UNIVERSITY OF KWAZULU·NATAL

FUNCTIONAL HEALTH LITERACY AND ASSOCIATED GLUCOSE CONTROL OF BLACK, SOUTH AFRICAN PATIENTS, 30 YEARS AND OLDER, WITH TYPE 2 DIABETES ATTENDING THE DIABETES OUTPATIENT CLINIC AT EDENDALE HOSPITAL, PIETERMARITZBURG, KWAZULU-NATAL

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PREFACE

The work within this dissertation was conducted in the School of Agricultural, Earth and Environmental Sciences at the University of KwaZulu-Natal. The supervisors were Doctor Suna Kassier and Professor Frederick J. Veldman.

Signed: _____ Date: _____

René Burns (candidate)

As supervisor of the candidate I agree to the submission of this dissertation.

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Doctor Susanna Maria Kassier (Supervisor)

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ABSTRACT

Type 2 Diabetes is one of the fastest growing diseases of lifestyle in South Africa. It is suspected that this increase in incidence is directly linked to sedentary lifestyles, consumption of unhealthy foods and population and culture shifts due to urbanisation. Diabetes is preventable when diagnosed early and attention is therefore being given to health education and lifestyle intervention, which will effectively impart knowledge of diabetes to patients. In order to impart knowledge in a way that will be understood by patients with varying levels of education, functional health literacy needs to be tested to ensure education programmes are effective.

Functional health literacy (FHL) can be defined as the extent to which patients acquire, process and understand basic health information needed to make appropriate health decisions. Diabetic patients with a low level of FHL often do not possess the knowledge to effectively manage their disease, resulting in poor adherence of treatment, inadequate control of glucose and higher morbidity and mortality rates. Due to the high illiteracy rate and poverty levels, diabetic patients in South Africa do not have the basic skills, knowledge or means available to effectively manage their disease. To develop a more effective health programme for diabetic patients which will cater specifically to patients from underdeveloped and resource-poor settings, a baseline FHL needs to be ascertained and problem areas identified.

A multiple-choice FHL questionnaire was designed in order to test the FHL of patients attending an outpatient, diabetic clinic within Edendale hospital, one of the major sub-urban areas in Pietermaritzburg, KwaZulu-Natal. Functional health literacy scores were then compared to average glucose control to ascertain whether FHL does have a role to play in poor glucose control in this population group. Responses were recorded to determine what knowledge on diabetes they did have, patients' first contact with the healthcare system and where patients would prefer to learn about diabetes.

FHL scores for both male and female genders were low, with a significant difference in FHL scores found between male and female participants ($p<0.025$) when Levene's test for Equality of Variances was applied to the statistics. Male participants had a mean FHL % of 48.155 and female participants had a mean FHL% of 46.713. The mean glucose levels of the participants was 13.9 (± 14.7), indicating poor glucose control. Over a third (34.7%) of participants had a normal post-prandial glucose level on the

morning of the study, with the target value for majority of patients being between 4.0 – 7.0 mmol/l. The participants in this study's had a mean HbA1c of 11.9, with only four participants maintaining an HbA1c value of < 7.5%, with none achieving a value of below 7%.

The significant difference between male and female participant's FHL could be attributed to the preferred source of healthcare where education was received. Female participants were more likely to attend primary healthcare clinics when experiencing symptoms of diabetes, or any other illness, with 73% of female participants being diagnosed at their local clinic. Male participants reported to prefer to go to their local hospital to receive healthcare and were more likely to be diagnosed at hospital level than that of their female counterparts. This preferred source of healthcare might affect the level and type of health education received by patients, as there is currently no formal education programme for diabetic patients at clinic level.

A highly significant correlation was found between the highest grade attained by participants in the study versus the age of the participant (Pearson value = -0.415; p = 0.000, N=89). A significant correlation was found between the age of the participant and their HbA1c levels (Pearson value = 0.214; p = 0.044; N = 89), which could be due to lower FHL% being found in older patients with lower levels of schooling. A highly significant correlation was found between the FHL % and highest grade achieved (Pearson value = 0.341; p = 001; N = 89). A highly significant correlation was also found between age at diagnosis of diabetes and the highest grade achieved (Pearson value = -0.343; p – 0.001; N = 84). A significant correlation was found between HbA1c and FHL% (Pearson value = -0.232; p = 0.028; N = 89) indicating that functional health literacy has an effect on the blood glucose of participants. Although this finding is expected, it is important to note that FHL% was affected by the age of participants and highest grade attained at school. It is therefore important that any diabetes self-management education programs consider not just the literacy of patient, but the age of participants and their degree of schooling.

Due to the paucity of published research on FHL in a South African setting, it is suggested that further research into FHL in diabetes should be conducted in different populations within South Africa. Due to the disparity in literacy rates seen in South African, the adapted FHL on diabetes questionnaire, designed and used in this study, might be of value when adapted for use among other diabetic population groups in South Africa.

ACKNOWLEDGEMENTS

I would hereby like to humbly acknowledge and thank Dr Kassier and Prof Veldman for their support and encouragement during this study – their unwavering faith during this time has been immeasurably important. Their supervision, reassurance and inspiration has made this study possible, and my thanks cannot be expressed in words.

Furthermore, I would like to thank Edendale Hospital's management – under leadership of Mrs ZSI Ndwandwe as CEO, and Dr G Ojo as Medical Manager – for approving this study and allowing it to be conducted at Edendale Hospital's Diabetic clinic whilst undergoing massive restructuring and construction.

To the nursing staff and doctors working at Edendale hospital's diabetic clinic – thank you for putting up the big fight and fighting for patient's health. Your daily sacrifice is often not seen or acknowledge – you are truly the unsung heroes.

To my family and friends who has supported me during the late nights and early hours and all the in between cups of tea – your love and support has made this process a little bit easier. I am blessed beyond measure to have such a fantastic support system!

DEDICATION

This dissertation is dedicated to every diabetic who has felt lost and alone when initially diagnosed, every time they've had a high blood glucose level and didn't understand why, and every time they received "health education" they did not understand. May this dissertation assist a little in alleviating the stress during diagnosis, and may all health professionals aim in providing health education that is easily understood and effective in making a difference in every person's life. Always remember that when something bad happens you have three choices; you can let it define you, let it destroy you or you can let it strengthen you.

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Chapter 1. THE PROBLEM AND ITS SETTING

1.1 Motivation for the study

Type 2 Diabetes is one of the fastest growing diseases of lifestyle in South Africa (Franz, Boucher, Green-Pastors & Powers 2008). It is suspected that this increase in incidence is directly linked to sedentary lifestyles, consumption of unhealthy foods, and population and culture shifts due to urbanisation (SEMDSA 2012). The International Diabetes Federation (IDF) has estimated that up to 13% of the South African population will develop diabetes at some stage of their lifetime (IDF 2012). Nevertheless, diabetes is preventable and reversible when diagnosed at an early stage and therefore attention is being given to health education and lifestyle intervention to prevent the extent and spread of the disease (SEMDSA 2012). Focus has therefore been drawn to ways and means of education that will effectively impart knowledge of diabetes in order to prevent the onset, and/or treat progression of this chronic disease of lifestyle (Jeppesen, Coyle & Miser 2009).

The norm in educating patients is to use written material, explaining the disease processes and its management, and instructions on ways in which patients can take care of themselves (Williams, Baker, Parker & Nurss 1999). Kandula, Nsiah-Kumi, Makoul, Sager, Zei, Glass, Stephens & Baker (2009) reasons that the complexity of the information, concepts and the language used in these diabetes education materials may be to blame for poor patient compliance to their prescribed treatment and required lifestyle changes. Williams *et al.* (1999) also shares the same sentiment and states that these materials are written at a level that only favours people with a high literacy level. Therefore patients with a lower literacy level struggle to comprehend the crucial information written in these materials, rendering the education process unsuccessful.

Literacy levels are usually defined by an individual's ability to read and write. This definition is complicated by the need to know what is written or read, the purpose thereof and how well the task is functionally illiterate (Stats SA 2014). This raises a concern when any educational intervention or programme is developed as literacy levels needs to be assessed prior to implementing the intervention.

Functional health literacy (FHL) can be defined as the extent to which patients acquire, process and understand basic health information needed to make appropriate health decisions (Jeppesen *et al* 2009). As a result, patients with a low level of FHL and low level of education have been shown to influence the

effectiveness of health interventions in international studies due to poor understanding and integration of knowledge (Kandula *et al* 2009; Tang, Pang, Chan, Yeung & Yeung 2007; Kim, Love, Quistberg & Shea 2004). Research conducted in South Africa has shown that traditional beliefs and culture also play an important role in decision making regarding health care and treatment adherence (Hughes, Aboyade, Clark & Puoane 2013; Mshunqane, Stewart & Rothberg 2012).

