of rural and urban areas is different for the FS and NW, and that these population elements would influence the method of sampling. Therefore, the sample was selected by means of stratified, randomized sampling; a well-known form of probability sampling, which ensures that all population elements (i.e. rural and urban areas) will be presented in the sample (Leedy, 2001). Since the adequacy of the sampling method depends on the adequacy of the sampling frame (Bailey, 1994), the population elements were separated into non-overlapping groups or strata, which also ensured that no person appeared in more than one group. The researcher then identified and used the health regions of each province as suitable strata to select a simple random sample. This could be done, since a more dense distribution of clinics was prominent near larger towns and cities, with fewer clinics in the rural areas in both the FS and NW.

Stratified sampling further consists of listing all members from one stratum in a homogeneous group. A random sample was drawn within each group, after numbers were assigned to each person in the sampling frame. Thus, registered nurses from both rural and urban areas in the two provinces would be equally represented in the final study sample. The numbering procedure, rather than identification by names, ensured that the researcher would not be biased by names. A computer programme was used to generate lists of random numbers for each health region in the FS and NW.

A stratified randomized sample of nurses was selected with assistance from a biostatistician at the Department of Biostatistics, Faculty of Health Sciences at the University of the Free State. This method ensured that the final sample was a true representation of the total population of registered nurses in the FS and NW.

3.3.2.3 Diabetes educators

DEs are recognized as specialists in diabetes education, and were therefore included in the study sample.

- **Identifying the target population**

The researcher contacted Hester Davel (a DE) at Rose Park Hospital in Bloemfontein, but according to her, there was no available list of DEs in the FS. The researcher then contacted the National Chairman of DESSA, Mrs. E. Beukes, but she was also unable to provide the researcher with a list of registered DEs in the FS and NW provinces. However, with assistance from Ms. E. du Toit, lecturer at the Department of Human Nutrition, Faculty of Health Sciences, University of the Free State, and chairman of DESSA in the FS, the researcher identified two other DEs in Bloemfontein. These DEs were telephonically contacted to inform them about the aims of the study. However, both DEs reported that they did not give nutrition messages to patients with diabetes, and rather referred patients to dieticians for nutrition education.

Being fully acquainted with this information, the study leader (Prof M Slabber) and the biostatician (Prof G Joubert), together with the researcher, decided to withdraw the population of DEs from the study sample. SASA was telephonically informed about this problem and also agreed to the decision to exclude DEs from the study. A formal letter (Appendix F) was sent to SASA confirming the telephonic conversation.

3.3.3 Inclusion Criteria

The following dieticians and nurses in the FS and NW were included in the target population:

- All dieticians affiliated with ADSA, registered as PPD members, and
- Registered nurses who met the criteria of employment (i.e. private practice settings, private hospitals and primary healthcare clinics)

There were no limitations for age, gender, education level, and type of employment (full- or part-time).

3.3.4 Exclusion Criteria

The following dieticians and nurses in the FS and NW were excluded from the target population:

- Dieticians affiliated with ADSA, but who were not registered as PPD members
- Nurses practicing under a permit only, and those who were assigned to working night shift at times.

3.3.5 Sample size

3.3.5.1 Dieticians

According to the data presented in the ADSA Private Practitioner Directory (2002), the population of PPDs in the FS and NW was 11 and 12, respectively. Leedy (2001) suggests that for small populations ($n<100$), the entire population should be surveyed. Therefore, the total population of PPDs was included in the study.

3.3.5.2 Registered nurses

The sample size of the nurses' population was determined by the method of sample selection (as discussed in section 3.3.2.2). Therefore, the method of sample selection will be discussed in more detail hereafter, and is presented schematically in Figure 3.1 and Figure 3.2. According to Hair *et al.* (1995, as referred to by Leedy, 2001), a sample size between 100 and 200 should be used to provide a basis for the estimation of sampling error.

After the researcher compiled a list of all the primary health care clinics and names of their employees for all regions of both the FS and NW, (section 3.3.2.2) the total number of nurses in each region was calculated, and is presented in figure 3.

Free State Province	North West Province

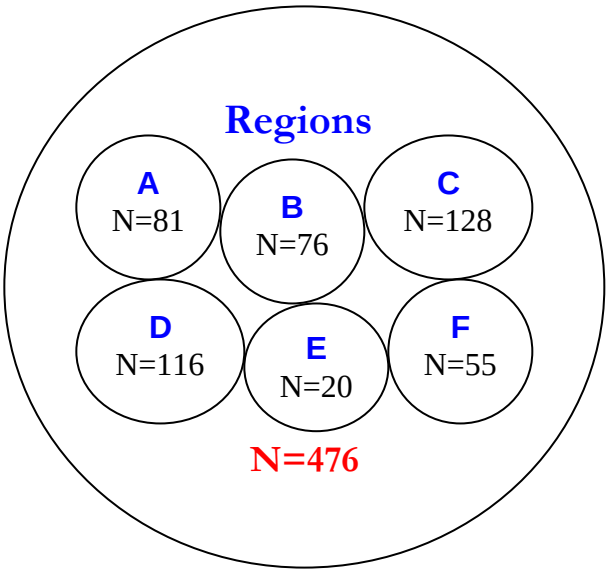


Figure 3.1

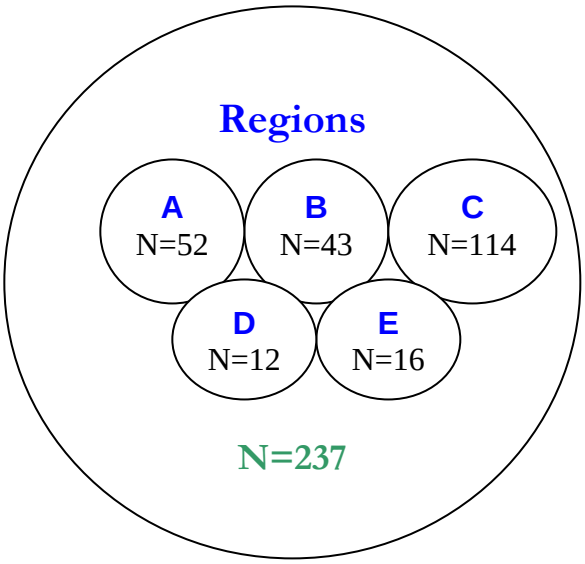


Figure 3.2

Figure 3 Schematic presentations of the regions of the FS and NW

For the FS in regions A, B and C, a total number of 81, 76, and 128 nurses were listed, respectively; and for regions D, E and F, a total number of 116, 20 and 55 nurses were listed, respectively. A total number of 476 nurses were listed for the FS. (Figure 3.1). For the NW the total number of nurses for regions A, B and C, were 52, 43 and 114, respectively; and for regions D and E, a total number of 12 and 16 nurses were listed, respectively. A total number of 237 nurses were listed for the NW. (Figure 3.2).

The population size of nurses in the FS was double that of the population size of nurses in the NW. Therefore, in order to determine the **number of nurses to be selected from each region** in the FS and NW, the number of nurses for each region in both provinces was divided by the **total number of nurses in the FS.** This procedure is schematically shown in figure 4.

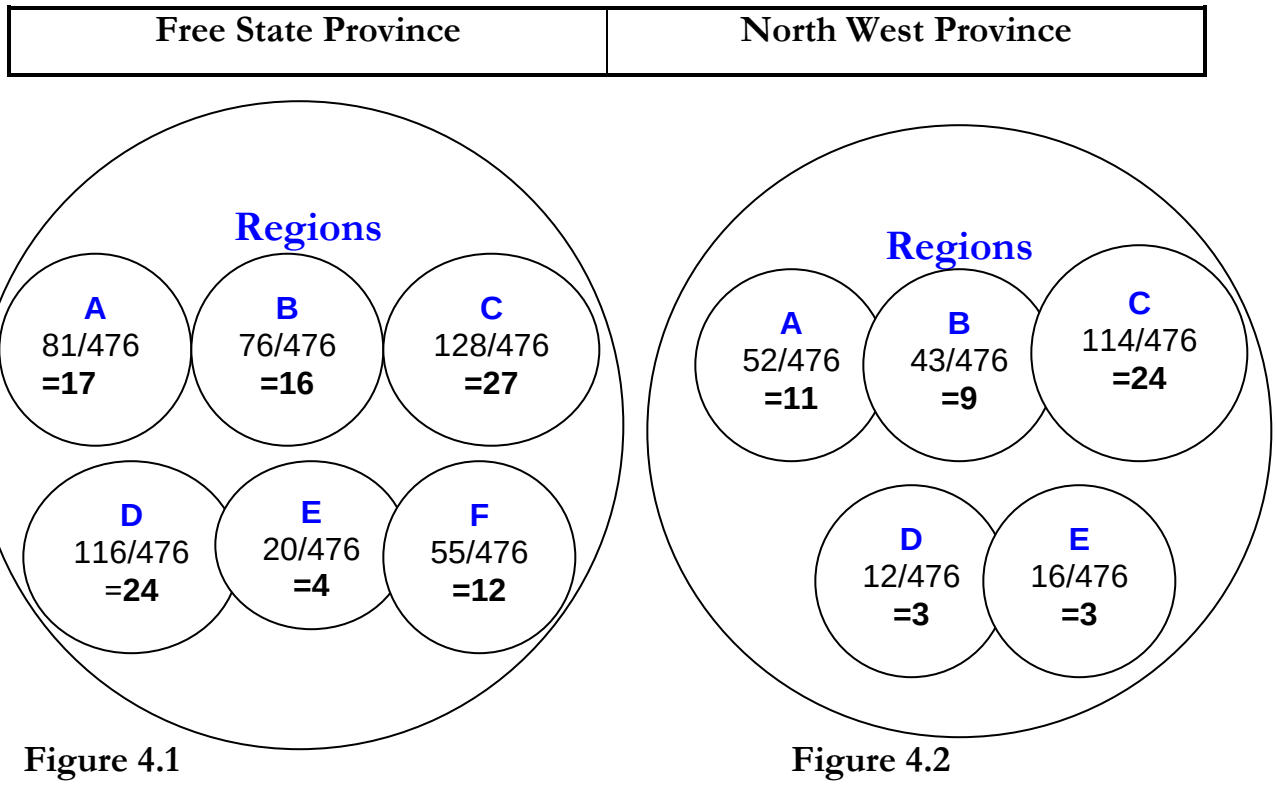


Figure 4.1 Figure 4.2

Figure 4 Schematic presentation of the selection of nurses from the FS and NW regions

For the FS, 17, 16 and 27 nurses were selected from regions A, B and C, respectively; and for regions D, E, and F, 24, 4 and 12 nurses were selected, respectively. (Figure 4.1). Therefore, a total number of 100 nurses were selected from the FS.

For the NW, 11, 9 and 24 nurses were selected from regions A, B and C, respectively, and three nurses were selected from both regions D and E. (Figure 4.2). Therefore, a total number of 50 nurses were selected from the NW, and a total number of 150 nurses were included in the final study sample.

3.4 ETHICAL CONSIDERATIONS

3.4.1 Ethical Approval

The protocol was approved by the Ethical Committee of the Faculty of Health Sciences from the University of the Free State. For approval of the proposed financial budget, the protocol was also submitted to the Nutrition Manager of SASA, Mrs. Carol Brown. After the Ethical Committee gave approval to perform the study, SASA requested some changes to the protocol. The Ethical Committee was informed about these changes and requested a letter from the researcher in which the changes were described (Appendix G). After the requested changes were made, the protocol was re-submitted for approval; after which both SASA and the Ethical Committee gave final consent to conduct the study.

3.4.2 Informed Consent

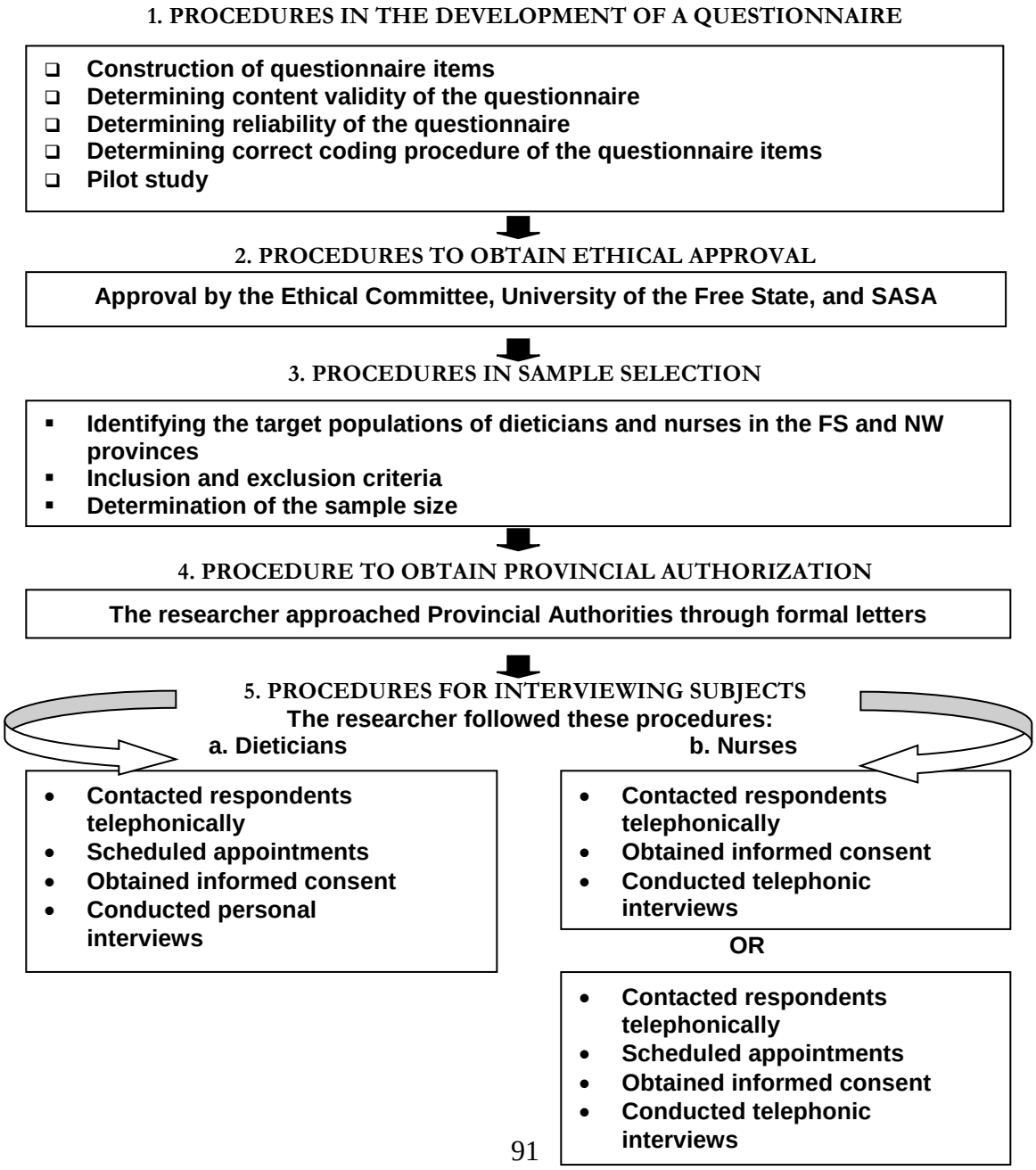
Informed consent was obtained from all subjects before enrollment in the study, as evidence of the authenticity of the study. Since all participants were either Afrikaans or English speaking, the consent form was available in both these

languages (Appendix H). The consent forms, written on University of the Free State letterheads, contained information pertaining to the study, and were signed by the researcher.