Various studies among the international research communities have shown that FHL may be determined using a questionnaire with multiple choice questions (Chew, Bradley, & Boyko 2004). Various questionnaires have been designed using the Short Test of Functional Health Literacy in Adults (STOFHLA) as a basic template. These questionnaires have been adapted to various conditions, including diseases of lifestyles such as Type 2 Diabetes and Hypertension (Schillinger, Grumbach, Piette, Wang, Osmond, Daher, Palacios, Sullivan & Bindman 2004).

A study conducted by Schillinger *et al* (2004) has shown that a STOFHLA questionnaire adapted for patients with Type 2 Diabetes was effectively used to determine the link between diabetic health literacy and glycaemic control. Unfortunately, it would seem that there is a paucity of local published data regarding the effect of FHL and traditional beliefs on blood glucose control in diabetics. Without this valuable information, diabetes education programmes can often fail as they often fail to consider the patient's lack of understanding of the disease, and how their knowledge, literacy level and traditional beliefs affect their understanding of the disease and adherence to treatment.

It is for this reason that FHL should be tested on a group of diabetic patients from a resource-poor setting to determine the health literacy level of these patients and what affect it has, if any, on glycaemic control.

1.2 Aim of the study

The aim of this study was to determine the functional health literacy and associated glucose control of black, South African patients, 30 years and older, with Type 2 Diabetes attending the Diabetes Outpatient clinic at Edendale Hospital, Pietermaritzburg, KwaZulu-Natal.

1.3 Objectives of the study

For the purpose of this study, the following objectives were formulated:

1.3.1 To determine the functional health literacy of black South African outpatients of both genders with Type 2 Diabetes attending the Diabetic clinic at Edendale Hospital, Pietermaritzburg through the use of a multi-lingual questionnaire.

1.3.2 To determine the preferred source of education of black South African outpatients of both genders with Type 2 Diabetes attending the Diabetic clinic at Edendale Hospital, Pietermaritzburg.

1.3.3 To determine the level of education of black South African patients attending the Diabetic clinic at Edendale hospital, Pietermaritzburg and whether the level of education is associated with functional health literacy.

1.3.4 To determine glycometabolic control by assessing existing blood values in patient files, inclusive of HbA1C, fasting- and random blood glucose values, as well as renal function tests.

1.3.5 To investigate if functional health literacy and the level of education is associated with glycometabolic control of black South African patients attending the Diabetic clinic at Edendale hospital, Pietermaritzburg.

1.4 Definition of terms

The following terms were used in this study:

1.4.1 Functional Health Literacy

Functional health literacy (FHL) can be defined as the extent to which patients acquire, process and understand basic health information needed to make appropriate health decision (Jeppesen, Coyle & Miser 2009).

1.4.2 Diabetes Mellitus

Diabetes Mellitus is a disorder of metabolism due to defective action or insufficient secretion of insulin by the pancreas. This causes disturbances in metabolism of carbohydrates, fats and protein, resulting in

chronic hyperglycaemia. Chronic hyperglycaemia causes damage to fine blood vessels, resulting in retinopathy, nephropathy and neuropathy (SEMDSA 2012).

1.4.3 Type 2 Diabetes

Type 2 Diabetes is more commonly found in patients above 30 years of age and is often found in patients with morbid obesity and/or abdominal obesity (SEMDSA 2012). Whereas Type 1 Diabetes is characterised by pancreatic beta-cell destruction resulting in a marked decrease in insulin production and secretion, Type 2 Diabetics exhibits cellular insulin resistance and secretory defects (SEMDSA 2012).

1.4.4 HbA1C (Glycosylated haemoglobin)

Glycosylated haemoglobin is a form of haemoglobin that is formed in a non-enzymatic glycation pathway by haemoglobin's exposure to the presence of glucose molecules. Glycosylated haemoglobin is tested in diabetics to determine the average plasma glucose levels for the last two to three months and is therefore a more accurate way to determine glycometabolic control (SEMDSA 2012).

1.5 Delimitations of the study

The following set of limitations was specified during the study:

1.5.1 The study was only conducted on outpatients attending the Diabetic Outpatient clinic at Edendale Hospital, Pietermaritzburg, KwaZulu-Natal. Edendale Hospital was chosen as the study centre as it serves a wide community of people and is the main referral centre for patients with diabetes after being diagnosed. This ensures that patients attending the outpatient clinic has already been diagnosed and started on medication and received health education from the primary referral clinics. This results in a baseline having been already established for testing of functional health literacy.

1.5.2 Study participants of black ethnicity were chosen as they have historically been disadvantaged in South Africa due to political and cultural unrest prior to 1994. Education levels are also often poor due to the above mentioned disadvantages and resource-poor settings they currently live in. Recent studies have shown that poor education levels negatively affect health outcomes, resulting in accelerated progression of disease. Considering the above, and the paucity of data on functional health literacy in black diabetic patients, it was decided that only black patients of South African heritage would be considered for this study.

1.5.3 Only patients between the ages of 30 – 70 years of age were chosen to participate in this study. As there is sometimes an overlap between Type 1 and Type 2 diabetes during the late teens and early twenties, it was decided that 30 years of age would be the youngest age considered for this study.

1.5.4 Only patients that have been diagnosed with Type 2 diabetes and have been on treatment for more than three months were considered for inclusion in this study. As newly-diagnosed patients often have uncontrolled blood glucose and have not yet received basic education on their condition, it was decided that all patients had to be treated at the outpatient clinic for more than three months before being included in this study. This three month grace period would allow for patient's blood glucose to stabilise on treatment and receive health education offered by the outpatient clinic.

1.6 Assumptions of the study

1.6.1 It was assumed that the sample of the participants selected would be representative of the target group.

1.6.2 It was assumed that the responses given by the participants would be honest and reflective of their inherent knowledge and that the data generated from this sample would be free of bias. To ensure this, and to reduce participant confusion, all questions had multiple choice answers that were illustrated with pictures or diagrams.

1.6.3 It was assumed that the fieldworker who conducted the interviews phrased the questions correctly, did not hint at the correct answers and recorded the participant's answers correctly.

1.6.4 It was assumed that all participants had received some form of health education on diabetes during or after their diagnosis and prior to starting treatment.

1.6.5 It was assumed that all participants who partook in this study have been correctly diagnosed and were receiving the correct treatment for their condition.

1.7 LIST OF ABBREVIATIONS

AADE	:	American Association of Diabetes Educators
DM	:	Diabetes Mellitus
DSME	:	Diabetes self-management education
FHL	:	Functional Health Literacy

HbA1c	:	Glycosylated haemoglobin
IDF	:	International Diabetes Federation
NCD	:	Non-communicable disease
NICE	:	National institute for health and care excellence
NVS	:	Newest Vital Sign
REALM	:	Rapid Estimate of Adult Literacy in Medicine
SANHANES:		South African National Health and Nutrition Examination Survey
SEMDSA	:	Society of Endocrinology, Metabolism and Diabetes of South Africa
STOFHLA	:	Short test of functional health literacy in adults
TOFHLA	:	Test of functional health literacy in adults
WHO	:	World Health Organisation

1.8 OUTLINE OF THE DISSERTATION

The structure of the thesis will follow, with chapter two including an extensive literature analysis, in which the most critical information required to interpret the hypothesis and the results of this study, is examined. Chapter three explains and gives the motivation behind experimental methods used during the study. The results of the study are supplied in Chapter four. In Chapter five, the results of the study are discussed and compared to previous studies. Finally, in Chapter six, the results, conclusions, and recommendations are made from the study results. The possible application of the findings is also highlighted and discussed in depth. The Harvard style of referencing was used throughout the dissertation when authors of journal articles and books were cited.

Chapter 2. REVIEW OF THE RELATED LITERATURE

2.1 INTRODUCTION

2.1.1 Prevalence of Diabetes Mellitus

The International Diabetes Federation (IDF) (2013) currently estimates that there are 382 million people living with diabetes worldwide – 8.3% of the global adult population. Current calculations by IDF (2013) have also shown that 175 million of the world's population have diabetes which remains undiagnosed and untreated (IDF 2013). Low- and middle-income countries seems to be the hardest hit with 80% of those affected with diabetes living in these resource poor countries. The latest statistics released by the IDF, based on global research conducted on the prevalence of diabetes, estimates that by 2035, the global prevalence of diabetes would have increased to 592 million people, with the most significant increase seen in the sub-Saharan Africa (IDF 2013).

The prevalence of Diabetes Mellitus (DM) in low- and middle income countries is increasing rapidly as a result of economic development resulting in urbanisation, acculturation and a change in dietary habits and lifestyle (Whiting, Guariguata, Weil & Shaw 2011). Changes in dietary and activity patterns results in a rapid nutrition transition, which in turn, has led to an increase in the prevalence of obesity and non-communicable diseases (NCDs) in middle-income, transitional countries such as South Africa (Turok 2001).

The IDF (2013) estimates that in South Africa there are currently 2.6 million people living with diabetes between the ages of 20 and 79 years of age. This accounts for 9.27% of the SA population, the fifth highest prevalence rate within the African continent (IDF 2013). By 2035, the IDF estimates that the prevalence of diabetes in Africa would have increased by 109.1%, affecting an estimated 5.4 million people. Considering that SA is deemed a middle-income, transitional country with development still haltered by gross inequality in income (Stats SA 2014), an increase in the prevalence of diabetes is of particular concern, considering the effect it has on local health expenditure.

2.1.2 Global Health Expenditure

Global health expenditure is rising exponentially as a result of the increasing prevalence of diabetes, with Zhang, Zhang, Brown, Vistisen, Sicree, Shaw and Nichols (2010) reporting that the global health expenditure on diabetes care reaching an excess of US $376 billion or 12 % of the total health expenditure. In addition, in their recent review, the IDF has estimated that US $548 billion is being spent on diabetes care globally, a trend that seems to be increasing exponentially (IDF 2013). However, a large disparity in health expenditure exists between the different international regions, with the low- and middle income countries only spending 3% of their annual health expenditure on diabetes care (IDF 2013).

Diabetes places a burden on the health care systems as diabetics require regular outpatient visits, utilise more medication, are more likely to be hospitalised and/or require emergency care compared to that of non-diabetics (Zhang *et al* 2010). There is however, a large disparity in health care expenditure when comparing developed to developing countries, with an estimated 91% of the global health expenditure being spent by developed countries on the management of diabetes, whilst in developing countries only 9% of global health expenditure is being spent on diabetes care (IDF 2013). Of further concern is that diabetes also affects the productivity of those who suffer from it, thereby resulting in the loss of income (Zhang *et al* 2010). This creates a vicious economic cycle as productivity loss and higher disability rates decreases the gross national income capital, which in turn results in a decreased amount money nationally available to spend on health care (Zhang *et al* 2010).

2.1.3 Mortality rates for diabetes

The IDF's recent position statement on diabetes has reported that more that 5.1 million global deaths in 2013 were as a result of diabetes (IDF 2013). The IDF has also estimated that every 6 seconds a person dies from diabetes, with close to half of these deaths occurring in those younger than 60 years of age. According to a recent systematic review and meta-analysis conducted by Nwaneri, Cooper & Bowen-Jones (2013) on published data from 1990–2010, macrovascular disease was the leading cause of death

in patients with diabetes, with coronary vascular disease, renal disease and cerebrovascular disease being the major contributors to mortality rates in this disease category.

In South Africa, recent data released by Statistics SA for the period 2010 - 2012, has shown that diabetes was the fifth leading cause of natural death in 2012 (Statistics SA 2014). When comparing data documented for 2010 to 2012, it was found that diabetes mellitus as causative agent for mortality has steadily increased from 3.9% to 4.4% within a relatively short period.

In KwaZulu-Natal, mortality data for 2012 revealed that diabetes mellitus is the third leading causes of underlying natural deaths, with 5.2% of deaths in the province being attributed to diabetes mellitus (see Table 2.1). Of further concern is that there seems to be a gender disparity, with diabetes being the third leading cause of mortality in women across all ages with 6.7% of deaths attributed to diabetes; whilst in men, diabetes is the sixth leading cause of death at 3.8% (Stats SA 2014). Analysis of the data also showed that over the age of 50, the leading cause of death for women was diabetes mellitus (12.8%), followed by tuberculosis (9.5%) and cerebrovascular disease (8.2%) respectively. In men older than 50 years, the leading causes of death were tuberculosis (14.7%), diabetes mellitus (7.0%) and cerebrovascular disease (5.9%) respectively.

In a country were the prevalence of HIV/AIDs is one of the major focus area in health care, it is of concern to see that a NCD like diabetes mellitus is a greater contributor to mortality than HIV/AIDS (Stats SA 2014). Although this phenomenon can be attributed to the progress in the management HIV/AIDS (Stats SA 2014), it would seem that the future focus of the healthcare system will need to be shifted to developing management programs for non-communicable diseases, such as diabetes mellitus.

Table 2.1: The ten leading underlying natural causes of death, 2010 to 2012

Cause of death (based on ICD-10 codes)	2010			2011			2012		
	Rank	Number	%	Rank	Number	%	Rank	Number	%
Tuberculosis	1	63 375	11.6	1	54 827	10.7	1	47 472	9.9
Influenza & pneumonia	2	39 275	7.2	2	33 742	6.6	2	26 385	5.5
Cerebrovascular disease	5	24 841	4.5	3	26 019	5.1	3	23 994	5.0
Other forms of heart disease	4	26 003	4.7	4	23 822	4.6	4	21 612	4.5
Diabetes mellitus	6	21 637	3.9	5	21 062	4.1	5	21 230	4.4
HIV / AIDS	7	18 501	3.4	7	17 274	3.4	6	18 663	3.9
Hypertensive diseases	8	14 981	2.7	8	15 726	3.1	7	16 195	3.4
Other viral diseases	10	12 742	2.3	9	14 749	2.9	8	15 057	3.1
Intestinal infectious diseases	3	27 576	5.0	6	19 528	3.8	9	14 948	3.1
Chronic lower respiratory diseases	9	13 194	2.4	10	13 223	2.6	10	12 228	2.5

Source: Adapted from Statistics SA (2014, pp 34)

2.2 Diabetes Self-Management Education Programs (DSME)

The National Institute for health and care excellence (NICE) describes Diabetes Self-Management Education (DSME) as the cornerstone of care for all patients with diabetes mellitus (NICE 2014). According to the 2012 Society for Endocrinology and Metabolic Diseases in South Africa's (SEMDSA) Guidelines for the Management of Type 2 Diabetes, education programs targeted specifically at diabetes

management and care, promotes compliance and adherence by facilitating behavioural change (JEMDSA 2012). According to SEMDSA it would require an average of 23.6 hours of DSME to reduce the patient's glycosylated haemoglobin (HbA1c) by 1% (JEMDSA 2012). Although this process is considered to be extremely labour intensive, the importance of such a programme far outweighs the amount of time spent on patient education and support and is seen as extremely cost–effective intervention (NICE 2014, JEMDSA 2012).

The American Association of Diabetic Educators (AADE) reported that although DSME is found to be a crucial step in managing the progression of diabetes, many patients have not received formal education on managing their diabetes (AADE 2011). This is of tremendous concern when a developed country such as the United States of America, with ample financial- and human resources, is unable to provide sufficient education to diabetics. The question then arises whether South Africa, a country with a large disparity between income groups and a lack of resources (STATS SA 2014), has a similar problem?

A review of DSME in South Africa conducted by Dube, Van den Broucke, Dhoore, Kalweit & Housiaux (2015) found that diabetes education is limited in scope, content and consistency, and that most programmes originated from developed countries. This resulted in a lack of DSME being adapted to cultural needs and perspective. Dube *et al* (2015) also noted that DSME is rarely addressed in South African' national policy and guidelines on NCDs and/or diabetes, resulting in DSME programmes being largely unstructured and monitored for efficacy (Dube *et al* 2015).

Msunqane, Stewart & Rothberg (2012), conducted a study on diabetic patients at a government facility in the South African province of Gauteng. Their findings were that patient knowledge was extremely lacking in all patients who participated in focus groups. The patient's knowledge was also affected by socio-economic factors and the inability to understand the concept of diabetes as a disease, with the majority of participants reporting that "diabetes was a death sentence" (Msunqane *et al* 2012).

Amod, Riback & Schoeman (2012) conducted a survey in the private healthcare sector of South Africa and found that 69.6% of diabetics surveyed (N=899) were not well controlled as they presented with an HbA1c of above 7%, despite adequate resources and appropriately implemented clinical guidelines for

medication prescriptions. These findings were reflected in a study conducted by Van de Sande, Dippenaar & Rutten (2007) in the Heidedal community health centre in Bloemfontein in 2005. A total of 247 diabetic patients were assessed and socio-economic, disease related, lifestyle parameter and education variables were collected. These variables were then analysed against glycaemic control. The study found that only 18% of patients had a fasting blood glucose level of below 7 mmol/l, indicating poor glycaemic control. This of great concern when considering that in South Africa, the majority of patients do not have access to adequate resources to manage their disease appropriately and are treated by the public health sector.

It would therefore seem that, irrespective of whether a country has adequate resources for diabetes education and patient care, or whether it is severely limited in its capacity to provide adequate health care, there are external factors such as socio-economic factors and level of literacy that affect the overall success of any diabetes self-management education program.

2.3 Socio-economic barriers to effective health care provision

The AADE (2011) found that health status and quality of life are affected by cognitive, emotional, social and situational factors, and that these factors should be identified and addressed prior to DSME programmes being implemented. This will ensure that diabetes educators set realistic and achievable behavioural goals which in turn will ensure that optimal self-care is achieved (AADE 2011).