3.5 STUDY PROCEDURE

The study procedure is presented schematically in figure 5.

3.5.1 Study design



6. PROCEDURES FOR ACCUMULATION OF NUTRITION EDUCATION MATERIALS
The researcher followed these procedures:

- **Informed respondents that further information would be needed from them**
- **Obtained correct postal addresses of respondents**
- **Mailed requests to respondents with pre-paid stamped return envelopes**
- **Telephonic follow-up was done after six weeks to determine if respondents received the requests**
- **Requests were then re-mailed to respondents who indicated that they did not receive the requests**
- **After another six weeks final telephonic follow-up was done to determine how many respondents received requests after the first follow-up**
- **The nutrition education materials were evaluated by means of a structured nutrition education checklist (Appendix C)**

Figure 5 Schematic presentation of the study procedure

3.5.1.1 Procedures in the development of the questionnaire

Parmenter and Wardle (2000) recommend that researchers should use an existing (or modified) measuring tool, rather than developing a new one. However, for the purposes of this study, no measuring tool existed to measure the specific phenomena under investigation (i.e. the ADG). Therefore, a questionnaire was developed by the researcher to measure these specific phenomena. Figure 6 illustrates the procedures followed in the development and construction of the questionnaire and are discussed in detail hereafter:

- **Development of the questionnaire items**

Generation of an item pool or constructing a questionnaire is concerned with deciding which items to include in the measuring instrument or questionnaire (i.e. whether the items cover all the aspects of what is being measured (Parmenter & Wardle, 2000). Therefore, to ensure that the items included in the questionnaire were valid and a fair representation of the area under study, the ADG were used to construct the items included in the questionnaire. The first section of the questionnaire included demographic data, including respondent's age, gender, health profession, practice setting, educational level and frequency of diabetic

counselling. The second section dealth with the ADG.

The thirteen Dietary Goals discussed in the Position Statement (ADSA, 1997), were converted to questionnaire items. The researcher developed and defined an assessment criterium for each Dietary Goal, to ensure effective assessment of application of the ADG when using the questionnaire. Development of these criteria is discussed hereafter. Alreck and Settle (1995) suggest that double-barreled items (i.e. items which include 'and') should be separated. Therefore, in order to prevent confusion associated with a double-barreled item, the recommendation for pregnant and lactating women was divided into two questionnaire items. Thus, the questionnaire consisted of fourteen items. Although open-ended questions may result in lengthy answers (Leedy, 2001), they allow respondents to answer adequately and are preferred whenever accuracy and detail are important (Bailey, 1994). For the purposes of this study, open-ended questions were used to allow respondents to give more detailed answers. All answers were recorded verbatim.

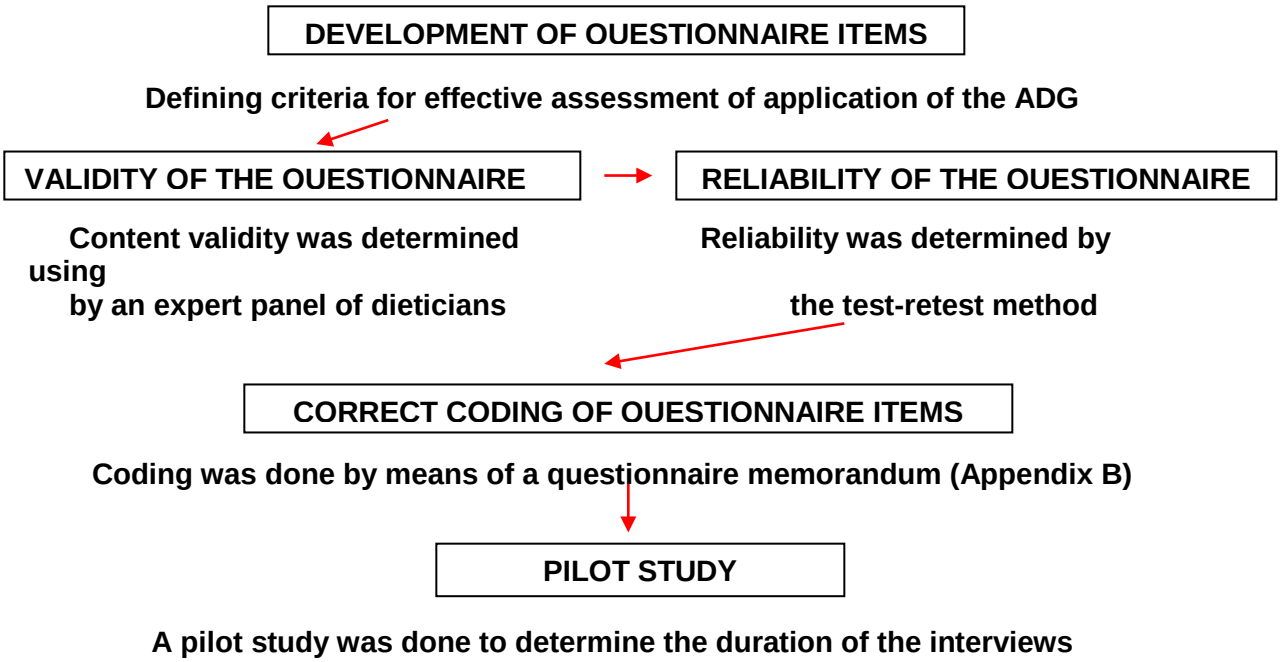


Figure 6 Procedures in the development of the questionnaire

Defining criteria for effective assessment of application of the ADG

Criteria for each of the recommendations discussed in the ADG were defined as follows:

- **Energy Content**

In order to assess the recommendation regarding energy content of the diet, respondents were asked to respond to a question regarding 'body weight': "*What do you tell patients with diabetes regarding their body weight?"* (Appendix A, question 3). Patients with diabetes should be taught that the amount of food they eat (i.e. energy intake) should be just enough to maintain a normal body weight. Therefore, if they maintain a normal body weight, they are able to control their energy. If they are overweight, they should eat less food (i.e. restrict energy intake).

- **Carbohydrates**

Including a question regarding carbohydrate intake assessed the recommendation regarding carbohydrates. Respondents were asked: "*What do you tell patients with diabetes regarding carbohydrate intake?*" (Appendix A, question 4). Patients with diabetes should be taught that unrefined carbohydrate foods must form the basis of every meal, with more or less the same amount at every meal.

- **Fats**

In order to assess the recommendation regarding fat intake, respondents were asked: "*What do you tell patients with diabetes regarding fat intake?*" (Appendix A, question 5). Healthcare professionals should teach patients with diabetes to restrict their total fat intake. Recommendations regarding saturated fat should be made in terms of 'animal fat'.

- **Proteins**

In order to assess the recommendation regarding protein, respondents were asked to respond to a question regarding 'protein intake'. *"What do you tell patients with diabetes regarding protein intake?"* (Appendix A, question 6). Patients with diabetes should be taught to incorporate moderate amounts of both animal protein sources and plant protein sources into their total dietary intakes. If patients are known to have impaired kidney function, lower protein intakes should be advised.

- **Vitamins, minerals and trace elements**

Including a question regarding vitamins, minerals and trace elements, assessed the recommendation regarding supplementation. Respondents were asked: *"What do you tell patients with diabetes regarding vitamins, minerals and trace elements?"* (Appendix A, question 7). Patients with diabetes should be taught to rather eat a variety of foods than to buy supplements. If they eat a healthy balanced diet, supplements will not be necessary.

- **Sweeteners**

In order to assess the recommendation regarding sweeteners, respondents were asked to respond to the following question: *"What do you tell patients with diabetes regarding the use of sweeteners?"* (Appendix A, question 8). Patients with diabetes should be taught that limited amounts of sugar and other sweeteners are allowed as part of an energy controlled diet.

- **Alcohol**

A question regarding alcohol intake was asked in order to assess the recommendation regarding alcohol. Respondents were asked: *"What do you tell patients with diabetes regarding alcohol intake?"* (Appendix A, question 9). Patients with diabetes should be taught that only limited alcohol consumption is allowed in well-controlled diabetes and is contraindicated in pregnancy, obesity and poor glycaemic control.

- **Meal frequency**

In order to assess the recommendation regarding meal frequency, respondents were asked to respond to the following question: *"How many meals and snacks do you advise patients with diabetes to include in their daily meal plan?"* (Appendix A, question 2). Patients with type 1 diabetes should be advised to eat meals according to their insulin regimen. Patients with type 2 diabetes should preferably eat three meals with three snacks in between, or three meals and a late night snack, depending on their treatment regimen.

- **Exercise**

Including a question regarding physical activity, assessed the recommendation regarding exercise. Respondents were asked to respond to the following question: *"What do you tell patients with diabetes regarding physical activity?"* (Appendix A, question 10). Healthcare professionals should teach patients with diabetes that regular exercise is a vital part of their treatment. Patients should also learn that exercise cannot commence unless blood glucose concentrations are between 4mmol/l and 14mmol/l.

- **Method of education**

In order to assess the method of education that healthcare professionals use when they explain the diet to a patient with diabetes, the following question was asked: *"Which method do you use when explaining dietary guidelines to diabetes patients?"* (Appendix A, question 1). Healthcare professionals should tailor methods of education according to the individual needs and abilities of the patient.

- **Pregnant and lactating women**

Two separate questions were asked, in order to assess the recommendation regarding pregnant and lactating women. Respondents were asked: *"What do you tell pregnant women with diabetes?",* and *"What do you tell lactating women with diabetes?"* (Appendix A, questions 11 & 12). Pregnant women with diabetes should be taught that successful pregnancy outcomes depend on adequate

dietary intake, frequent glucose monitoring, maintenance of optimal blood glucose concentrations, correct insulin management, and prevention of ketosis and hypoglycaemia.

Lactating women with diabetes should be taught that blood glucose concentrations must be monitored and additional snacks must be included, if needed.

- **Children with diabetes**

In order to assess the recommendation regarding children with diabetes, the following question was asked: *"What do you tell mothers or caretakers of children with diabetes?"* (Appendix A, question 13). Mothers and caretakers of children with diabetes should be taught to provide enough food for these children, in order to provide adequate energy intake.

- **Diabetic Food**

A question regarding 'diabetic' foods was included, in order to assess the recommendation regarding foods that make diabetic claims. Respondents were asked: *"What do you tell patients with diabetes regarding foods that make diabetic claims?"* (Appendix A, question 14). Patients with diabetes should be taught that foods claiming to be suitable for diabetics are not essential in the diet of a person with diabetes.

Determining the validity of the questionnaire

According to Parmenter and Wardle (2000), validity concerns the extent to which a questionnaire measures what it claims to measure. In order to determine how well the items represent the subject under investigation, content validity should be determined. For the purposes of this study, content validity was assured by using the 1997 ADG as valid criteria for developing the questionnaire items, as discussed in the section above. To maximize content validity, the questionnaire was submitted to an independent expert panel consisting of three registered

dieticians from the Department of Human Nutrition, Faculty of Health Sciences, at the University of the Free State. These dieticians were also part of the expert panel who compiled the ADG. All the experts have postgraduate education and at least ten years experience with diabetes patients. The members of the expert panel independently reviewed the questionnaire items and returned them to the researcher. All the items were revised, following suggestions from each member of the panel, and were independently re-submitted to the experts. The expert panel returned the questionnaires to the researcher for a second time. As a final procedure to ensure content validity, the researcher reviewed the questionnaires. All items were then considered appropriate by the panel.

- **Determining the reliability of the questionnaire**

According to Parmenter and Wardle (2000), reliability is assessed to establish that a questionnaire is measuring something in a reproducible and consistent way. Reliability of the questionnaire was determined by using the test-retest method, to make sure that the results were consistent over time (Parmenter & Wardle, 2000). Personal interviews were conducted with five final year undergraduate dietetic students from the Department of Human Nutrition at the University of the Free State, on two separate occasions, with a week's interval in between. The participants were not aware of the second intended interview at the time of the first interview. Dates of birth were used to match the two sets of questionnaires and correlate the scores. Pearson's correlation co-efficient was used to assess test-retest reliability of the scores of the five respondents who completed the questionnaire twice. According to Axelson and Brinberg (1992), for the purpose of reliability, modest instrument reliabilities of 0.70 or higher suffice. The overall reliability for the second section of the questionnaire was 0.81, and therefore considered sufficient.

- **Determining the correct coding procedures for the questionnaire items**

Coding is the main task of data reduction and generally consists of assigning a code number to each response category (Bailey, 1994). According to Alreck and

Settle (1995), such numeric codes that represent answers to questions are more easily manipulated than words. Pre- and post coding are the two main procedures that are used to conduct numerical coding. Bailey (1994) reported that open-ended questions are difficult to pre-code, because the researcher may not know the complete range and number of potential answers. However, since the ADG were used to assess the application of current dietary guidelines for people with diabetes, pre-coding was possible. After the researcher identified a list of possible answers for each item within the different categories as discussed in section 3.2.2.1, the list was submitted to the expert panel in order to refine these possible responses for each category. All three dieticians accepted the responses in the categories for most of the items. However, changes of categories for responses in two items, were recommended. The list was re-submitted to the panel for their final opinion after these changes had been made. After their final approval for the responses in each category, the researcher was able to construct a questionnaire memorandum (Appendix B). This memorandum was used to code the questionnaires, as well as the different nutrition education materials.

- **Pilot study**

A pilot study was done to determine the duration of the interviews and if the questions were being understood. Final year dietetic students were included in the pilot study. Although the class consisted of fifteen students, the five students who were used to determine test-retest reliability were excluded from the pilot study. Therefore, the researcher conducted personal interviews with only ten of the final year dietetic students from the Department of Human Nutrition at the University of the Free State. All interviews lasted more or less fifteen minutes, and all questions were clearly understood.

3.5.1.2 Procedures to obtain provincial authorization

Prior to commencement of the study, the researcher was granted permission from provincial authorities to perform the study in primary healthcare clinics in the FS

and NW. The study protocol, with an accompanying letter, was submitted to the Head of Health, Dr. V. Lithlakanyane, from the FS; and the Deputy Director General Dr. H. Gosnell, from the NW (Appendix D).

3.5.1.3 Procedures for interviewing subjects

Since response rates of mailed questionnaires may receive responses as low as 10% (Bailey, 1994), it was decided to conduct interviews with the respondents, to ensure that the majority of interviews would be successfully completed (Bailey, 1994). According to Sudman and Bradburn (1982, as referred to by Bailey,1994), there are no differences in the answers given to the same questions asked by telephone or face-to-face interviews. Therefore, typical face-to-face (personal) and telephonic interviews (Leedy, 2001) were employed to investigate the phenomena in question.

- **Procedures for interviewing dieticians**

Since the PPD population was small compared to the nurses' population, it was financially feasible to conduct personal interviews with them.

The researcher followed these procedures:

- All PPDs were telephonically contacted prior to enrollment in the study. The purpose of the study, as well as the estimated duration of the interview, was explained to them.
- Since the PPDs were dispersed over a wide geographical area, the researcher had to identify the most appropriate travel route to employ. The route was planned so that all PPDs in one province could be interviewed during one trip in the shortest time period. Separate trips were planned for each province.
- Distances between towns, duration of the interviews, as well as possible time delays such as peak traffic hours, were taken into consideration. This procedure was done separately for each province.

- The researcher then planned a time schedule in which all appointments could be accommodated. It was determined that a single trip to each of the provinces could be completed in two days.
- All the PPDs who gave permission to take part in the study were then telephonically contacted to schedule appointments with them. This was time-consuming, since appointments could only be finalized if the scheduled times suited all PPDs on the same day.
- A week prior to the scheduled appointments, the researcher confirmed appointments with all PPDs.
- The researcher arrived promptly on the day of the interviews, after which informed consent (Appendix H) was obtained from each PPD before interviewing.
- The researcher then conducted personal interviews with all PPDs. All answers were recorded verbatim on the questionnaire. Each interview was completed in more or less 15 minutes.

❑ **Procedures for interviewing registered nurses**

In order to save time, because of long distances between clinics in small towns and high traveling costs, it was decided to conduct telephonic interviews with the nurses.

The researcher followed these procedures:

- The nurses were also contacted telephonically prior to enrollment in the study. The purpose of the study, as well as the estimated duration of the interview, was explained to them.
- However, since 150 registered nurses had to be contacted, the researcher intended to limit telephone calls in order to save costs and time.
- Therefore, after the researcher explained the purpose of the study and the time duration of the interview to every nurse, he/she was asked if it was possible to complete the interview at that time.

- If nurses were able to answer the questions immediately, the researcher explained and signed a consent form on behalf of every nurse who gave permission to take part in the study. Informed consent (Appendix H) was obtained from all nurses.
- If however, the nurse was unable to complete the interview at that time, appointments were scheduled at a time that best suited the nurse. Nurses were promptly contacted at the scheduled times.
- All open-ended questions were posed to the nurses by means of a telephonic interview, and answers were recorded verbatim on the questionnaire. Each interview was completed in more or less 15 minutes.

3.5.1.4 Procedures in accumulation of nutrition education materials

The procedures followed in the accumulation and assessment of the nutrition education materials are schematically presented in figure 7, and are discussed in detail hereafter.

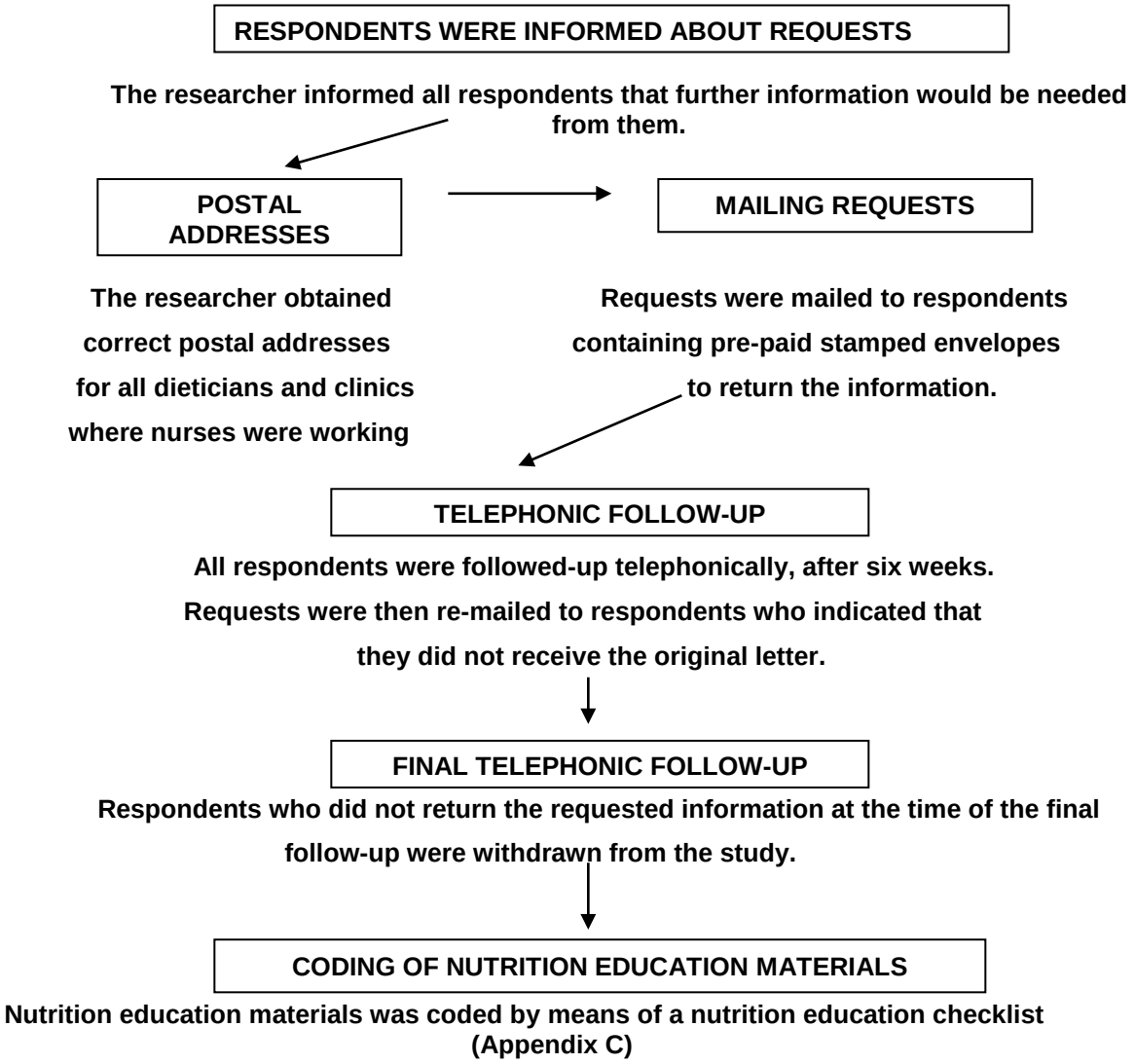


Figure 7 Schematic presentation of procedures involved in accumulation of the nutrition education materials

- **Informing respondents about requested information**

At the end of all interviews the researcher informed and explained to all PPDs, as well as to one nurse from each clinic included in the study, that further information would be needed from them later on.

- **Obtaining correct postal addresses**

The correct postal address of every PPD and clinic that was included in the study was documented, to ensure that the correspondence reached the respondents.

- **Mailing requests**

Formal letters (Appendix I) were sent to every PPD and informed nurse at the clinics. This requested a copy of the nutrition education materials that were available to patients with diabetes in their practice settings. A tear-off slip was included on which respondents had to indicate if there was such information available or not. A pre-paid, self-addressed envelope with return postage was enclosed in every request.

- **Telephonic follow-up**

A period of six weeks was allowed to ensure that the information could be returned timeously. A list was drawn up of all the nutrition education materials that were returned. Requests were then re-mailed to those respondents who indicated that they did not receive the original letter.

- **Final follow-up**

After another six-week period, the researcher again contacted respondents telephonically who did not return the requested information. Respondents who did not respond to the requests at the time of the second follow-up were withdrawn from the study.

- **Coding of nutrition education materials**

Nutrition education materials were coded by means of a nutrition education checklist (Appendix C), as discussed in section 3.2.2.2.

3.6 STATISTICAL ANALYSIS

Statistical analysis was done by personnel at the Department of Biostatistics, Faculty of Health Sciences at the University of the Free State. Numeric variables were summarized using means and ranges. Categorical variables were summarized using frequencies and percentages. For each respondent the total

score obtained for the questionnaire was calculated. To compare total scores obtained by nurses in the FS, to those obtained by nurses in the NW, 95% confidence intervals were calculated for the median differences. To compare total scores obtained by dieticians in the FS to those obtained by dieticians in the NW, 95% confidence intervals were determined.

3.7 PROBLEMS ENCOUNTERED DURING THE STUDY

3.7.1 Provincial Authorization

Commencement of the study was delayed for more than two months after the study protocol was submitted to provincial authorities. Reasons for this time delay were the following: unanswered fax messages, lost faxed copies of the protocol, as well as the inability of both the FS and NW authorities to attend to the protocol.

3.7.2 Scheduling appointments for interviews

3.7.2.1 Scheduling appointments with dieticians

Seven of the eight PPDs listed in the FS gave permission to take part in the study. The remaining PPD cancelled the appointment the day prior to the scheduled appointments, and it was impossible to re-schedule all appointments at that time.

In the NW, only seven of the ten listed PPDs gave permission to take part in the study. Two of the remaining PPDs were on maternity leave. The other remaining PPD were working in Ga-Rankuwa and was omitted from the study, because the researcher felt unsafe to travel alone in this area.

3.7.2 2 Scheduling appointments with nurses

Of the 100 respondents in the FS, 13 did not complete the questionnaire. One respondent each in regions A, B, C and F, as well as two respondents in region E, were left out of the study, because of busy working schedules at the clinics where they were working. The six selected respondents from the Virginia clinic in region C were omitted, after the Nursing Head of the clinic refused to have the selected nurses take part in the study; in spite of permission from the provincial authority. One respondent in region D was omitted, since the telephone of the SPS Tsatsi clinic in Sasolburg was out of order for several weeks.

Only two of the 50 selected nurses in the NW were omitted from the study. In spite of permission from provincial authorities of the NW, the Nursing Head of the Zeerust clinic refused to have the two selected nurses from this clinic take part in the study.

3.8 SUMMARY

In this chapter the variables of the study are defined. The sample population, as well as the selection of the sample population, is discussed. A schematic presentation is used to highlight the different study procedures according to a comprehensive study design. Special attention has been given to the construction, as well as to the validity and reliability of the questionnaire. Although problems were encountered during the execution of the study, the goals of the study could still be achieved.

CHAPTER 4

RESULTS

"Keeping up with the knowledge gained from ongoing research, and the innovations made in the field of dietetics and associated professions is essential for dietetics practitioners, regardless of their area of practice" – Ronni Chernoff

4.1 INTRODUCTION

This chapter focuses on the study results, as revealed through personal and telephonic interviews. In order to assess application of the ADG by dieticians and nurses in the FS and NW, total scores obtained for the questionnaire, as discussed in Chapter 3, were calculated for each participant. The same procedures were followed in order to assess the nutrition education materials. The data were statistically analyzed and the results of the study are presented in the following order:

- Final study sample
- Description of participants' characteristics by means of demographical information, as obtained in the first section of the questionnaire
- Results of questions regarding the ADG:
    - Highest, lowest and means of total scores, as well as the standard deviation of the scores obtained by dieticians and nurses
    - Comparison between scores of each question, for dieticians and nurses
- Description of characteristics of the nutrition education materials, as revealed through the first section of the nutrition education checklist

- Results of the nutrition education materials regarding the ADG:
    - Highest, lowest and means of total scores, as well as the standard deviation of the scores obtained by nutrition education materials from dieticians and nurses

4.2 FINAL STUDY SAMPLE

The final study sample included a total of 149 participants, which consisted of 14 dieticians, and 135 nurses from the randomized sample of nurses, for both provinces. Seven dieticians, from both the FS and NW, as well as 87 and 48 nurses from the FS and NW, respectively, were interviewed. Table 6 shows the final response rate of dieticians and nurses, as percentages.

Table 6 The final study sample of dieticians and nurses

DIETICIANS n=14		NURSES n=135	
FS	**NW**	**FS**	**NW**
n=7	n=7	n=87	n=48
88%	70%	87%	96%

4.2.1 Drop out of participants

Except for problems that occurred at the time appointments were being scheduled with the dieticians and nurses (as discussed in Chapter 3, section 3.7.2), no further drop-outs occurred after participants had given their permission to take part in the study.

4.3 PARTICIPANTS' CHARACTERISTICS

In this section, the participants' characteristics, which includes age, gender, level of education, frequency of counselling patients with diabetes and presence of diabetes among participants and their families, is described.

4.3.1 Age of participants

Table 7 shows results regarding participants' ages.

Table 7 Age range, median of age and age categories of dieticians and nurses

Dieticians	Age Range (Years)	Age Median	Age Categories				
			≥20<30 (%)	≥30<40 (%)	≥40<50 (%)	≥50<60 (%)	≥60 (%)
FS (n=7)	23.3 - 44	26.9	57.1	14.2	28.5	0.0	0.0
NW (n=7)	27.1 - 43.2	37.9	14.2	42.8	42.8	0.0	0.0
Nurses							
FS (n=87)	24.5 – 62.7	37.4	13.1	46.0	19.7	15.7	5.2
NW (n=48)	26.1 – 58.4	37.4	11.1	48.8	26.6	13.3	0.0

Age ranges extended from 23.3-44 years for dieticians, with a much wider age range for nurses, which extended from 24.5-62.7 years. For both the FS and NW nurses, the majority of participants fell within the age categories of 30-39 years and 40-49 years. Although the age ranges were similar for the FS and NW dieticians, the median of age for dieticians in the NW (37.9) was much higher than

the median of age for the FS dieticians (26.9). The median of age for nurses in both the FS and NW was the same (37.4).

4.3.2 Other demographical information

Table 8 shows gender, highest level of education, frequency of counselling patients with diabetes, as well as the presence of diabetes for both dieticians and nurses in the FS and NW.

Table 8 Demographical information of participants.

	DIETICIANS n=14		**NURSES n=135**	
	FS n=7	**NW** n=7	**FS** n=87	**NW** n=48
Gender				
Male (♂)	1		5	2
Female (♀)	6	7	82	46
Highest level of education				
Diploma			77	38
Degree	4	6	10	10
Post-graduate	3	1		
Frequency of counselling patients with diabetes				
Daily	3	3	51	31
Weekly	3	2	19	6
Monthly	1	1	14	10
Presence of diabetes among:				
Themselves	0	0	6	2
Family members	1	3	28	20
Friends	1	0	6	3

4.3.2.1 Gender

The majority of participants were female. Only one male dietician from the FS and seven male nurses, of which five were from the FS, participated in the study.