Brown, Ettner, Piette, Weinberge, Gregg, Shapiro, Karter, Safford, Waitzfelder, Prata & Beckles (2004) compiled a conceptual framework after reviewing relevant literature in order to determine a causative link between socioeconomic factors and health status among diabetics. Brown *et al* (2004) found that healthcare is often not sought by those of a low socio-economic background, as patients feel that public health facilities do not provide support or understand the hardships they are faced with. The conceptual framework compiled by Brown *et al* (2004) as outlined in Figure 2.1 shows that a patient's level of education, financial stability and health literacy, together with race, gender and age have a direct impact on health outcomes.

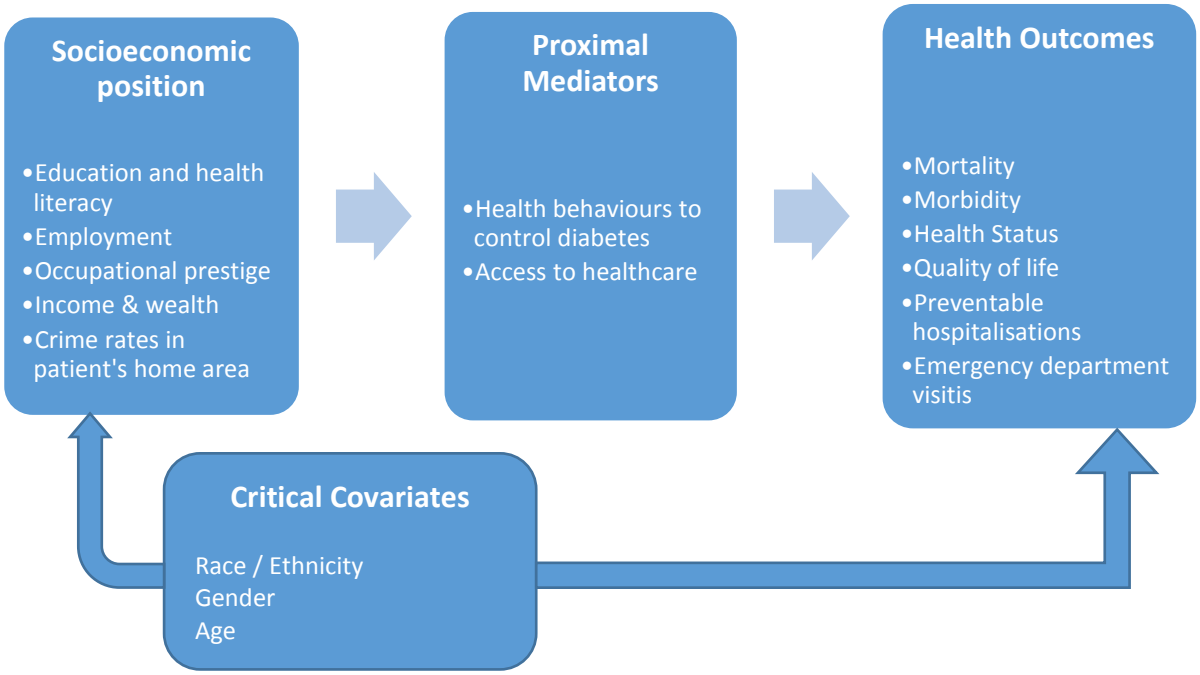

Figure 2.1: Conceptual framework for the relation between socioeconomic factors and health among persons with diabetes mellitus after Brown *et al* (2004)

An analysis conducted by Kapur (2007) on the cost of care for diabetics in the healthcare system in India, a low- to middle income transitional country, found that the level of education of patients was a major determinant of the cost of healthcare, as this variable had an effect on how soon symptoms were recognised, when a diagnosis was made at a local healthcare facility, as well as how compliant patients were with their treatment. The Cost of Diabetes in India (CODI) study surveyed 5 516 diabetics receiving active treatment and found that those who were uneducated, unemployed and lived in semi-urban and rural areas, were more likely to be diagnosed at a later stage of disease onset, only after complications had already developed. These patients were also less adherent to treatment, required more contact time with medical health care professionals and cost the healthcare system more (Kapur 2007).

In order to ensure that diabetes care programmes are successful and cost-effective, cognisance needs to be taken of the target audience's level of education and functional health literacy (FHL). Without taking this important cornerstone into consideration, the majority of diabetes care programmes, whether it be at a primary care level or tertiary facility intervention will fail - as a result of patient's inability to understand basic concepts that influence any healthcare decision and/or intervention.

2.4 Functional health literacy (FHL)

DSME programmes are only successful if the interventions address a patient's socio-economic status, financial stability, level of education and health literacy (AADE 2011). This statement is also supported by a host of international Diabetes organisations, including the IDF, the World Health Organisation (WHO) and the local Society for Endocrinology, Metabolism and Diabetes of South Africa (IDF 2013, WHO 201, SEMDSA 2012). Although very little can be done by the healthcare system to change a patient's socioeconomic status and level of education, DSME programmes can be designed to ensure that it takes into consideration the patient's FHL.

2.4.1 Definition of Functional Health Literacy

As was previously explained, functional health literacy (FHL) can be defined as the extent to which patients acquire, process and understand basic health information that is needed to make appropriate health decisions (Jeppesen *et al* 2009). A more expanded definition used by the WHO states that "health literacy is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise and apply health information in order to make judgements and take decisions in everyday life concerning health care, disease prevention and health promotion to maintain or improve quality of life during the life course" (WHO 2013).

According to the European Health Literacy Survey conducted by the WHO in 2013, various conceptual approaches to health literacy have been created since the first definition of health literacy was coined in 1986 by the International Conference on Health Promotion in Ottawa (WHO 2013). The WHO has supported the conceptual model of health literacy as defined by the European Health Literacy Survey outlined in Figure 2.2. The conceptual framework identifies 12 sub-dimensions of health literacy and integrates medical and public health views of health literacy, based on a systematic literature review conducted by the European Health Literacy Survey (WHO 2013). This framework has been used by the WHO to develop interventions to increase functional health literacy and has provided a basis for creating and validating measurement tools for disease prevention and health promotion settings.

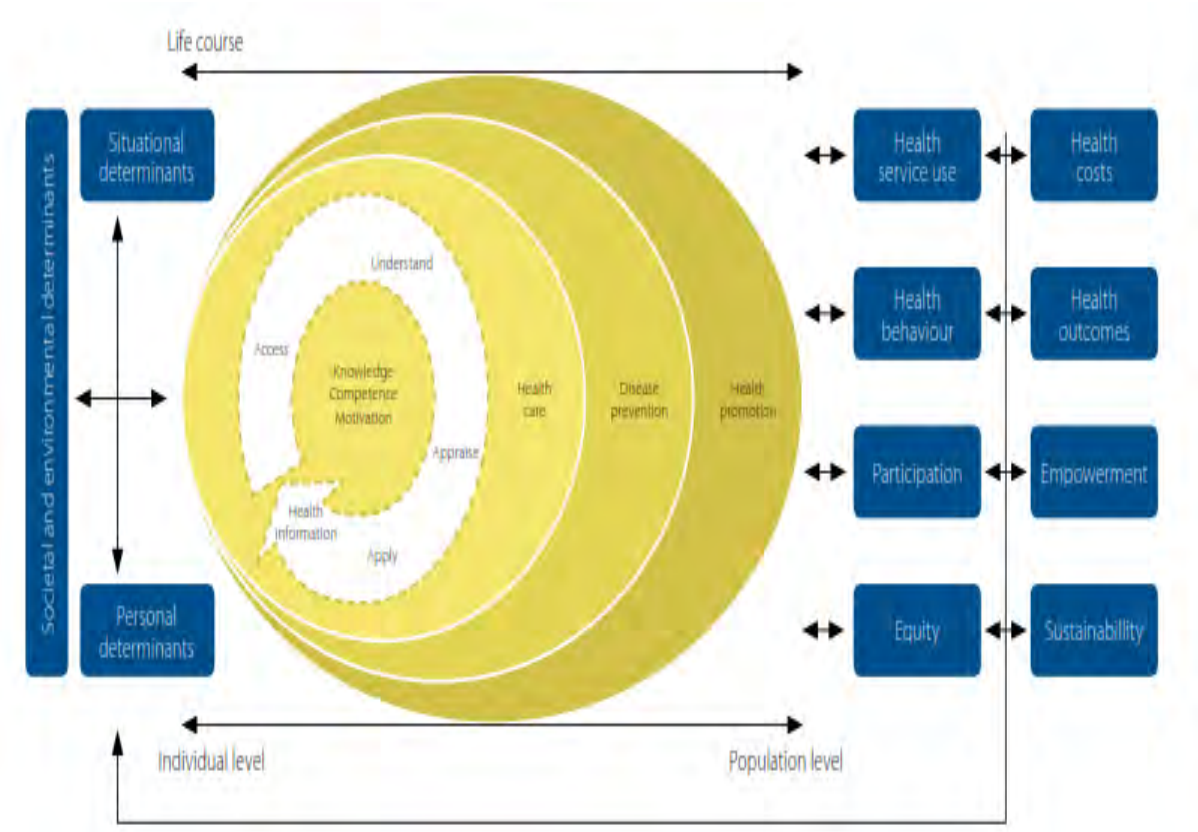

Figure 2.2: Conceptual framework of health literacy of the WHO (2013) after Sørensen *et al* (2012)

The above conceptual framework clearly illustrates that a patient's health care and health behaviour is directly linked to their ability to access information on medical care, an ability to understand and interpret medical information, as well as making informed decisions on medical matters and appropriate health care options (WHO 2013). It would therefore seem that without the ability to interpret and evaluate information on health-related matters, any health-related intervention will be unsustainable due to a lack of a patient's personal involvement and empowerment.