4.3.2.2 Highest level of education

Four dieticians completed a post-graduate degree, of which three were FS dieticians. While the majority of nurses, 77 and 38 nurses in the FS and NW, respectively, completed a diploma in nursing, only ten nurses in both the FS and NW completed a degree in nursing.

4.3.2.3 Frequency of counselling patients with diabetes

Three dieticians in both provinces, as well as 51 and 31 nurses in the FS and NW, respectively, indicated daily counselling of patients with diabetes.

4.3.2.4 Presence of diabetes

The majority of participants had no association with diabetes among themselves, family members or friends. While none of the dieticians had diabetes, eight nurses, of which six were from the FS, had diabetes. Only one dietician in the FS and three dieticians in the NW reported the presence of diabetes among family members. Twenty-eight and 20 nurses from the FS and NW, respectively, had family members with diabetes.

4.4 RESULTS OF QUESTIONS REGARDING THE ADG

A comparison between highest, lowest and mean scores obtained by dieticians and nurses are discussed in the following section.

4.4.1 Highest, lowest and mean scores obtained by dieticians and nurses

A comparison between scores obtained by dieticians and nurses is shown in Table 9. Both highest and lowest scores obtained by dieticians in the FS and NW, were much higher than highest scores obtained by nurses in both provinces. Highest scores obtained by dieticians were similar, with 73.8% and 71.4% for the FS and NW dieticians, respectively. However, these scores were below 75% and did not fall in the highest score category (Chapter 3, section 3.2.2.1). The lowest scores obtained by dieticians were 57% and 50% for the FS and NW, respectively. Nurses in the FS and NW obtained similarly highest scores (45.2%). The lowest scores obtained by nurses in the FS were as low as 9.5%, and 14.3% in the NW.

According to the score categories (refer to Chapter 3, section 3.2.2.1), scores below 65% fell in the lowest score category. Although the mean scores obtained by dieticians were much higher than the mean scores obtained by nurses, they were still below 65%.

Within the dietetic group, there were no statistically significant differences between scores obtained by dieticians. There were also no significant differences between scores obtained by nurses, within the nurses' group. However, statistically significant differences occurred between scores obtained by dieticians and scores obtained by nurses in both provinces.

Table 9 Comparison between scores obtained by dieticians and nurses

	DIETICIANS n=14		NURSES n=135	
	FS n=7	**NW** n=7	**FS** n=87	**NW** n=48
Highest score	73.8%	71.4%	45.2%	45.2%
Lowest score	57.1%	50.0%	9.5%	14.3%
Average scores	64%	61%	28%	29%
Median	61.9%	61.9%	27.4%	28.6%
Std Dev*	6.6	8.3	10.8	9.6
95% CI	55.2; 68.5	53.6; 70.2	16.6; 38.2	19.0; 38.2

*** Std Dev: Standard Deviation**

4.4.2 Comparison between scores obtained by dieticians and nurses for each question

Scores obtained for each question regarding the ADG *(refer to Appendices A and B)* by dieticians and nurses were compared and are shown in Tables ten to 23.

For the convenience of the reader, each question is stated before the results of that particular question are shown in a table.

4.4.2.1 Comparing scores for question one

Question 1

"Which method do you use when explaining dietary guidelines to diabetes patients?"

Table 10 Scores obtained for question one

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	Frequency			
3	0	2	0	0
2	6	4	15	6
1	1	1	38	30
0	0	0	34	12
Total Score	62%	71%	26%	29%

Table 10 clearly shows that dieticians obtained much higher scores than nurses for question one. For both the dieticians and nurses, higher scores were obtained in the NW. There were no statistically significant differences between the scores obtained by dieticians in the FS and dieticians in the NW (p=0.7063), as well as no significant differences between scores obtained by nurses in both the FS and NW (p=0.1257).

4.4.2.2 Comparing scores for question two

Question 2

"How many meals and snacks do you advise patients with diabetes to include in their daily meal plan?"

Table 11 Scores obtained for question two

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	4	0	31	6
2	3	5	17	5
1	0	2	27	29
0	0	0	12	8
Total Score	86%	57%	59%	40%

Although dieticians in the FS obtained much higher scores than NW dieticians, with 86% and 57%, respectively, there were no statistically significant differences between these scores (p=0.0699). However, scores obtained by nurses in the FS were significantly higher than scores obtained by nurses in the NW (p=0.0023). Of further interest is that FS nurses obtained higher scores than dieticians in the NW.

4.4.2.3 Comparison of scores for question three

Question 3

"*What do you tell patients with diabetes regarding their body weight?*"

Table 12 Scores obtained for question three

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	5	4	8	7
2	2	3	10	1
1	0	0	61	34
0	0	0	8	6
Total Score	90%	86%	40%	40%

Dieticians in both provinces obtained high scores for question three. With 90% and 86% for the FS and NW, respectively, there were no significant differences between scores obtained by dieticians (p=1). In both the FS and NW, nurses obtained much lower scores than dieticians, with no significant differences between these scores (p=0.1940).

4.4.2.4 Comparison of scores for question four

Question 4

"*What do you tell patients with diabetes regarding carbohydrate intake?*"

Table 13 Scores obtained for question four

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	0	0	0	0
2	7	7	6	2
1	0	0	35	30
0	0	0	46	16
Total Score	67%	67%	18%	23%

Dieticians in both the FS and NW obtained similar scores (67%), which was almost three times higher than scores obtained by nurses in both provinces. Scores obtained by nurses were very low, with significant differences between scores of nurses in the FS and NW (p=0.0484). Scores were 18% and 23% for nurses in the FS and NW, respectively.

4.4.2.5 Comparison of scores for question five

Question 5

"*What do you tell patients with diabetes regarding fat intake?*"

Table 14 Scores obtained for question five

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	1	1	2	0
2	6	5	15	3
1	0	1	56	35
0	0	0	14	10
Total Score	71%	67%	35%	28%

Dieticians in both the FS and NW obtained higher scores than nurses in both provinces. For both the dieticians and nurses, higher scores were obtained in the FS than in the NW. No statistically significant differences were found between scores obtained by dieticians (p=1), as well as between scores obtained by nurses (p=0.2106), in both provinces.

4.4.2.6 Comparison of scores for question six

Question 6

"What do you tell patients with diabetes regarding protein intake?"

Table 15 Scores obtained for question six

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	Frequency			
3	0	0	2	0
2	6	4	13	6
1	1	3	49	31
0	0	0	23	11
Total Score	62%	52%	31%	30%

Although dieticians in the FS obtained higher scores than dieticians in the NW, there were no significant differences between these scores (p=0.5594). Nurses in both the FS and NW obtained similar, low scores, with 31% and 30%, respectively. There were no significant differences between these scores (p=0.7557).

4.4.2.7 Comparison of scores for question seven

Question 7

"What do you tell patients with diabetes regarding vitamins, minerals and trace elements?"

Table 16 Scores obtained for question seven

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	2	1	0	0
2	0	1	4	2
1	3	5	27	23
0	2	0	56	23
Total Score	43%	48%	13%	19%

Although dieticians obtained higher scores than nurses, scores obtained by dieticians and nurses in both the FS and NW, were very low. There were also no significant differences between scores obtained by dieticians (p=0.4371), as well as for the nurses (p=0.1331), in both the FS and NW. Dieticians in the FS and NW obtained 43% and 48%, respectively, while nurses in the FS and NW obtained 13% and 19%, respectively.

4.4.2.8 Comparison of scores for question eight

Question 8

"What do you tell patients with diabetes regarding the use of sweeteners?"

Table 17 Scores obtained for question eight

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	2	3	2	0
2	3	2	0	0
1	0	1	30	14
0	2	1	55	34
Total Score	57%	67%	14%	10%

Scores obtained by dieticians were more or less four times higher than scores obtained by nurses. In the FS and NW, dieticians scored 57% and 67%, respectively, with no significant differences between these scores (p=1). Nurses obtained scores as low as 14% and 10% for the FS and NW, respectively. There were no significant differences between these scores (p=0.5623).

4.4.2.9 Comparison of scores for question nine

Question 9

"What do you tell patients with diabetes regarding alcohol intake?"

Table 18 Scores obtained for question nine

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	0	0	0	0
2	7	4	1	1
1	0	3	77	45
0	0	0	9	2
Total Score	67%	52%	30%	33%

For question nine, dieticians in both the FS and NW obtained higher scores than nurses in both provinces. Although FS dieticians obtained higher scores than NW dieticians, there were no significant differences between these scores (p=0.1923). Dieticians scored 67% and 52% in the FS and NW, respectively. In the FS and NW, nurses obtained 30% and 33%, respectively, with no significant differences between these scores (p=0.4106).

4.4.2.10 Comparison of scores for question ten

Question 10

"What do you tell patients with diabetes regarding physical activity?"

Table 19 Scores obtained for question ten

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	5	5	2	1
2	2	2	14	9
1	0	0	65	35
0	0	0	6	3
Total Score	90%	90%	38%	39%

Dieticians in the FS and NW obtained high scores for question nine, which were similar (90%) for both provinces (p=1). Nurses obtained lower scores, but scores were also similar, with 38% and 39% in the FS and NW, respectively (p=0.9762).

4.4.2.11 Comparison of scores for question eleven

Question 11

"What do you tell pregnant women with diabetes?"

Table 20 Scores obtained for question eleven

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	0	3	1	0
2	5	0	1	2
1	1	3	49	37
0	1	1	36	9
Total Score	52%	57%	21%	28%

Dieticians obtained higher scores than nurses in both the FS and NW. For this question, scores obtained by dieticians in the FS (52%) were significantly lower than scores obtained by dieticians in the NW (57%) (p=0.0169). The same phenomenon occurred among nurses. FS nurses obtained significantly lower scores (21%) than nurses in the NW (28%) (p=0.0129).

4.4.2.12 Comparison of scores for question twelve

Question 12

"What do you tell lactating women with diabetes?"

Table 21 Scores obtained for question twelve

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	0	0	1	0
2	3	1	0	1
1	2	4	44	35
0	2	2	42	12
Total Score	38%	29%	18%	26%

Although dieticians in both provinces obtained very low scores for question 12, these scores were still higher than those of nurses in both provinces. Dieticians obtained 38% and 29% for the FS and NW, respectively, with no significant differences between scores (p=0.7902). Scores for nurses differed significantly (p=0.0079), with 18% and 26% for nurses in the FS and NW, respectively.

4.4.2.13 Comparison of scores for question thirteen

Question 13

"What do you tell mothers or caretakers of children with diabetes?"

Table 22 Scores obtained for question thirteen

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	Frequency			
3	0	1	2	0
2	4	3	2	0
1	2	3	40	37
0	1	0	43	11
Total Score	48%	57%	19%	26%

Dieticians in the FS obtained lower scores than dieticians in the NW, with 48% and 57%, respectively. No significant differences occurred between these scores (p=1). However, scores obtained by nurses in the FS were significantly lower (19%) than scores obtained by nurses in the NW (26%) (p=0.0019).

4.4.2.14 Comparison of scores for question fourteen

Question 14

"What do you tell patients with diabetes regarding foods that make diabetic claims?"

Table 23 Scores obtained for question fourteen

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Scores	**Frequency**			
3	5	2	1	0
2	0	2	0	1
1	1	1	19	6
0	1	2	67	41
Total Score	76%	52%	8%	5%
$p \leq 0.05$	p=0.5105		p=0.2373	

Dieticians in both the FS and NW obtained much higher scores for question fourteen than nurses in both provinces. Although dieticians in the FS obtained higher scores (76%) than dieticians in the NW (52%), these differences were not statistically significant (p=0.5105). Nurses in the FS and NW obtained very low scores, with 8% and 5%, respectively. No significant differences occurred (p=0.2373).

4.4.2.15 Summary

Table 24 summarizes the total scores obtained by dieticians and nurses for questions one to fourteen and highlights significant differences where relevant. Abbreviations are used for the questions in the table and are provided in parenthesis.

Table 24 Summary of total scores for each question

	DIETICIANS n=14		NURSES n=135	
	FS n=7	NW n=7	FS n=87	NW n=48
Questions	**Total Scores**			
1 “Educational methods”	62%	71%	26%	29%
2 “Meal frequency”	86%	57%	59%*	40%*
3 “Body weight”	90%	86%	40%	40%
4 “Carbohydrate intake”	67%	67%	18%#	23%#
5 “Fat intake”	71%	67%	35%	28%
6 “Protein intake”	62%	52%	31%	30%
7 “Supplements”	43%	48%	13%	19%
8 “Sweeteners”	57%	67%	14%	10%
9 “Alcohol intake”	67%	52%	30%	33%
10 “Physical activity”	90%	90%	38%	39%
11 “Pregnant women”	52%~	57%~	21%†	28%†
12 “Lactating women”	38%	29%	18%¤	26%¤
13 “Children”	48%	57%	19%¢	26%¢
14 “Diabetic food”	76%	52%	8%	5%

*p=0.0023 †p=0.0129

#p=0.0484 ¤p=0.0079

~p=0.0169 ¢p=0.0019

Dieticians in the FS obtained high scores (above 75%) for questions two, three, ten and fourteen, whereas NW dieticians obtained high scores only for questions three and ten. Nurses in both provinces obtained low scores (below 65%) for all questions.

4.5 NUTRITION EDUCATION MATERIALS

In spite of the fact that the researcher did several follow-ups, only ten of the 95 nurses responded to the requests for nutrition education materials. Seven of the 14 dieticians returned copies of the requested information. Since the response rates were so low, provinces were not compared and the researcher assessed the nutrition education materials for dieticians and nurses only.

4.5.1 Characteristics of the nutrition education materials

Table 25 shows the characteristics of the nutrition education materials. These characteristics included information regarding the format, language, as well as the distributor of the nutrition education materials.

Table 25 Characteristics of the nutrition education materials

	Nutrition education materials from dieticians n=7	Nutrition education materials from nurses n=10
Format		
Leaflet	4	6
Poster	0	0
Booklet	2	0
Other (i.e. self-compiled)	1	4
Language		
English	4	9
Afrikaans	3	1
Distributor		
Pharmaceutical Company	1	2
SASA	2	1
Self-compiled	4	6
Other, such as from the Department of Health	0	1

Most of the nutrition education materials that were returned to the researcher, were leaflets, with four and six different leaflets, from dieticians and nurses, respectively. Most nutrition education materials were in English and self-compiled by both dieticians and nurses.

4.5.2 Results of questions regarding the ADG

In Table 26 the overall highest, lowest, and means of total scores, as well as the standard deviation and median of scores obtained by nutrition education materials from dieticians and nurses are shown.

Table 26 Comparison between overall scores obtained by nutrition education materials from dieticians and nurses

	Nutrition education materials dieticians n=7	Nutrition education materials nurses n=10
Highest score	47.6%	45.2%
Lowest score	14.3%	21.4%
Mean scores	35%	33%
Median	38.1%	31%
Std Dev*	8.2	9.8
95% CI	29.9; 46.3	21.1; 40.8

*** Std Dev: Standard Deviation**

Highest scores obtained by nutrition education materials from dieticians were slightly higher than those obtained by nutrition education materials from nurses. However, the lowest scores obtained by nutrition education materials from dieticians were much lower than those obtained by nutrition education materials from nurses.

Mean scores were similar for nutrition education materials from dieticians and nurses, 35% and 33%, respectively, and no statistically significant differences occurred between these scores.

4.5.2.1 Scores obtained by nutrition education materials for each question

Table 27 provides a summary of scores obtained for each question by nutrition education materials from dieticians and nurses. Total scores for each question, as well as frequencies of categorical scores obtained are shown as described in

chapter 3, section 3.2.2.2. Abbreviations are also used for the questions and are provided in parenthesis.

Table 27 Scores obtained for questions one to fourteen

	Nutrition education materials dieticians n=7					Nutrition education materials nurses n=10				
Questions	Total Scores	Frequency of category 3	2	1	0	Total Scores	Frequency of category 3	2	1	0
1 “Educational methods”	**10%**	2			5	**30%**	1		6	3
2 “Meal frequency”	**62%**	2	2	3		**50%**	3	1	4	2
3 “Body weight”	**10%**	2			5	**43%**	4		1	5
4 “Carbohydrate intake”	**86%**	4	3			**90%**	7	3		
5 “Fat intake”	**76%**	4	2			**73%**	4	4	2	
6 “Protein intake”	**62%**	3	2		3	**70%**	4	4	1	1
7 “Supplements”	**0%**				7	**7%**		1		9
8 “Sweeteners”	**33%**	1	2		4	**50%**		7	1	2
9 “Alcohol intake”	**52%**	1	3	2	1	**17%**		1	3	5
10 “Physical activity”	**57%**	3	1	1	2	**17%**		1	3	6
11 “Pregnant women”	**0%**				7	**0%**				10
12 “Lactating women”	**4%**			1	6	**0%**				10
13 “Children”	**4%**			1	6	**0%**				10
14 “Diabetic food”	**24%**		2	1	4	**17%**		2	1	7

Nutrition education materials from dieticians obtained very low scores (< 65%) for most questions. High scores (> 75%) were obtained only for questions four and five regarding carbohydrate and fat intake, respectively. Nutrition education materials from nurses obtained similar low scores (< 65%) for most questions with high scores only for question four, regarding carbohydrate intake. Inadequate, or in many cases, no information were provided by nutrition education materials from both dieticians and nurses regarding dietary intake for pregnant and lactating women with diabetes, as well as for mothers/caretakers of children with diabetes.

4.6 SUMMARY

A total of 149 participants, of which 135 were nurses, completed the study. Age ranges of nurses extended to 62.7 and 58.4 years, respectively for the FS and NW. These age ranges extended far beyond those of dieticians, meaning that most of the nurses who took part in this study were of a more advanced age than the dieticians. Statistically significant differences occurred between averages of total scores obtained by dieticians and nurses in both provinces. However, scores obtained by dieticians were still below 65%, which fell in the lowest score category. There were no statistically significant differences between scores obtained by dieticians in the FS and NW. The same phenomenon occurred between scores obtained by nurses in the FS and NW. Means scores obtained by nutrition education materials from both dieticians and nurses were very low. There were no statistically significant differences between scores obtained by nutrition education materials from dieticians, and scores obtained by nutrition education materials from nurses.

CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

"Research provides credible, scientifically supported information that contributes to the success of nutrition education – but maximum benefits will be derived from research efforts when an active interchange between nutrition education researchers and practitioners exists as a rule of thumb" – Rebecca Mullis.

6.1 INTRODUCTION

The main aim of this study was to assess the application of the current dietary recommendations for people with diabetes by dieticians and nurses in the FS and NW. A standardized questionnaire was developed and used during personal and telephonic interviews in order to assess how well dieticians and nurses apply the ADG when counselling patients with diabetes. Assessment of the application of the ADG has not been determined before. The ADG were used as valid criteria to develop the questionnaire, as discussed in Chapter 3. This was done in order to ensure that the questionnaire measured what it was supposed to measure (i.e. assessing the application of the ADG).

The results of this study are considered reliable and valid, as standardized methods and procedures were used throughout the study. Therefore, significant conclusions can be drawn from this study.

6.2 CONCLUSIONS

The following conclusions are drawn:

- As members of the diabetes care and diabetes management team, dieticians make decisions about the nutritional care of patients. Since dieticians generally obtain higher credentials than registered nurses, it is assumed that dieticians will provide higher-level services. Although PPDs in both the FS and NW obtained higher scores than nurses, their scores were lower than expected. It can therefore be concluded that PPDs in the FS and NW are not properly applying the current dietary goals for people with diabetes. However, since the beginning of 2003, compulsory community service for dieticians was introduced in South Africa. Many dieticians were employed in communities, where dieticians have never before been available to provide dietetic services to patients. It is possible that these changes might induce more effective translation of dietary information, but needs to be investigated.

- In the primary health care setting, diabetes care and patient education are primarily done by registered nurses. In this setting, the expertise of nurses in various aspects of diabetes care is obviously an important determinant of its quality. The effectiveness of patient education is, therefore, largely dependent on the accuracy of the information provided. Nurses in the FS and NW obtained low scores (below 65%), indicating that the current dietary guidelines are not applied, and that the information provided to patients with diabetes is probably outdated.

- Many pharmaceutical companies, as well as SASA, provide nutrition education materials to health care professionals to assist in nutrition education and counselling. Most of the nutrition education materials the researcher had received from both dieticians and nurses, were self-

compiled. However, it was surprising that the results of the study indicated that these nutrition education materials, currently being used by dieticians and nurses in the FS and NW, did not correlate with the ADG and/or were completely outdated. It can be concluded that proper, up-to-date nutrition education materials are lacking in both private and primary health care settings.

- Dieticians and nurses in both provinces do not properly apply current recommendations regarding carbohydrate, fat and protein intake, as well as for meal frequency, energy intake and exercise.

- Dieticians and nurses in both the FS and NW poorly apply current recommendations regarding the use of supplements.

- Most nurses in both the FS and NW still advise patients to avoid sugar, in spite of various studies, which have shown that moderate amounts of sucrose can be included in the diets of people with diabetes.

- Most nurses in both provinces still encourage the use of special ‘diabetic food’, regardless of the fact that legislation in South Africa prohibits the marketing of foods, claiming to be ‘diabetic foods’.

6.3 RECOMMENDATIONS

It is recommended that:

- Since DE are currently being educated only in Johannesburg, a national diabetes education programme should be developed in order to improve health care professionals’ understanding of diabetes and its control; and to promote an integrated approach to diabetes care, as well as promoting

health care policies that will improve quality and access to diabetes care. Intensive diabetes therapy is therefore dependent on the reinforcement and repetition of consistent diabetes messages, providing patients with increased value from health messages and multiple sources of support.

- Nutrition education must be integrated within the curricula of the health professions' education programmes, to provide the knowledge and skills necessary to meet the health objectives of the South African, diabetic population, which are the following: to achieve optimal blood glucose and blood lipid concentrations; to provide appropriate energy for reasonable weight, normal growth and development; to prevent, delay and treat nutrition-related complications; and to improve health through optimal nutrition.

- The expanded role dieticians and nurses play in providing nutrition education to patients with diabetes should be more readily acknowledged by the other members of the health care team. The under-valuation of the role of both dieticians and nurses implies that teamwork based on the application of professional skills, is restricted.

- More research is needed to identify possible barriers to the application of the ADG by dieticians and nurses, such as time constraints and practice economics in the private practice setting, the need to maintain referral relationships and maldistribution of professionals in the primary health care community, low awareness and low socio-economic status among patients, and lack of access to health care services for low-income patients.

- More focus is needed on the compilation and dissemination of nutrition education materials with consistent educational content by pharmaceutical companies, dieticians and nurses, in order to help decrease the risk of health complications associated with diabetes.

- Although dieticians and nurses in the FS and NW do not apply the 1997 ADG as expected when counselling patients with diabetes, it does not mean that these guidelines should not be revised. The 1997 ADG do not make any recommendations regarding the following factors: the glycaemic index of carbohydrate foods, hypertension and sodium-intake, recommendations for the elderly with diabetes and omega-3 fatty acids. It is therefore recommended that up-to-date, basic dietary guidelines (such as the South African food-based dietary guidelines) should be compiled by a representative committee of all health professionals involved in diabetes care, in order to improve the treatment and consequent outcomes for people with diabetes.

Appendix A

Questionnaire for interviewing dieticians and nurses

Office use

Respondent nr: ☐☐☐ 1-3

Date of interview:_____

D D M M Y Y

☐☐☐☐☐☐ 4-9

Date of birth:_____

D D M M Y Y

☐☐☐☐☐☐ 10-15

Gender: 1.) Male ☐ ☐ 16

2.) Female ☐

Profession: 1.) Dietician ☐ ☐ 17

2.) Nurse ☐

Type of practice: 1.) Primary health care clinic ☐ ☐ 18

2.) Provincial hospital ☐

3.) Private practice ☐

4.) Other, specify_____ ☐

Highest level of education completed: ☐ 19

1.) - Diploma ☐

2.) – Degree ☐

3.) - Post-graduate degree ☐

How often do you counsel patients with diabetes? ☐ 20

1.) – Daily ☐

2.) - Weekly ☐

3.) - Monthly ☐

4.) – Other_____ ☐

Presence of diabetes: ☐ 21

1 – Yourself ☐

2 – Family ☐

3 – Friends ☐

4 – None of the above ☐

Did the presence of diabetes influenced your interest in counseling patients with diabetes? ☐ 22

Yes ☐ 1 No ☐ 2

Questions

1.) Which standard tools do you use when explaining dietary guidelines to diabetes mellitus patients? ☐ 23

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2.) What do you advise patients with type 2 diabetes regarding meal frequency? ☐ 24

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3.) What do you tell patients regarding body weight? ☐ 25

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4.) What do you tell patients regarding carbohydrate intake? ☐ 26

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5.) What do you tell patients regarding fat intake? ☐ 27

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6.) What do you tell patients regarding protein in the diet? ☐ 28

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7.) What do you tell patients with diabetes regarding vitamins, minerals and trace elements? ☐ 29

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8.) What do you tell patients with diabetes regarding the use of sweeteners? ☐ 30

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9.) What do you tell patients with diabetes regarding alcohol intake? ☐ 31

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10.) What do you tell patients with diabetes regarding physical activity? ☐ 32

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11.) What do you tell pregnant women with diabetes regarding dietary changes? ☐ 33

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12.) What do you tell lactating women with diabetes regarding dietary changes? ☐ 34

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13.) What do you tell mothers and caretakers of children with diabetes regarding dietary changes? ☐ 35

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14.) What do you tell patients with diabetes regarding foods that make diabetic claims? ☐ 36

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Appendix B

Questionnaire Memorandum

1.) Which standard nutrition education tools do you use when explaining dietary guidelines to diabetes mellitus patients?

1 – according to individual needs and abilities by using methods for example: the plate model and food pyramid	3
2 – use an exchange list or portion list	2
3 - use pamphlets & posters	1
4 - explain the 3 main food groups	1
5 – provide a standardized meal plan with menus	0
6 – no method is used when explaining dietary guidelines	0

2.) How many meals & snacks are patients with diabetes advised to include in their daily meal plan?

1 – six meals (3 meals + 3 snacks),depending on medication	3
2 – four meals	3
3 – three meals with snacks in between	2
4 – small, frequent meals	1
5 – three meals (no snacks)	1
6 – it depends on medication, don't skip meals if medication has been taken	1
7 – whenever the patient feels hungry	0
8 – no advice given about the frequency of meals and snacks	0

3.) What are patients with diabetes advised regarding body weight?

1 – overweight patients with diabetes are encouraged to lose weight because hyperglycaemia, dyslipidaemia and hypertension will improve	3
2 – patients with diabetes should achieve and/or maintain a desirable of reasonable body weight	3
3 – moderate weight loss lower blood glucose, cholesterol and triglyseride concentrations and can reduce hypertension	3
4 – moderate weight loss lower blood glucose concentrations	2
5 – moderate weight loss improves cholesterol levels	2

6 – moderate weight loss improves hypertension 2

7 – exercise will help to reduce weight 1
8 - any weight loss is beneficial 1

9 – overweight patients with diabetes should try to lose weight as fast as possible 0
10 – no advice is given regarding body weight 0

4.) What are patients with diabetes advised regarding carbohydrate intake?

1 – unrefined products such as whole wheat or brown bread, brown rice high fiber breakfast cereals and whole wheat pasta should be included in the diet 3
2 – certain types of fibre such as high soluble fibre are especially good at controlling blood glucose concentrations, e.g. oats, certain types of fruit & vegetable (such as brussels sprouts, broccoli, carrots, beetroot parsnips, turnips, apricots, figs, mangos, oranges & plums) as well as beans and lentils 3

3 – a diet high in unrefined carbohydrates is recommended 2
4 – carbohydrate rich foods should form the basis of every meal 2
5 – vegetables and fruit are good sources of fibre 2
6 – carbohydrate rich foods with a low glycaemic index is a good choice 2
7 – the diet should be high in carbohydrate and fibre and should include some fruit 2

8 - the diet should provide 50-65% of the total daily energy as carbohydrate 1
9 – increasing the total amount of carbohydrate will help to decrease fat intake 1
10 - carbohydrate rich foods provide fibre in the diet 1
11 – 3 g of fibre/1000 kJ is recommended 1
12 – persons with diabetes are allowed to eat carbohydrate-rich foods 1
13 – carbohydrates provide energy to the body 1
14 – the patient must eat a variety of vegetables to get enough carbohydrates 1

15 – no advice given about carbohydrate intake 0
16 – no restrictions on any kind of carbohydrate 0

5.) What are patients with diabetes advised regarding fat intake?

1 – total fat, especially saturated fat should be restricted 3
2 – fat should be restricted because it causes weight gain and 3

cardiovascular problems

3 – animal fat should be restricted	2
4 – people with diabetes should follow a low fat diet or reduce fat in the diet	2
5 – avoid fatty foods such as French fries, pies, full cream dairy products	1
6 -- total fat should comprise < 30% of the total daily energy intake with saturated fat < 10% of the total, poly-unsaturated fat <10% of the total (preferably 6-8%) and mono-unsaturated fat the balance	1
7 – rather use low fat or fat free products	1
8 – people with diabetes are not allowed to eat any fat	0
9 – no advice given about fat intake	0

6.) What are patients with diabetes advised regarding protein in the diet?

1 – dietary protein should be derived form both animal and vegetable sources	3
2 – lower protein intake is advised with impared kidney function	3
3 – moderate protein intake from a variety of foods is recommended	3
4 – dry beans and lentils are a good source of protein	2
5 – many protein sources are high in fat e.g. meat, cheese, full cream milk and intake should be restricted	2
6 – small protein portions are sufficient to supply daily requirements	2
7 – rather use white meat such as chicken and fish than red meat	1
8 – people with diabetes should include protein-rich foods in their diet	1
9 - people with diabetes may eat protein-rich foods	1
10 - protein should provide 10-20% of the total daily energy intake or 0.8g/kg/dag	1
11 – no advice given regarding protein intake	0
12 – no restriction on protein intake	0

7.) What are patients with diabetes advised regarding vitamins, minerals and trace elements?