In order to develop any successful health intervention, a baseline measurement of health literacy needs to be conducted to ensure that health interventions are aimed at the patient's appropriate level of literacy and understanding. Various questionnaires have been compiled by a variety of stakeholders in order to assess functional health literacy (WHO 2013 citing Sørensen *et al,* 2012). For the purpose of this literature review, the focus will be on functional health literacy questionnaires aimed at assessing literacy levels in patients with chronic diseases of lifestyle.

2.4.2 Assessing Functional Health Literacy

Various instruments exist to test and measure functional health literacy in specific populations. According to Berkman, DeWalt, Pignone, Sheridan, Lohr, Lux, Sutton, Swinson & Bonito (2004) the most widely used tests are the Rapid Estimate of Adult Literacy in Medicine (REALM) test and the Test of Functional Health Literacy in Adults (TOFHLA) . The REALM test uses a word recognition test to assess reading and comprehension abilities, whilst the TOFHLA assesses literacy by subjects reading passages in which every fifth to seventh word has been deleted - the participant then has to insert the correct word from a choice of four words. (Berkman *et al* 2004). The short version of the TOFHLA (s-TOFHLA) involves only two reading comprehension sections to assess literacy (Berkman *et al* 2004). The Newest Vital Sign (NVS) uses six questions based on scenarios in various health-related fields to test a patient's response to the scenario (Weiss, Mays, Martz, Castro, DeWalt, Pignone, Mockbee & Hale 2005).

A systematic literature review conducted by Al Sayah, Williams & Johnson (2013) using nine search engines found 56 studies that measured health literacy, using eight generic health literacy tests – including REALM, REALM-R, TOFHLA, s-TOFHLA, NVS, 3-brief screening questions tool, 3-level FHL scales and SILS (Single item literacy screener); as well as a diabetes specific healthy literacy test (LAD – Literacy assessment in Diabetes). Al Sayah *et al* (2013) found that the REALM and s-TOFHLA were the most commonly used instruments to measure FHL among diabetics, but should be used with caution due to the inherent limitations of measurement. The identified tests were all found to have inherent strengths and weaknesses which would affect the FHL score. According to Al Sayah *et al* (2013) the REALM, TOFHLA, NVS and LAD were all designed to measure specific skills, which might make the patients uncomfortable or embarrassed. Secondly, direct measurement test require good vision, good reading and writing skills and sufficient concentration to complete the test, which makes these test less reliable and not as convenient to administer. Mode of administration would also play an important role in the test' applicability and use, as certain tests are only administered by a clinician and therefore is time intensive and less practical (Al Sayah, Williams & Johnson 2013). This finding was echoed by Bailey, Brega, Crutchfield, Elasy, Herr, Kaphingst, Karter, Moreland-Russel, Osborn, Pignone, Rothman & Schillinger (2014) who found that available FHL tests do not always explore the link between literacy and glycaemic control, with few tests assessing diabetes-related complications, the use of health care facilities and the quality of life of patients. Bailey *et al* (2014) has therefore recommended that future studies should explore how FHL affect health outcomes.

Table 2.2: Summary of questionnaires available to assess Functional Health Literacy

Questionnaire name	Purpose	Type	Number of question	Administration	Language availability	Limitations
Newest Vital Sign (NVS)	Rapid screening test for health literacy	Scenario-based questions	6	Self-administered	English	Assumes that patient can read and understand scenario.
Rapid Estimate of Adult Literacy in Medicine (REALM)	Screening tool to evaluate an individual's ability to read medical words	Word recognition and comprehension	66	Administered by examiner	English Spanish	Takes about 1 to 2 minutes to administer. Assumes patient can read and comprehend certain words.
Short assessment of Health Literacy in Adults (s-TOFHLA)	Screening tool used to determine comprehension and numerical ability.	Test numeracy and reading comprehension.	40 to 67	Administered by examiner	English Spanish	Takes about 15 to 20 minutes to administer test. Assumes patient can read or write
Literacy assessment in Diabetes (LAD)	Screening tool using word recognition and pronunciation	Word recognition using list	60 words	Administered by examiner	English	Takes about 1 to 2 minutes to administer. Assumes patient can read and comprehend words.

After: Al Sayah *et al* (2013), WHO (2013), Weiss *et al* (2005), Berkman (2004).

2.4.3 Global studies conducted on FHL and diabetes management

FHL is often assessed in patients with chronic disease conditions, as patients are reliant on their own knowledge of the disease and its management, with healthcare not often optimal when other health professionals are not present (Kandula *et al* 2009). Patients with adequate knowledge of their disease states are more likely to manage their health properly, but those with inadequate knowledge regarding their disease in addition to poor functional health literacy are less likely to implement good self-care (Pandit, Tang, Bailey, Davis, Bocchini, Persell, Federman & Wolf 2009).

Schillinger *et al* (2002) conducted a cross-sectional observational study on 408 English- and Spanish-speaking Type 2 diabetics who were older than 30 years. Patient health literacy was tested using the s-

TOFHLA questionnaire in either English or Spanish and then compared to their most recent HbA1c. The study found that patients with inadequate health literacy were less like to achieve optimal glycaemic control (HbA1c < 7.2%) than their counterparts who had adequate health literacy. However, Schillinger *et al* (2002) reported that a limitation to their study was that although literacy levels were measured using the s-TOFHLA, specific knowledge related to diabetes was not assessed. The latter may therefore have impacted on study findings. Although the s-TOFHLA determines a patient's health literacy, it does not assess diabetes specific knowledge and self-care behaviour, which can inherently affect a patient's HbA1c (Schillinger *et al* 2002). Schilinger *et al* (2002) therefore recommended that health literacy and a patient's knowledge of diabetes should both be assessed prior to implementing any health care intervention.

A prospective, observational study conducted by Kim *et al* (2004) on 92 diabetic patients attending outpatient diabetes education classes in Pennsylvania (United States of America) measured FHL using the s-TOFHLA questionnaire and compared the findings to the patient's HbA1c level to gage diabetes control. The study found that 23% of participants had limited health literacy, which was associated with being older, having attended less formal education, receiving a lower annual income and experiencing more self-reported complications associated with diabetes. Kim *et al* (2004) reported that the limited level of health literacy was an unexpected finding, and that the majority of patients had already received diabetes education at the time of the survey, thereby affecting FHL. Although there was no significant difference between patients with limited health literacy as opposed to adequate health literacy when comparing their HbA1c measurements, Kim *et al* (2004) were of the opinion that these findings could be explained by the relatively short follow up period (three months) after commencement of the study. The above researchers therefore recommended that FHL should be assessed at a baseline prior to commencement of health education, to ensure that results are not skewed (Kim *et al* 2004).

Tang *et al* (2007) conducted a descriptive study at a diabetes education management centre of a public hospital in Hong Kong on 149 patients with Type 2 diabetes mellitus. A modified version of the s-TOFHLA was used to measure literacy, as well as a questionnaire that was developed for the purpose of the study that measured diabetes awareness and its associated complications. These scores were then compared to the patient's most recent HbA1c level. Study findings were that health literacy ($p < 0.001$) and patient awareness scores were negatively correlated to diabetes control, while the score of the self-developed questionnaire targeting disease and complication awareness were positively correlated to HbA1c. Age,

gender and the duration of diabetes were also positively correlated to HbA1c. Tang *et al* (2004) hence recommended that both health literacy, numeracy and knowledge of the disease should be considered when educating diabetic patients.