1 – when a person with diabetes is under good metabolic control, there is no need for supplementation	3
2 – supplements may be needed if you eat very low energy diets and have uncontrolled diabetes	3
3 – a balanced diet with a variety of foods will supply adequate quantities of vitamins, minerals & trace elements required by the body	2

4 – rather buy fresh fruit & vegetables than buying supplements 1
5 – certain groups are at high risk of deficiencies 1
6 – consult a doctor before using any kind of supplements 1
7 – don't give a daily supplement to all patients with diabetes 1

8 – all persons with diabetes should take supplements 0

9 – no advice given regarding supplementation 0

8.) What are patients with diabetes advised regarding the use of sweeteners?

1 – limited amounts of sugar and other nutritive sweeteners are allowed as part of an energy-controlled, high-fibre low fat diet 3
2 – people with diabetes are allowed to use limited amounts of sugar in their diet 3

3 - 3 types of sweeteners can be used: namely nutritive and non-nutritive sweeteners and sugar alcohols 2
4 – non-nutritive sweeteners on the market e.g. saccharine, cyclamates aspartame and acesulfame-k have a very low energy content and can be safely included in the diet 2
5 – no more than 8-10 tablets/sachets of non-nutritive sweetener or 2 cans of diet cold drink per day should be used 2

6 – patients should vary the types of sweeteners they use 1
7 – patient with diabetes are allowed to use sweeteners 1
8 – people with diabetes are allowed to drink artificial sweetened cold drinks like low-cal 1

9 – patients with diabetes may only use sweeteners with no sugar in their diet 0
10 – no advice given on the use of sweeteners 0
11 – no restrictions given on the use of sweeteners 0

9.) What are patients with diabetes advised regarding alcohol intake?

1 – limited alcohol consumption is allowed in well-controlled diabetic patients 3

2 – alcohol intake is contraindicated in conditions such as hypertriglyceridaemia, obesity, neuropathy, poor glycaemic control and pregnancy 2
3 – alcohol is high in kilojoules and should be avoided when trying to lose weight 2
4 – patients are discouraged from taking any alcohol 1
5 – alcohol can interfere with diabetic medication 1

6 – alcoholic drinks should be taken with a meal	1
7 - alcohol intake may lead to hypoglycaemia	1
8 - alcohol intake should not exceed 6-10% of the total daily energy intake and must always be ingested in combination with a meal	1
9 – no advice given regarding alcohol intake	0
10 – no restrictions given on the use of alcohol?	0

10.) What are patients with diabetes advised regarding activity?

1 – regular exercise is a vital part of the treatment of diabetes	3
2 – exercise can commence when blood glucose concentrations are between 4mmol/L and 14mmol/L	3
3 – normal blood glucose concentrations should be maintained before during and after exercise	2
3 – exercise should not be too strenuous or last for too long	2
4 – frequent short bouts of exercise are recommended in terms of lowering blood glucose concentrations	2
5 – exercise can assist in weight loss	2
6 – patients should try to avoid injuries because of slow wound healing	1
7 – exercise will improve your overall health status	1
8 – patients must eat before exercise to prevent hypo-	1
9– patients with diabetes should exercise	1
10– no advice given on exercise	0

11.) What advise are given to pregnant women with diabetes?

1 – it is very important that blood glucose concentrations remain very well controlled both before and after meals	3
2 – successful pregnancy outcomes depend on adequate dietary intake frequent glucose monitoring, maintenance of optimal blood glucose concentrations, correct insulin management and prevention of hypoglyceamia	3
3 – pregnant women with diabetes should exercise whenever possible as it will assist in controlling blood glucose concentrations	3
4 – carbohydrate must be distributed throughout the day	2
5 – eat small breakfast meals and include some protein	2
6 – eat low glyceamic index foods	2
7 - avoid non-nutritive sweeteners	2
8 – avoid alcohol consumption	2
9 - include plenty of fibre and fluids to prevent constipation	2

10 – limit caffeine intake i.e. coffee, tea, chocolate and cola drinks 2

11 – eat small, frequent meals 1
12 – eat a well balanced diet, not necessary to eat for two people 1
13 – follow the general nutrition guidelines for people with diabetes 1

14 – never had such a patient 0
15 – no advice given to pregnant women with diabetes 0

12.) What advise are given to lactating women with diabetes?

1 – it is very important that blood glucose concentrations remain well-controlled both before and after meals in order to maintain good maternal nutrition 3
2 – it may be necessary to include a snack before feeding the baby in order to prevent low blood glucose concentrations 3
3 – suitable exercise with doctor's permission is highly recommended 2
4 – insulin requirements may be decreased as a result of lower blood glucose concentrations during lactation 2

5 – eat a well-balanced diet/follow the normal dietary guidelines for patients with diabetes 1
6 – diabetic mothers should be encouraged to breastfeed their babies 1

7 – never had such a patient 0
8 – no advice given to lactating women with diabetes 0

13.) What advise are given to mothers and caretakers of children with diabetes?

1 – children with diabetes should take in enough energy to allow for normal growth and development 3
2 – children with diabetes should eat at least six times a day – that is three meals and three snacks 3
3 – the child should be allowed to eat if he/she is hungry and insulin adjusted accordingly 3
4 – it is very important that a child with diabetes eat a late night snack just before bedtime 3
5 - children under 2 years of age should be given full cream milk 3
6 – a child who goes to bed early needs to be woken up to eat a snack 2
7 - food should not be with-held from the child if blood glucose concentra tions is high 2
8 - blood glucose concentrations should not be controlled by restricting food intake 2

9 – the child must have a well-balanced diet & not too much sweets 1
10 – children with diabetes should be taught why they have to eat differently/or more frequently then other children 1
11 – the diabetic diet must be introduced to the whole family 1
12 – the caretaker should be told how to prepare food, how often the child should eat 1
13 – children should be encouraged to eat fruits and vegetables 1
14 – children under 2 years of age should not be given sugar alcohols 1
15 – children aged 2-5 years can be given low- or full cream milk, but not skim milk 1
16 – children under 5 years of age may need more fat in their diets can be achieved by adding fat to other foods e.g. little oil/margarine to their porridge 1

17 - no advice is given to mothers and caretakers of children with diabetes 0

14.) What advise are given to patients with diabetes regarding foods that make diabetic claims?

1 – people with diabetes don't have to use special food 3

2 – the diabetic diet is a healthy eating plan and no special foods are needed 2

3 – make patients aware of such products, but don't encourage them to buy it 1
4 – diabetic foods are not necessary 1

5 – diabetic products are very expensive 0
6 – the patient can buy it, if he/she can afford it 0
7 – the patient can use the products if they want to 0
8 – it is important that patients with diabetes use special 'diabetic' foods 0
9 - no advice is given regarding special diabetic foods 0

Appendix C

Checklist for evaluation of educational material

Office use

Poster/Leaflet nr: ☐☐ 1-2

Background information

1.) Poster/leaflet/booklet from: ☐ 3

1 – Private hospital ☐

2 – Provincial hospital ☐

3 – Municipal primary health care clinics ☐

4 – Private practicing dietician ☐

2.) Language: ☐ 4

1 – English ☐

2 – Afrikaans ☐

3.) Distributor ☐ 5

1 – Pharmacy-company ☐

2 – South African Sugar Association ☐

3 – Self-compiled ☐

4 – Other_____ ☐

4.) Format of written information ☐ 6

1 – Leaflet ☐

2 – Poster ☐

3 – Booklet ☐

4 – Other_____ ☐

Criterium

1.) Which nutrition education tool is used when explaining dietary guidelines to patients with diabetes mellitus? ☐ 7

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2.) How many meals and snacks are patients with diabetes mellitus advised to include in their daily meal plan? ☐ 8

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3.) What recommendations is given to patients with diabetes mellitus regarding body weight? ☐ 9

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4.) What recommendations is given regarding carbohydrate intake? ☐ 10

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5.) What recommendations is given regarding fat intake? ☐ 11

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6.) What recommendations is given regarding protein intake? ☐ 12

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7.) What recommendations is given regarding vitamins, minerals and trace elements? ☐ 13

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8.) What recommendations is given to patients with diabetes regarding the use of sweeteners? ☐ 14

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9.) What recommendations is given to patients with diabetes mellitus regarding alcohol intake? ☐ 15

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10.) What recommendations is given to patients with diabetes mellitus regarding activity? ☐ 16

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11.) What recommendations is given to pregnant women with diabetes mellitus? ☐ 17

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12.) What recommendations is given to lactating women with diabetes mellitus? ☐ 18

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13.) What recommendations is given to mothers and caretakers of children with diabetes mellitus? ☐ 19

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14.) What recommendations is given to patients with diabetes mellitus regarding food that make diabetic claims? ☐ 20

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Appendix D

Free State Province
Head of Health: Dr. V. Lithlakanyane

Dear Dr. Lithlakanyane

Request to execute research study in Provincial Primary Health Care Clinics

I am a MSc Dietetic student at the University of the Free State. The University together with the South African Sugar Association (SASA), will launch a research project: Application of the current South African dietary guidelines for people with diabetes mellitus by dieticians and nurses

The main aim of the study is to determine if dieticians and nurses apply the current dietary guidelines when counseling patients with diabetes mellitus. Sub-aims include assessment of written information available to patients with diabetes mellitus.

The target study population will include dieticians, registered as Private Practicing Dieticians (PPDs) in the Free State and North-West provinces, which includes dieticians working in private hospitals or as private practicing dieticians. The final sample will also include a randomized, stratified sample of 150 registered nurses working in primary health care clinics and those registered as Diabetes Educators in both provinces.

Dieticians and nurses will be contacted telephonically to schedule appointments in order to conduct interviews. In order to save time because of long distances between small towns and high travel cost, telephonic interviews will be conducted with the nurses. Half an hour interviews will be conducted during a time that best fits the circumstances of the clinic.

Hereby, I request for your informed consent for us to perform this study at Provincial Clinics in the Free State. A representative sample of all clinics in the Free State will be included in the study. The names of the clinics included in the study will be provided to you as soon as the sample is finalized. Attached you'll find a copy of the proposal.

Thank you for your kind co-operation
Sincerely,

Hilana Fourie	Prof. M. Slabber
Researcher	Study Leader

Appendix E

Streek A Bloomforth	Vrystaat		
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Bloemfontein klinieke	Bayswater kliniek	4	Suster Matlolo
	almal werk nie elke dag		Suster Phure
	nie		Suster Pheko
			Suster Wilman
	Chris de Wet kliniek	8	Suster A. Burger
			Suster M. Erasmus
			Suster I. Magwe
			Suster L. Tsabo
			Suster R. Briedenhan
			Suster Myburg
			Suster Mogeti
	Fauna kliniek	2	Mnr. Kitsa
			Suster M. November
	Fichardtpark kliniek	2	Suster E. Pretorius
			Suster L.E. Simpson
	Bloemspruit Kliniek	5	Suster M.N. Moshe
			Suster D.P. Palela
			Suster M. Kubu
			Suster W. Williams
			Suster D. Tsolo
	Langenhovenpark Kliniek	3	Suster Prinsloo
			Suster Jordaan
			Suster Purcell
	Bainsvlei kliniek	2	Suster Nkane
			Suster Mgalo
	Kagisanong	5	Suster Rampoana
			Suster Mohokane
			Suster Mepha
			Suster Mogotso
			Mnr. Mokhelo
	Central Park kliniek		Geen diabete
	Opkoms kliniek	4	Suster Seekoe
			Suster Ntsimenyane
			Suster Mosase
			Suster Tsekeletsa
	Freedom square	3	Suster Moipolai
			Suster Thiti
			Suster Rametsi
	Hilton Kliniek	1	Suster Q. Phurae
	Maandae & Donderd.		
	Monument kliniek	1	
	Woensdae & Donderd		
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Bloemfontein (vervolg)	Heidedal kliniek	Geen diabete	

	MCDC	2	Mnr. Mohotsi Suster Bobobelo
	Mmabana Phahameng Kliniek	6	Suster J. Ramakao Suster Mosese Suster Lali Suster Mochoari Mnr. Mtjobokoaeane Suster Mohohlo
	Thusong Kliniek	3	
	Hostel NO 1	Geen verpleegkundige Slegs Radiografie	
	MUCPP	4	
	Batho Kliniek	2	Suster Ramoetsi Mnr. Sethlare
	Westdene Kliniek	2	
	Wilgehof Kliniek *Slegs Vrydae*	1	
Brandfort	Lukestr. Kliniek	4	Suster N.R. Hardy Suster S. Bosman Suster M.du Plessis Suster G. Serote
	Moranta Kliniek	2	Suster Fhake Suster Ngamole
	Valrock Kliniek	2	Suster G.N. Makomo Suster. G.G. Thike
Dealesville	Tswaraganang kliniek 811 0155	6	Suster Thebang Suster Langka Suster Rantjelebane Suster Mafayane Suster Kobile Suster Myburg (Mobiel)
Deneysville	Deneysville kliniek 016 371 1130	1	Suster Stokes
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Soutpan	Soutpan kliniek 051 683 0398	3	Suster Winkel Suster Matete Suster Lebajoa

Verkeerdevlei	Thsepong kliniek 051 841 1028	2 2	Suster Pherieahae (mobiel) Suster Nkopane (mobiel) Suster van Vuuren (mobiel) Suster Vivier (mobiel)
Totaal Streek A			**82**
Streek B Gariep			
Bethulie	Bethulie Kliniek	3	Suster J.R.Masita Suster Z.A. Taitai Suster S.N. Bakaqa
Dewetsdorp	Dewetsdorp kliniek 541 0595	4	Suster Venter Suster Seluane Suster Pinki Suster Dollie
Edenburg	Nelson Rohlihlahla Mandela Kliniek	4	Suster L.C. Mbaqa Suster M.F. Mohlomi Suster L.G. Mereko Suster T.S.Mohlomi
Fauresmith	Fauresmith	3	Suster Nauhaus Suster Kumolo Mnr. Khonkhobe
Gariepdam	Flora Park Kliniek	1	Suster St. Claire
Jacobsdal	Jacobsdal Kliniek *Begin 6 Mei werk*	7	Suster H. Dekker Suster L. Krause Suster N. du Toit Suster S. Dekker Suster A. Bekker Suster C. Steenkamp Suster Lerato
Jagersfontein	Itumeleng Kliniek	5	Suster Kaeng Suster Leseme Suster Boysen Suster Mei (Mobiel) Suster Maema (mobiel)
Koffiefontein	Koffiefontein Kliniek	6	Suster Mipholo Suster Leshupe Suster Mekwa Suster Naile Suster Mochela Suster Meyer
Luckhoff	Luckhoff Kliniek	3	Suster M. Piek (mobiel) Suster Theron Suster Dippenaar
Oppermans	Oppermans Kliniek	2	Suster M. Romain Suster L. Bradford
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Petrusburg	Petrusburg Kliniek	4	Suster I. Wilson Suster R. Benade Suster M. van den Berg Suster A. Stragen
Philippolis	Philippolis Kliniek	4	Suster E. Smit