A study conducted by Kirk, Grzywacz, Arcury, Ip, Nguyen, Bell, Saldana & Quandt (2012) evaluated three health literacy tests among older patients with diabetes, using the s-TOFHLA, REALM and the NVS test of FHL. The researchers found that almost 23% of their respondents were unable to complete one or more of the tests, due to poor vision, self-reported illiteracy or not finishing the FHL test in time (Kirk *et al* 2012). Kirk *et al* (2012) cautioned future researchers to select the appropriate FHL test carefully depending on the intended target population; they further recommended that the REALM or NVS not be used in elderly patients.

The above-mentioned studies were all conducted in developed countries. It therefore complicates the possibility to extrapolate the findings to a country like South Africa, as it is classified as newly-industrialised, transitional country with great disparities in education and level of income. In order to determine whether the assessment of functional health literacy testing would be appropriate in South Africa setting, local studies should be examined to determine the feasibility of such assessments.

2.4.4 Local studies conducted on FHL

It would seem that there is a paucity of local data in terms of published studies that assessed functional health literacy. Although data exist on all other aspects of diabetes care, such as barriers experienced in diabetes care and management, there is a lack of studies that assessed functional health literacy in diabetes in South Africa. A study that investigated the functional health literacy in patients attending a public health clinic in South Africa, will therefore be of value in determining limiting factors when testing functional health literacy in diabetic patients.

Dowse, Lecoko & Ehlers (2010) investigated the appropriateness of the REALM test as a tool for measuring the health literacy of a South African population from a predominantly rural area with English

as their second language. The REALM test was used as it is quick to administer and could easily be administered by the researchers. Although the s-TOFHLA test was considered for this study, limitations were that it could take up to 22 minutes to administer in a population that is predominantly illiterate, when compared to the one to two minutes it would take to administer for the REALM test. The study conducted by Dowse *et al* (2010) in Grahamstown, Eastern Cape, South Africa on 125 Xhosa-speaking individuals attending a public health clinic, found that the average grade-equivalent reading level of the study population was grade 7 – 8, with very poor comprehension levels.

In addition, the study conducted by Dowse *et al* (2010) found the REALM test to be unsuitable for administration in its current form when targeting participants with a poor education background, as it was originally created for a health setting that is very different from that of the public health sector in South African (Dowse *et al* 2010). According to data published by Statistics SA (2012), the South African public health sector is extremely under-resourced and a large number of patients need to be assessed and treated on a daily basis. In addition, when considering that only 33.9% of South Africans have completed some secondary schooling, and 28.9% of the population completed Grade 12, it is to be expected to find low literacy and numeracy levels public healthcare settings (Statistics SA 2012).

Considering that that the REALM test was found to be unsuitable for the South African public healthcare population when assessing health literacy levels, the fact that administration of the s-TOFHLA test is time intensive, especially when considering how under-resourced the South African public health sector is and the fact that various studies conducted on diabetic patients in developed countries found that health knowledge should be assessed in conjunction with health literacy, it is deemed necessary to design a questionnaire that will test a diabetic patient's functional health literacy. The latter will include the assessment of patient's disease knowledge and consideration of patients' traditional or cultural beliefs, level of education and socio-economic status.

2.5 Conclusion

The International Diabetes Federation in 2013 estimated that 175 million of the world's population have diabetes which remains undiagnosed and untreated, with low- and middle-income countries seems to be the hardest hit with 80% of those affected with diabetes living in these resource poor countries. In South Africa, recent data released by Statistics SA for the period 2010 - 2012 has shown that diabetes was the fifth leading cause of natural death in 2012. When comparing data documented for 2010 to 2012, it was found that diabetes mellitus as causative agent for mortality has steadily increased from 3.9% to 4.4% within a relatively short period.

Diabetes Self-Management Education as the cornerstone of care for all patients with diabetes mellitus. However, it has been shown that the level of education of patients is a major determinant on how well DSME is received, as well as how compliant patients were with their treatment. Prior to any DSME programmes being implemented, the patient's FHL will have to be determined to ensure compliance and understanding in patients.

Functional health literacy is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise and apply health information in order to make judgements and take decisions in everyday life concerning health care, disease prevention and health promotion to maintain or improve quality of life during the life course. Although FHL can be determined by a variety of tests, none have been shown to be applicable to the South African population – where patients are often functionally illiterate. To ascertain functional health literacy for the South African population, a questionnaire will have to focus on not only a patient's diabetic knowledge and perceptions, but also be easy to administer to both literate and illiterate patients and designed specifically for the South Africa population.

Chapter 3. METHODS AND MATERIALS

3.1 Introduction

This chapter will provide an overview of the methods used to conduct this study. Hence the following aspects will be covered: (i) study design; (ii) questionnaire development; (iii) study population and sampling procedure as well as (iv) data capturing and statistical analysis. The reliability and validity of the data will also be discussed, including the ethical considerations that were taken into account before the study was conducted.

3.2 Study Design

A cross-sectional, descriptive survey was conducted to determine the functional health literacy (FHL) and blood glucose control of male and female black diabetic outpatients attending an outpatient clinic at Edendale Hospital, Pietermaritzburg in KwaZulu-Natal.

3.2.1 Advantages and disadvantages of a cross-sectional descriptive study design

Cross-sectional, descriptive studies are designed to measure the prevalence of a health measure or outcome at one specific point in time. Due to the inherent study design, a descriptive survey can be conducted on a smaller group within a larger population to determine certain risk factors (Grimes & Schultz 2002). In addition, cross-sectional studies are usually conducted to investigate associations between risk factors and the outcome of interest (Levin 2006).

Advantages of cross-sectional, descriptive studies includes the fact that they are relatively inexpensive to conduct and can be conducted within a short space of time. A variety of outcomes or risk factors can be assessed, which makes it very useful for health planning and understanding disease aetiology. Due

to the inherent design of a cross-sectional descriptive study, it is difficult to identify causative factors as it is only measured at one point of time. It is also difficult to make causal inferences as a study could provide different results if done at a different time (Levin 2006). It is therefore of the utmost importance to ensure that when this study design is utilised, questions are phrased to ensure that time does not present itself as a limiting factor (Levin 2006).

3.3 Sampling

3.3.1 Study population

The study population for this survey was black South Africans with type 2 diabetes mellitus that reside within Edendale Township, a semi-urbanised area outside Pietermaritzburg in KwaZulu-Natal (see Figure 3.1). Black South Africans with type 2 diabetes mellitus were chosen as a target population, as they were neglected with regard to healthcare and education during Apartheid (Moodley & Rambiritch 2007). The IDF has also indicated in their recent review of the global prevalence of diabetes, that the African continent will experience the most significant increase in the prevalence of diabetes in the next 15 years (IDF 2013).

3.3.2 Sample

Edendale Hospital, a regional and district hospital located in Edendale Township, functions as a diabetic outpatient clinic on Wednesdays with patients being referred from local feeder clinics. Patients who are unable to be controlled on oral hypoglycaemics alone, are referred to Edendale Hospital for intervention. After glycometabolic control is maintained for three consecutive months, the patient is down referred to their local clinic for follow-ups. Due to the referral system in place, it is very difficult to ascertain how many patients attend the clinic every Wednesday, as it is dependent on whether new patients are referred from the local clinics. It was therefore very difficult to ascertain the potential number of participants eligible for participation in this study although the Clinic Manager usually expects 30 to 45 patients to attend the weekly clinic. The hospital outpatient clinic was chosen due to the regular availability of patients that

have had difficulty in achieving glycometabolic control on oral hypoglycaemics alone and therefore have biochemical assessments, such as HbA1c, available in their patient files on a routine basis.

Figure 3.1: Map depicting Edendale Township on the outskirts of Pietermaritzburg, KwaZulu-Natal were the study was conducted (Source: Google Maps 2014)

3.3.3 Sampling technique

Participants were sampled by means of systematic non-random sampling and were invited to participate in the survey. The survey was conducted on a sample of 91 participants with Type 2 diabetes that fell within the age category of 30 – 75 years of age. This age category was chosen to ensure that Type 1 diabetics that have been diagnosed in early adulthood were inadvertently included into the study, as their glycometabolic control might be more difficult to achieve with insulin strategies. It was therefore decided that inclusion of these subjects with Type 1 diabetes might alter the study outcome and were therefore excluded.

Both genders were chosen to participate in the survey to achieve a more representative sample of type 2 diabetics attending the Edendale Hospital diabetic outpatient clinic. As a result, the inclusion criteria for participation in the study were as follows:

- Aged 30 to 75 years
- Male and female
- Diagnosis of Type 2 diabetes made more than three months prior to the study
- South African citizen

Potential participants were approached after their baseline parameters were measured by a diabetic nurse, prior to seeing the doctor in attendance. Baseline parameters included blood pressure, a random glucose value obtained via a finger prick, HbA1c (done every three months) as well as other blood samples such as urea and creatinine. Participants were not removed from the waiting queue, to ensure that anxiety for losing their place was minimised. The purpose of the study, as well as ethical considerations were explained to participants who met the inclusion criteria, by a trained fieldworker. Only two participants were excluded from the study; one withdrew from the study as he was scared of identity theft and one patient had Type 1 diabetes and did not meet the inclusion criteria.