			Suster E. Pritchard Suster. N. Intgantweni Suster E. Jakata
Reddersburg	Phekolong Kliniek	3	Suster M.N.C. Mahlae Suster M. du Plessis Suster. N.R. Ncheche
Rouxville	Winnie Madikizela Mandela Kliniek	4	Suster M.E. Stroebel Suster G. Masehana Suster G. Mancipu Suter C van Wyk
Springfontein	Sehularo Tau Kliniek	5	Suster Beukes Suster Likobo Suster Mtlhao Suster Khatene Mnr. Khunou
Smithfield	One-stop Kliniek	3	Suster M.N.Winkel Suter N.M. Mathetha Suster D.A. Lebajoa
Trompsburg	Mamello	4	Suster T.M. Sethlare Suster N.P. Jonoas Suster B.V. Beqhezi Suster A. Grobler
Vanstadensrus	051 584 1118	2	Suster E. Bruwer (mobiel) Suster M. Ingram
Wepener	Ebenhauserhoogte kliniek	5	Suster Tshupi Suster Leota Suster Mosala Suster Letaba Suster Moeketsi
Zastron	Matlakeng Kliniek Zastron Kliniek Boesmanskop Kliniek	1 2 1	Mnr. Tshangela Suster E. Church Suster Nthuleng Suster Fouche
Totaal Streek B			**76**
Streek C Thsepo-kopano			
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Allanridge	Allanridge kliniek Bophelong kliniek	3 2	Suster Radile Suster Bothedi Suster Wium Suster Buthelezi Suster Thabalala

	Leratong kliniek	3	Suster Mosikili Suster Mosebi Suster Mahaseha
Boshoff	Boshoff kliniek	5	Suster M.Mokgele Suster S. Feza Suster M.Chabeli Suster I. Lombard (Mobiel) Suster Opperman (Mobiel)
Bothaville	Kgotsong kliniek Maile kliniek 056 515 6144	1 4	Suster Mototo Suster M.A Mokhothu Suster M. Dasheka Suster R. Motlogoloa Suster M. Tekane
Bultfontein	Burgersentrum 051 853 1418 Phahameng kliniek 051 853 2467	2 5	Suster E. Zietsman Suster H. van Rensburg Suster Kolobi Suster Morata Suster Swanepoel Suster Jona Suster Masoa
Dealesville	Tswaraganang kliniek 811 0155	6	Suster Thebang Suster Langka Suster Rantjelebane Suster Mafayane Suster Kobile Suster Myburg (Mobiel)
Henneman	Henneman Dorpskliniek 057 573 2055 Phomolong kliniek	2 4	Suster G. Maree Suster F. Pelesane Suster Malapo Suster Soodie Suster Mmutsi Mnr. Kgansi
Hertzogville	Hertzogville kliniek 053 421 9622	2	
Hoopstad	Hoopstad kliniek 053 444 1314	5	Suster van Jaarsveld Suster v.d Merwe Suster van Zyl Suster Makunye Suster Makerepla
Odendaalsrus	A.M.Kruger kliniek 057 391 8528	4	Suster B. Marumo Suster J. Botsane Suster T. Mothele

Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Odendaalsrus (vervolg)			Suster G. Mekwa
	Phedisanang kliniek	6	Suster M. Ralele Suster L. Phumo Suster G. Mokhele Suster S. Dichechene Suster K. Tlhaole Suster L. Maboyane
	Boithusang kliniek	5	Suster G. Mutsi

			Suster S Marotholi
			Suster R. Chakana
			Suster H. Mandlazi
			Suster L. Mokhobo
	Bophelong kliniek	5	Suster E. Scheurkogel
			Suster N. Lamani
			Suster M. Sethaloha
			Suster M. Sehloho
			Suster M. Seloane
	Geneva	3	Suster P. Nyamane
			Suster K. Mothabe
			Suster N. Nyetenyane
Theunissen	Theunissen kliniek 057 733 0889	15	Suster Tsotsotso Suster F. Mohbi Suster N. Mpophompo Suster M.J.C Botma Suster J.E.K le Roux Mnr. J.J le Roux Mnr. J.J de Vries Suster Mpahati Mnr. R. Smit Mnr. M. Malethale Mnr. P. Smit Mnr. A.Mokate Mnr. P. Daniel Mnr. J.F Boyen Suster Thamale
Ventersburg	057 651 4031	1	Suster M.M. Moletsane
Virginia	6 klinieke - sal inligting faks	12	
Welkom	Bophelong kliniek 057 382 252	4	Suster Nkuna Suster Letsoha Suster Mokoena Suster Masilo
	Bronville kliniek 057 394 1561	5	Suster Plaatjies Suster Koetjie Suster Nthurubele Suster Eiman Suster Mathews

Dorp	Naam van Kliniek	Hoeveelheid	Naam
Welkom (vervolg)	Khotsong kliniek 057 382 1105	6	Suster M. Mokati Suster P. Nthombeni Suster L.Loeba Suster M. Maweni Suster M. Motsau Suster D. Serekego
	Rheederspark kliniek	2	Suster Mahabuke Suster Phakoe
	Riebeeckstad kliniek	3	

	Thabong kliniek Thsepong kliniek	geen inligting 3 geen inligting 3	
Weselsbron	Weselsbron Kliniek	1	Suster Ramatsele
Winburg	Winburg Dorpskliniek	3	Suster A.M van Straten Suster M.E Lesenjeho Suster K.J Malebo
Totaal Streek C	Kamohelo kliniek	3	Suster M.E Mokoene Suster S.W Bosman Suster Tlhahadi **128**
Streek D Itoseng			
Edenville	Edenville kliniek	Dieetkundige van Kroonstad doen weekliks besoek + gee voorligting vir diabete	Cecilia de Vries (Dieetk.)
Frankfort	Dorpskliniek 813 1015 Philani kliniek Phameng kliniek 082 3353 580	1 4 3	Suster Keefe Suster Mbele Suster Mkhwanazi Suster Motloung Suster Stato Suster Maseko Suster Seisa Suster Molaoa
Heilbron	Heilbron kliniek 852 2014	3	Suster Rothman Suster M.J.S Els Suster M.Berg
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Koppies	Koppies kliniek 056 7771819	6	Suster Human Suster Mosala Suster Senobe Suster Mahlaba Suster Sebego Suster Pitso (mobiel)
Kroonstad	Bophelong kliniek	8	Suster Moselesele Suster Motza Suster Ntlapo Suster Sedikaene Suster Ramotsheoa Suster Sebetoane Suster Mofoeu

			Suster Scott
	Hillstr. Kliniek	7	Suster J.M Hatting
			Suster T. Seheri
			Suster A. Viljoen
			Suster E. September
			Suster J. Kapp
			Suster R. Kroukamp
			Suster A. Grimbeek
	Brentpark kliniek	3	Suster B. Molete
			Suster L.I.B. Bester
			Suster P.M. Kobuoe
	Seeisoville kliniek	7	Suster K.A. Khunjali
			Suster M. Kokonope
			Suster M. Dlamini
			Suster M.R.Ramotsehoa
			Suster D. Mofokeng
			Suster D. Mohoene
			Suster K. Makebe
	Thusanong kliniek	8	Suster Mazavi
			Suster Phakoe
			Suster Naanyane
			Suster Thabe
			Suster Thupudi
			Suster Smit
			Suster Mokenane
			Suster Mpongo
	Tshepong kliniek	8	Suster Molete
			Suster Mqebisa
			Suster Beukes
			Suster Raletoane
			Suster Jordaan
			Suster Bramave
			Suster Selelane
			Suster Boss

Dorp	Naam van Kliniek	Hoeveelheid	Naam
Oranjeville	Mitsimasolo Kliniek	1	Suster M. Mofokeng
	Primêre Gesondheid	2	Suster S.M. Schoeman
	016 351 1600		Suster N.M. Moqatsi
Parys	Thumahole kliniek	5	Suster M.M Manzi
	056 819 8070		Suster M.G. Hannie
			Suster P.P. Leping
			Suster M.M. Lebea
			Suster M.P. Makau
	Thusanong kliniek	2	Suster Lebitse
	056 819 9960		Suster Monkhe
Sasolburg	Dorpskliniek	5	Suster Coetzee
	016 976 0029		Suster van Domelen
			Suster de Wet
			Suster Coetzer
			Suster Brits

	Busstop kliniek	2	Suster Malatse Suster D. Nete
	SPS Tsatsi kliniek	3	Suster Kotsoane Suster Mosebi Suster Tsoai
	Thusanong kliniek	1	Suster Sandamela
	Zameela Gemeenskaps-gesondheidsentrum	6	Suster M.P Rantsing Suster B.E Masimang Suster D. Breed Suster F.F. Khanyile Suster E.Boyesi Suster K. Nokwe
Tweespruit	Boroa kliniek 051 963 0148 *Dinsdae & Vrydae*	2	Suster Hloae Suster Putsoeli
	Dorpskliniek *Maandae & Don.dae*	1	Suster Neethling
Viljoenskroon Inligting verkry by matrone Noge	Gemeenskapsentrum Buite pasiente	18	Suster P.M. Motsemme Suster Y.K. Montsitsi Suster A.M.J. Menge Suster M.N Serapelo Suster N.M Tloome Suster M.N Tsotitsi Suster G.P Dhlamini Suster M.M Manone Suster M.E. Mbambo Suster M.M Rampuru Suster F.D Moreke Suster M.S Noge Suster N.J Mokoena Suster M.E Kzomase Suster M.L Ntseki Suster M.Matebuku Suster A.M Diedericks
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Viljoenskroon (vervolg)			Suster M.E Lipheko
Villiers	Villiers kliniek 058 821 0008	1	Suster N.B. Thabalala
	Phedisong kliniek	4	Suster M.E. Thabalala Suster T.E. Mokeone Suster T.A. Mofokeng Suster M.L. Mofokeng
	Qalabotja kliniek 058 821 0008		
Vredefort	Reledohile kliniek	2	Suster Sabongo Suster Matesa
	GGS kliniek	3	Suster M.E Pule Suster S.M Mofokeng Suster N.Nocada
Totaal Streek D			**116**
Streek E Hlanganai			
Cornelia	Cornelia kliniek	2	Suster Nkozi

	058 8410 723		Suster Sebiloame
Harrismith	Dorpskliniek 058 623 2093 Primere Gesondheid	4 5	Suster Barnard Suster Marais Suster Moiloa Suster Kubheka Suster Mzizi Suster Mofokeng Suster Mafeko Suster Louw Suster Ngcongwane
Memel	Memel kliniek 058 924 0407	2	Suster M.M. Keele Suster N.P. Mokoane
Vrede	Vrede Dorpskliniek Thsepo-themba Kliniek Bophelong kliniek	1 1 2	Suster Mofokeng Suster Mlangeni Suster Msibi Suster Mosemaka
Warden **Totaal Streek E**	Warden kliniek Ezenzeleni kliniek	1 2	Suster Thabalala Suster Hlalaele Suster Nhlapho **20**
Streek F Imperani			
Bethlehem Clocolan Clarens	Bethlehem kliniek Hlohlowane kliniek 943 0582 Clarens kliniek 256 1319	1 4 3	Suster Mbonchi vir sus- ter Sanderson - op verlof tot 3 Junie Suster Moliane Suster Mabote Suster Thelingoane Mr. Mofokeng Suster H. Wilstra Suster D. Motsukumyane Suster N. Hadebe
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Ficksburg	Ficksburg kliniek	6	Suster Mohaladi Suster Teatea Suster Chabane Suster Edmunds Suster Pienaar Suster Lehloemya
Fouriesburg	Fouriesburg kliniek 223 0267	4	Suster A. Matla Suster M.D. Mokhatla Suster D.J. Tlatsa Suster M.A. Lethuthing
Hobhouse	Hobhouse kliniek	3	Suster M.R Swanepoel Suster A. Jaarsen Suster M. Mogorosi
Ladybrand	Dorpskliniek 051 924 0654 Mouersnek kliniek Monatseng kliniek	2 1 3	Suster A. Foort Suster C. Mapate Suster V. Fourie Suster Phoole Suster Tebelo Suster Molapi

	Ikaeng kliniek	3	Suster M. Qhoai Suster P. Motana Suster E. Seqhee
Lindley	Dorpskliniek	2	Suster Keyter Suster Motlaong
	Gemeenskapskliniek	1	Suster Tooane
Marquard	Hoofkliniek 051 991 0021 Faks nr: 051 9910 321	3	Suster Bason Suster Doyle Suster van Zyl
	Kokelong kliniek	2	Suster Melani Suster Motete
	Notnagel kliniek	1	Suster Mofokeng vir Suster Pieterse - op verlof
Paul Roux	Paul Roux kliniek 058 471 0231	2	Suster Rabebe Suster Mokoene
	Fateng kliniek	2	Suster Mbele Suster Mobaza
Petrus Steyn	Petrus Steyn kliniek 058 871 3131	3	Suster E. Taunyane Suster M. de Wet Suster L. Visser
Reitz	Reitz kliniek 058 863 2811	3	Suster Jokozela Suster Dhlamini Mr. Dladla
Senekal	Dorpskliniek (DG) 058 481 2142	1	Suster L. Ferreira
	Matwabeng kliniek (DG) lokasie	1	Suster L. Mokhoro
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Steynsrus	Steynsrus kliniek 056 471 0006	4	Suster Totoane Suster Jwara Suster Motlabe Suster Phakoe
Totaal Streek F			**55**

Streek A	Noordwes		
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Biesiesvlei	Welfare Organization Kliniek	2	Suster Spooner Suster Setshase
Hartebeesfontein *Praat met Suster Scheepers*	Munisipale Kliniek	6	
	Tigane Satile Kliniek	9	Suster Scheepers Suster Tloboro Suster Mokoetsi Suster Zweswe Suster Moleleki Suster Sweta Suster Matlhara Suster Kooreng Suster Marakalla
Koster	Hospitaal Kliniek 014 543 2027 Township Kliniek 014 243 2004 Mobiele Kliniek	2 2 1	Suster T.Masigo Suster S. Seripe Suster M. Kgosimore Suster C. Phumo Suster P. Haasbroek

Lichtenburg Posbus 7	Township Kliniek	5	Suster Muller Suster Ditira Suster Matabegi Suster Lekwakwe Suster Mothlabane
	Boikhitso Kliniek	3	Suster Maposa Suster Coetzee Suster Schoeman
	Blydeville Kliniek	3	Suster Batansi Suster Masiboeka Suster Legai
	Mobiele Kliniek	2	Mnr. Ramthlolo Suster Kaitsane
Ottosdal	018 571 0002	4	
Sannieshof	PHC Kliniek	2	Suster M.E. Thlape Suster G.T. Thare
Swartruggens	PHC Kliniek	1	Suster du Plessis
	Borolelo Kliniek	1	Suster Steyman
Zeerust	PHC kliniek	3	Suster M. Seabi Suster R. Qukani Suster M. Dipale

Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Zeerust (vervolg)	Tswelelopele Kliniek	6	Suster L.K. Semenya Suster M.S.Kgage Suster L.K. Moeti Suster M.B. Momyale Suster I.P. Sebetlela Suster M.S. Modula
Totaal Streek A			**52**
Streek B			

Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Bloemhof	Dorpskliniek 053 4331 357	2	Suster E. Fourie Suster M. Makgatho
	Boitumelong Kliniek	6	Suster Van Rooyen Suster Hlapane Suster Matlhauhel Suster Motsagi Suster Hans Suster Malumbe
	Coverdale Kliniek	1	Suster Mzwaldi
Christiana	Dorpskliniek	1	Suster Swanepoel
	Utlwanang	2	Suster J. Moremane Suster Mokanyane
	Geluksoord Kliniek	1	Suster Ferreira
Schweizer Reneke	Dorpskliniek	2	Suster. S. Janse v. Vuuren Suster Mokoetsi
	Mobiele kliniek	2	Suster M. Matong

			Suster R. Janse v. Vuuren
	Ipelegeng Kliniek	7	Suster Lolwana
			Suster Nthemdu
			Suster Modisadise
			Suster Modise
			Suster Kgomte
			Suster Moalusi
			Suster Mokoetsi
Vryburg	Huhudi Kliniek	12	Suster M.C. Jele
			Suster M. Jonathan
			Suster D. Sejomotso
			Suster D. Lebora
			Suster R. Buthelezi
			Suster J. Butselo
			Suster I. Bohedele
			Suster M. Montewa
			Suster D. Moatshe
			Suster J. Hlakudi
			Suster E. Mere
	Colridge Kliniek	4	Suster B. Moarthi
			Suster Selehelo
			Suster Tong
			Suster Maine
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
	Gateway Kliniek	4	
Totaal Streek B			**44**
Streek C			
Klerksdorp	Munisipale Kliniek	7	Suster Viljoen
	018 462 2151		Suster Jacobs
			Suster Legoale
			Suster Goralotsa
			Suster Makhongoana
			Suster Malefo
			Suster Galana
	Alabama Kliniek	5	Suster Lubbe
	018 467 5009		Suster Appel
			Suster Mokoetsi
			Suster van Heerden
			Suster Nkagisang
	Jouberton Kliniek	9	Suster Oliphant
	018 465 3157		Suster Marawa
			Suster Rakokalo
			Suster Stuurman
			Suster Mitchel
			Suster Vilakazi
			Suster Ntuli
			Suster Oganne
			Suster Moirhoa
	Empilisweni Kliniek	4	Suster M.S.Sesing
	018 465 5590		Suster R.L. Mwundle
			Suster M.E. Oliphant

			Suster R. Daniels
	Thsolofelo Kliniek	3	Suster Tube
	018 465 3740		Suster Fikizolo
			Suster van den Werf
Leeudoringstad	Munisipale Kliniek	3	Suster B.Fouche
			Suster S.A. Kgosi
			Suster S. Pelele
	Kgakala Kliniek	2	Suster G. Morris
			Suster E. Dintoe
Makwassi	Munisipale Kliniek	1	Suster Gouws
	Lebaleng Kliniek	3	Suster Tawana
			Suster E. Mokoetsi
			Suster D. Masisi
Orkney	Munisipale Kliniek	4	Suster R. Marais
			Suster C. Mokanyane
			Suster S. Lesekele
			Suster Stella ?van?
	Kanana Kliniek	3	
	018 476 2125		
018 476 1141	Tel werk nie		
tel werk nie	Grace Mokomo Kliniek	3	
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Potchefstroom	*Top City Kliniek*	*4*	Suster B. Pretorius
Suster Kolbe	*Mohadin Kliniek*	*4*	Suster A.Ellis
Weet nie wie werk by	*Lesego*	*3*	Suster S. Jansen
watter kliniek nie	*Boikithlapi*	*4*	Suster L. de Jager
018 299 5263	*Primosa*	*3*	Suster G. Bansener
		7	Suster Boikanyo
			Suster Bekebeke
			Suster Kgengwe
			Suster Molaolwa
			Suster M. Ntutlwane
			Suster S.Seseng
			Suster M. Makgale
			Suster A. Ledimo
			Suster M. Motswejane
			Suster C. Temane
			Suster F. Tshuinke
			Suster V. Gongxeka
			Suster B. Sepato
			Suster M. Maboe
			Suster J. Nyokong
			Suster R. Thoane
			Suster L. Mosiane
			Suster W. Dithabe
			Suster M. Pinkwane
Stilfontein	PHC kliniek	1	Suster E. Mocke
	Botshabelo Kliniek	13	Suster Moleshi
			Suster Nkodi
			Suster Magakwe
			Suster Bisware

	Khuma PHC kliniek	7 verlof tot 10 Jan Tydelik	Suster Makebalo Suster Monayela Suster Purabatho Suster Seutlolay Suster Ndlovo Suster Seitshiro Suster Metsuamere Suster Mabusela Suster Monaeng Suster Kumalo Suster Lebone Suster Nyatumba Suster Mojahi Suster Mosjake Suster Ramantsi Suster Hofman (mobiel)
Ventersdorp	Thsing Kliniek	5	Suster van Jaarsveld Suster L. Monye Suster C. Leseyane
Dorp	**Naam van Kliniek**	**Hoeveelheid**	**Naam**
Ventersdorp (vervolg)			Suster K. Dinake Suster J. Molope
	Gateway Kliniek Mobiele kliniek	3 5	Suster N.M. Mogano Suster R. Pretorius Suster E. Theron Suster Niemand Suster Laas Suster Neelthling Suster Grobler Suster de Jager
Wolmaranstad	PHC Kliniek Tswelelong Kliniek nr 1 Tswelelong Kliniek nr 2	1 2 5	Suster Lewis Suster M.M. Monabora Suster M.S. Motseki Suster M. Maseko Suster N. Mogeri Suster R. Letsapa Suster N. Sindi Suster K. Molamo
Totaal Streek C			**114**
Streek D			
Brits	Brits Kliniek *Moet eers faks stuur en sê waarvoor inlig-ting nodig*	12	
Totaal Streek D			**12**
Streek E			
Rustenburg	City Counsil	4	Suster Prinsloo Suster Pietersen Suster Serage Suster Dibatana

	Classic Health Kliniek	8	Suster A. Biphoko Suster K. Malapane Suster M. Viljoen Suster N. Kitsa Suster E. Dikjole Suster S. Mothlagg Suster L. Makalusa Suster M. Mohutsiwa
	Gateway Kliniek	4	
Totaal Streek E			**16**

Appendix F

19 May 2003

Nutrition Manager
South African Sugar Association
Mount Edgecombe
Durban
4300

Dear Carol

RE: EXCLUSION OF DIABETES EDUCATORS FROM PROJECT 168 ENTITLED: APPLICATION OF THE CURRENT SOUTH AFRICAN DIETARY GUIDELINES FOR PEOPLE WITH DIABETES MELLITUS.

Hereby confirmation of our telephonic conversation earlier regarding the exclusion of diabetes educators (DE) from this research study.

Finding a list of diabetes educators functioning in the North West and Free State provinces seems to be impossible. Firstly, I have spoken to Hester Davel (a diabetes educator) at Rose Park Hospital in Bloemfontein, October 2002. According to her there was no list available of DE in the Free State until some meetings was to be held early in 2003. Unfortunately she had to move to Gauteng unexpectedly before any meetings could be arranged. Thereafter I spoke to her successor, Donavan Swanepoel, but he was not aware of any such information. Lastly I contacted Eunice Beukes, the National Chairman of Dessa, hoping that she could give me the required information. Surprisingly, even she was not aware of any list of DE's. Furthermore, a diabetes educator practicing in Bloemfontein informed me that she does not give any dietary advice to patients with diabetes mellitus. I discussed these problems with my study leader (Prof M Slabber) and the biostatician (Prof G Joubert). Although both considered the information gathered from nurses and dietitians as sufficient to use as valid and reliable information and to conclude data gathering, we decided to discuss the matter with the Sugar Association as well.

A full report will be sent to the South African Sugar Association as soon as I have finished processing the results.

Yours Sincerely

Hilana Taljaard

Appendix G

30 Mei 2002

Voorsitter
Etiekkomitee
Fakulteit Gesondheidswetenskappe
Universiteit van die Vrystaat

Geagte Professor,

ETOVS NR: 53/02
NAVORSER: ME HILANA FOURIE
PROJEK TITEL: ASSESMENT OF THE INFORMATION CONVEYED IN THE EDUCATION OF PATIENTS WITH DIABETES MELLITUS BY NURSES AND DIETICIANS.

Probleme is ondervind met die uitvoer van bovermelde studie deurdat die Gesondheidsowerhede in Kwa-Zulu Natal nie toestemming wou gee om die studie daar uit te voer nie. Die Suikervereniging, wat die studie borg het aanbeveel dat die Gesondheidsowerhede in die Noordwes Provinsie genader word vir toestemming dat die studie aldaar uitgevoer word. Voorts het die Suikervereniging ook die volgende wysigings van die protokol aanbeveel:

- dat toepassing van al die dieetriglyne soos voorgestel in 1997, en nie slegs suikerinname evalueer moet word;
- dat onderhoude met verpleegkundiges telefonies gevoer word om koste en tyd te bespaar;
- dat die titel verander.

Na aanleiding van bovermelde aanbevelings het die evalueringskomitee weer op 2 Mei 2002 vergader en die protokol is sodanig gewysig. Aangeheg ‘n gewysigde protokol. Die titel is ook as volg gewysig.

NUWE TITEL: APPLICATION OF THE CURRENT DIETARY GUIDELINES FOR PEOPLE WITH DIABETS MELLITUS BY DIETICIANS AND NURSES

Vriendelike groete,

Prof M Slabber (Studieleier)

Appendix H

Informed Consent Form

I _____ hereby declare that I grant my infirmed consent to complete the interview by providing the necessary information, as explained to me.

I am completely informed about the aims of the study and pledge to be available for any other commendation necessary for the project.

I also authorize the researcher to use the results of the study for any sort of publication, if my anonymity is protected. I trust that the information will not be used for any other purposes.

I give my permission out of free will and I am aware that I can withdraw from the study at any time.

Signed at_____ on _____ (date)

_____

Participant

_____ 083 411 8643

Researcher Contact number

****

Ingeligte toestemmings vorm

Hiermee verklaar ek_____ dat ek my toestemming verleen tot die deelname aan die navorsingsprojek, soos aan my verduidelik.

Ek is ten volle ingelig aangaande die doel van die studie, asook dat verdere inligting van my benodig mag word.

Ek verleen ook my toestemming dat resultate van hierdie navorsingsprojek vir publikasie gebruik mag word, mits my anonimiteit te alle tye beskerm word.

My toestemming word uit vrye wil verleen en ek besef ook dat ek my toestemming te enige tyd kan herroep.

Geteken te_____ op _____ (datum)

_____
Respondent

_____ 083 411 8643
Navorser Kontak nommer

Appendix I

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister/Dietician…….

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse/Dietician

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister/Dietician…….

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse/Dietician

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Du Toit

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Kobile

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Van Zyl

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mototo

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Jonoas

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Kolobi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Soodie

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Sethakga

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Maboyane

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Bosman

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mepha

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Ramakao

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Wies

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Bradford

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Fouche

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Mr. Kitsa

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Myburg

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Seloane

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mereko

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Stroebel

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Rothman

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Kobuoe

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Nkuna

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Mr. Mohotsi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Moloi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Seisa

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mandlazi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Nauhaus

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Welman

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Lesenjeho

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Khunyali

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Eiman

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Lebea

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Van Domelen

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Tamale

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Breed

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Keele

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Poole

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Leeba

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Human

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Thabalala

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mabote

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Mchaze

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Hatting

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Molapo

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Makomo

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Msibi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Phaku

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Sequee

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Febudi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Dhlamini

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mokhatla

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Hadebe

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Toloane

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Burger

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Researcher

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Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Scott

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Researcher

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Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Taita

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mothabe

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Jordaan

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mokhoro

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mathetha

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Visser

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Ferreira

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Batansi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Steyman

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Gouws

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Malumbe

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Villakazi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Pretorius

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Selehelo

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at the clinic where you are working. I hereby kindly request copies of this information. If no written or printed information is distributed at your clinic, kindly return the attached slip.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Manong

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Diphoko

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Nyatumba

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Nyatumba

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Jele

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Modise

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Scheepers

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Lebethe

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Laas

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Pretorius

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Gonxeka

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Maboe

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Makgale

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Seseng

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Nkagisang

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Malefo

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Prinsloo

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Kgosi

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

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Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Comakae

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Hilana Taljaard

_____

Researcher

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_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Mokanyane

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Galane

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Sister Monabona

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear ……

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear ……

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at the _____ (name of clinic) in _____ (town/city).

_____

Signature of nurse

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Ilsabe

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at my practice to patients with Diabetes Mellitus

_____

Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Marinda

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at my practice to patients with Diabetes Mellitus

_____

Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Lucy

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at my practice to patients with Diabetes Mellitus

_____

Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Dedre

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

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Kind Regards

Hilana Taljaard

_____

Researcher

No written or printed information distributed at my practice to patients with Diabetes Mellitus

_____

Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Nereen

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

Many thanks also for your kind co-operation at the time of the interview. I realise that it must have been difficult finding time to answer the questions during working hours.

Presently we are in the final stages of concluding the research study. However, I require some additional information regarding written or printed information (i.e. pamphlets, posters, leaflets etc.) that are available to patients with diabetes mellitus at your practice. I hereby kindly request copies of this information. If no written or printed information is distributed, kindly return the attached slip.

Please note that all information will be handled with confidentiality and anonymity. I would appreciate it if you could return the information as soon as possible in the included envelope.

Kind Regards

Hilana Taljaard

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Researcher

No written or printed information distributed at my practice to patients with Diabetes Mellitus

_____

Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Elmarie

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Christiaan

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Ina

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Wendy

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Mareon

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Kind Regards

Hilana Taljaard

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Researcher

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Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Laetitia

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Hilana Taljaard

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Researcher

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Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Marieta

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Carla

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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Signature

28 January 2003

RE: WRITTEN/PRINTED INFORMATION TO PATIENTS WITH DIABETES MELLITUS FOR RESEARCH PROJECT

Dear Antonette

Thank you for your willingness to participate in the research study titled: **Application of the current South African dietary guidelines for people with Diabetes Mellitus**

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Kind Regards

Hilana Taljaard

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Researcher

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Signature