Due to inclusion criteria being used, it is implied that the selection of participants was based on criterion sampling. The concept of systematic non-random sampling is normally reserved for qualitative research. As the sample is not large enough to be representative of the entire type 2 diabetic population visiting the Edendale type 2 diabetic outpatient clinic, it will not be possible to extrapolate study findings to all the type 2 diabetic outpatients that attend the Edendale diabetic outpatient clinic on a weekly basis.

3.4 Methods and instruments

The questionnaire developed for the purpose of this study was designed using traditional functional health literacy (FHL) tests as a starting point. The most frequently used FHL tests, including the s-TOFHLA, REALM and NVS tests, were analysed and utilised to develop a conceptual framework on which the questionnaire was ultimately based (Berkman *et al* 2004) (See Figure 3.2).

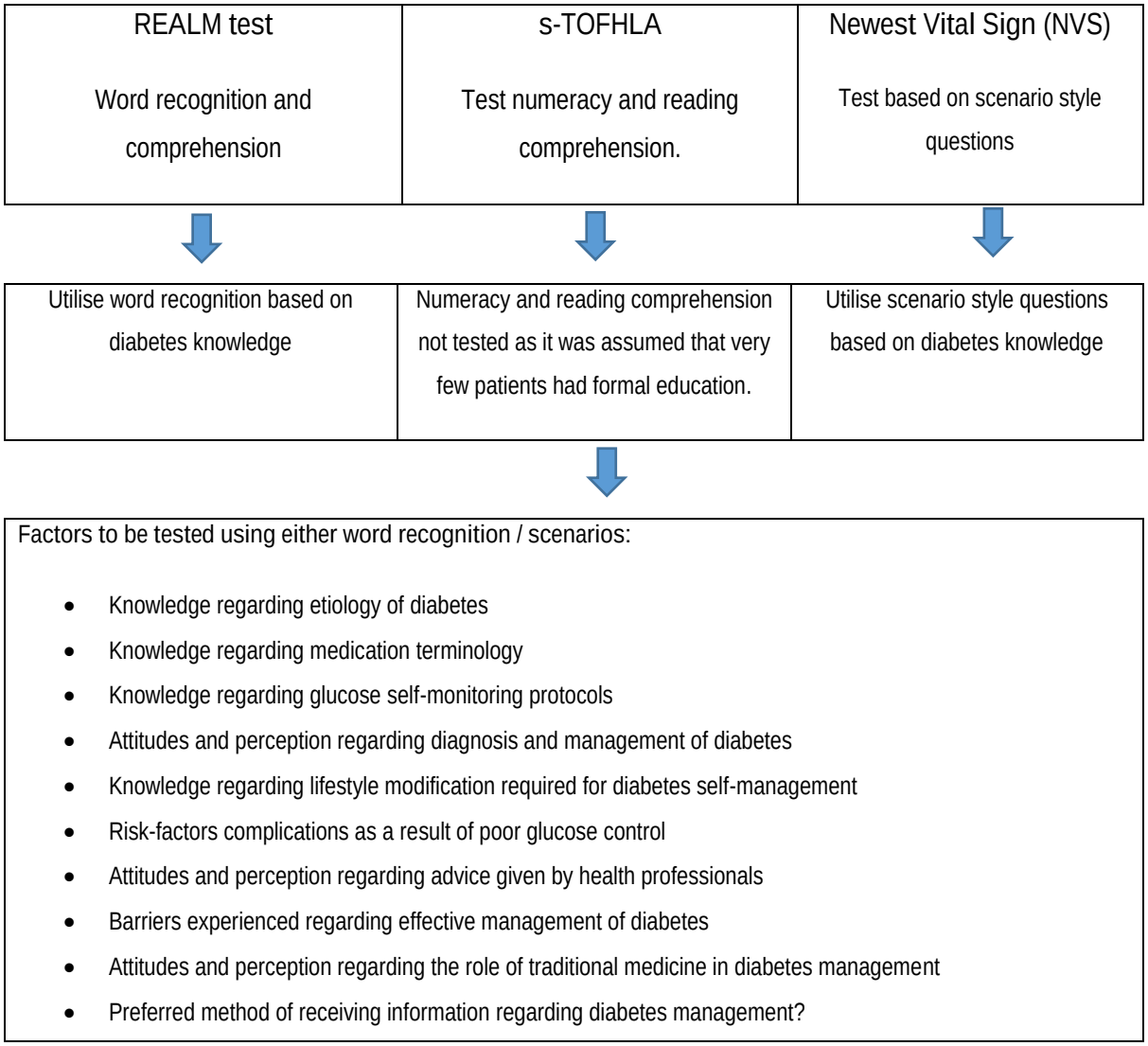

Figure 3.2 Conceptual framework used for questionnaire development

It is important to note that in the current study, literacy and numeracy were not assessed using traditional methods such as the s-TOFHLA and REALM tests, as these have been shown to be ineffective in a population with very limited literacy and inadequate attendance of any formal schooling (Dowse *et* al 2010), which is highly likely for that segment of the South African black population that were schooled during the Apartheid era (Dowse *et al* 2010). Knowledge related to diabetes was assessed, rather than using generic literacy and numeracy questions, using scenario-based question as used in the NVS test (Weiss *et al* 2005). This made the survey questionnaire more appropriate for the target population and ensured that potential participants did not withdraw from the study due to an inability to read or write.

Questions were designed based on the SEMDSA guidelines on knowledge of disease and diet adjustments required for diabetes self-management education programs (SEMDSA 2012). Each question in the survey questionnaire were multiple-choice questions with an option to choose "other" and in so doing, add the participant's own response. The resulting questionnaire was assessed by a panel of experts in the field that consisted of three registered clinical dietitians working at Edendale Hospital's Dietetics department, a senior medical registrar currently in charge of Edendale Hospital's Diabetic clinic and two academics from Dietetics and Human Nutrition, UKZN. Table 3.1 depicts the variables linked to each study objective as well as which question was associated with which objective.

After the final questionnaire was developed and approved by a panel of experts (please see Appendix A), it was translated into IsiZulu by a clinical dietitian working at Edendale Hospital whose mother tongue is IsiZulu. It was then translated back into English using the back translation method (Squires, Alken, Van den Heede, Sermeus, Bruyneel, Lindqvist, Schoonoven, Stromseng, Busse & Brozstek 2013) by an independent IsiZulu translator with a background in Dietetics. Although back translation is considered appropriate for generating questionnaires, Squires *et al* (2013) recommends that the content should be considered when translating a health survey questionnaire. This becomes evident when translating an English survey, using English concepts and words, into IsiZulu. Problems picked up during content analysis after back translation was conducted, showed that there were certain words for which there was no IsiZulu equivalent, as they are westernised concepts and disease specific. Concepts such as "insulin", "hormone" and "starch" could not be directly translated into isiZulu as they do not form part of the IsiZulu vocabulary. The words "insulin" and "starch" was used in its English form as "ama-Insulin" and "ama-stashi" as they were used as such in educational messages in the clinic. The word "hormone" was initially directly translated into "a feeling or emotion". However, this error was picked up during back translation, and changed to "chemical in your blood/body" during content analysis. The problems experienced during back translation can be shown as substantiating proof that content analysis should be utilised after back translation, to ensure that the true meaning of questions are not lost during translation.

Table 3.1: Study objectives, related variables and corresponding survey questions.

Objective	Variable applicable to the objective	Question
Objective 1 To determine the functional health literacy of black South African outpatients of both genders with Type 2 Diabetes attending the Diabetic clinic at Edendale Hospital, Pietermaritzburg through the use of a multi-lingual questionnaire.	Knowledge regarding diabetes and disease-related lifestyle modification	FHL: 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 23, 24, 26, 27, 29, 30. Source of information: 4, 14, 22, 25
Objective 2 To determine the preferred source of education of black South African outpatients of both genders with Type 2 Diabetes attending the Diabetic clinic at Edendale Hospital, Pietermaritzburg.	Preferred source of education	Preferred source of education: 4, 14, 22, 25.
Objective 3 To determine the level of education of black South African patients attending the Diabetic clinic at Edendale hospital, Pietermaritzburg and whether the level of education has an effect on functional health literacy.	Knowledge regarding diabetes and disease-related lifestyle modification Highest grade achieved at school	FHL: 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 23, 24, 26, 27, 29, 30.
Objective 4 To determine glycometabolic control by assessing existing blood values in patient files, inclusive of HbA1C, fasting- and random blood glucose values, as well as renal function tests.	HbA1c, glucose, urea, creatinine	Patient Biochemical assessment.
Objective 5 To investigate functional health literacy and the level of education has an effect on glycometabolic control of black South patients attending the Diabetic clinic at Edendale hospital, Pietermaritzburg.	Knowledge regarding diabetes, appropriate lifestyle modification, HbA1c, glucose, urea and creatinine.	FHL: 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 23, 24, 26, 27, 29, 30. Preferred source of education: 4, 14, 22, 25. Patient Biochemical assessment.

After the isiZulu questionnaire was finalised using the "content analysis" questions, the final questionnaire contained 30 open- and close- ended questions (Appendix A). A pilot study (see Section 3.7) was conducted to ensure that the questionnaire was appropriate for the target population.

3.5 Reliability of the Questionnaire

Reliability of data refers to the ability of a questionnaire to consistently yield the same results when tested within the same study population at different times to ensure repeatability of the questionnaire (Drost 2011; Sapp & Jensen 1997). According to Bradley (2013), reliability can be evaluated not only by repeatability, but is also linked to a test's internal consistency, using test-retest reliability and intercoder reliability as means of assessment. Test-retest reliability evaluates a questionnaire's ability to repeat results over a period of time by administering the questionnaire to the same participants after a specified time (Bradley 2013). This has been partially achieved by administering the designed questionnaire to a sample group during the pilot study (as outlined in section 3.8), however it is recommended that a follow-up study is conducted in the future to ascertain test-retest reliability..

According to Sapp & Jensen (1997), when assessing nutrition knowledge, questions should be carefully constructed to ensure that they do not hint towards a certain correct answer. In addition, questions should not be asked if a particular question has two different, but correct answers (Drost 2011). Questionnaires should therefore be designed while paying attention to inherent mistakes that might surface when multiple-choice question surveys are compiled. The questionnaire that was used to conduct the current study, was assessed by a panel of experts in the field to ensure that questions were neither misleading nor ambiguous as a result of one question having more than one correct answer. During the translation and back-translation of the questionnaire, both translators also assessed all questions and related multiple-choice answers for any possible errors.

Intercoder, or interrater, reliability is of importance when questionnaires are not completed by the participant himself, where reliability could be affected by the interviewer's methods of obtaining the information (Bradley 2013). In order to ensure that the interviewer's opinions do not influence the results of the questionnaire, the interviewer was trained to be as consistent as possible in the approach to conduct each interview and not to indirectly influence a participant's responses through inadvertently emphasising the correct answer or guiding the participant to a correct answer.

3.6 Validity of the Questionnaire

Validity is the extent to which the questionnaire measured what it aimed to measure (Bradley 2013; Anderson, Bell, Adamson & Moynihan 2001). Construct, content and face validity are all important when determining the validity of a questionnaire (Bradley 2013). Construct validity examines the extent to which the questionnaire measured what it aimed to measure, whilst content validity aims to examine whether the questionnaire measures every part of the research concept (Bradley 2013). Construct and content validity was achieved by basing the questionnaire's questions on the NVS questionnaire of FHL – a FHL questionnaire that has already been proven to have construct and content validity. During the pilot study, it was noted that participants could not read the questionnaire due to illiteracy - the questionnaire's method of interviewing was therefore changed, to ensure that the validity of the questionnaire was maintained (see Section 3.8). Face validity, a measure of how representative the questionnaire is seen by the study participants (Bradley 2013). Face validity was achieved in this survey by discussing the importance of the study with the participants prior to start of the questionnaire.

3.7 Ethical Consideration and consent

3.7.1 Ethical Consideration

Ethical clearance was obtained from University of KwaZulu-Natal's Biomedical Research Ethics Committee prior to the survey being conducted (Appendix B: BE251/13). Ethics approval was also obtained from the Department of Health's Health Research and Knowledge Management component (Appendix C - HRKM 300/13).

3.7.2 Consent

Written informed consent was obtained from each participant in isiZulu prior to them participating in the survey. Each participant was informed that their personal information would be kept anonymous and not

used for anything other than research purposes. The fieldworker was also instructed not to commence with the questionnaire unless written consent was obtained. Participants were also informed that they can withdraw from the study at any time (please see Appendix D).

3.8 Pilot study

A pilot study was conducted on female in-patients that were admitted to Edendale Hospital with Type 2 diabetes (n=22), thereby representing 25% of the final study sample size. The pilot study was conducted on in-patients to ensure that patients that were attending the outpatient clinic was not utilised in the study sample. The purpose of the pilot was to assess the flow of the interview, clarity of questions forming part of the questionnaire and whether all required biochemistry markers were available within the hospital.

The pilot study revealed that patients had difficulty in understanding the concept of multiple-choice questions and often deviated from the available answer options. It also proved difficult for an English-speaking researcher to ask questions in isiZulu due to problems with pronunciation. Although the flow and content of the questionnaire was not changed after the pilot study was conducted, it was decided that an isiZulu speaking fieldworker would be required to conduct the survey in order to yield responses that were reliable and valid.

3.9 Fieldworker recruitment and training

Due to the limited space available in the outpatient clinic and concerns posed by the Clinic Manager regarding the interruption of the clinic queue system, it was decided that one fieldworker would be sufficient to conduct the survey. Hence, a male student studying at the University of KwaZulu-Natal who was proficient in both English and isiZulu was recruited from the fourth year Dietetic student complement. As the fieldworker did not reside in Edendale Township or surrounding areas, it was highly unlikely that the fieldworker would have been related to any of the study participants.

Fieldworker training took place at Edendale Hospital's Dietetic Department where the researcher requested the fieldworker to go through the survey questionnaire and explain each question as he understood it. Each question was discussed in detail, with the reasons for each possible answer being discussed. Three patients with Type 2 diabetes who came for a consultation at the Dietetics Department were asked to partake in the fieldworker's initial training which entailed him conducting the survey while the primary researcher observed the fieldworker's approach to asking the survey questions as well as how the concept of multiple answer options were explained to the participants. The response to these questionnaires were not included in the final survey, as the pilot subjects have been receiving dietetic counselling on diabetes and lifestyle modification by staff from the Dietetics Department at Edendale Hospital for some time. Questions posed by the fieldworker were addressed until the fieldworker felt confident to conduct the survey without supervision.

3.10 Data collection

Due to time and cost constraints, this survey was conducted between August and September 2014, as there were severe space constraints at the hospital with very little space to interview patients. Due to these constraints, it was agreed upon with the Clinic Manager that interviews would only take place whilst patients were waiting for the doctor and that it would not interfere with the daily operations of the clinic. Data collection took place within the waiting area of the diabetic outpatient clinic in a secluded area away from other participants or patients or in a consulting room if it was available at the time. The duration of each interview was 10 to 15 minutes, as the fieldworker had to explain the purpose of the survey to each participant, obtain informed consent, read out the questions and answer options record answers. If the patient responded with an answer that was not one of the multiple choice answer options, the response was recorded in English as the primary investigator was not fluent in isiZulu. However, the survey was conducted in isiZulu. Upon patient request, an English version of the questionnaire was available. However, none of the participants requested the latter option.

After completion, survey questionnaires were submitted to the primary investigator and checked for completeness on the same day of participants answering the questionnaires. The primary investigator was also on site whilst the fieldworker was conducting the survey, to ensure that any questions or concerns could be addressed immediately. Certain patients did not have a complete set of biochemical

values available on the day of the survey, but these where then accessed after the interview on the hospital's laboratory system.

3.11 Data capturing, processing and statistical analysis

All data generated by this survey were captured and reworked using the Statistical Package for Social Sciences (SPSS) computer package (SPSS, Chicago, USA). Statistical analysis of the data was analysed according to the objectives set out in Chapter 1 (please refer to table 3.2).

Table 3.2: Statistical analysis of data in relation to the study objectives

Objective	Statistical significance	Parameters and significance
Objective 1: To determine the functional health literacy of black South African outpatients of both genders with Type 2 Diabetes attending the Diabetic clinic at Edendale Hospital, Pietermaritzburg through the use of a multi-lingual questionnaire.	Frequency distributions	N/A
Objective 2: To determine the preferred source of education of black South African outpatients of both genders with Type 2 Diabetes attending the Diabetic clinic at Edendale Hospital, Pietermaritzburg.	Frequency distributions Levene's test for equality of variances T-test for equality of means	Significant at $p < 0.05$
Objective 3: To determine the level of education of black South African patients attending the Diabetic clinic at Edendale hospital, Pietermaritzburg and whether the level of education has an effect on functional health literacy.	Frequency distributions Levene's test for equality of variances T-test for equality of means	Significant at $p < 0.05$
Objective 4: To determine glycometabolic control by assessing existing blood values in patient files, inclusive of HbA1C, fasting- and random blood glucose values, as well as renal function tests.	Frequency distributions Levene's test for equality of variances T-test for equality of means	Significant at $p < 0.05$
Objective 5: To investigate functional health literacy and the level of education has an effect on glycometabolic control of black South patients attending the Diabetic clinic at Edendale hospital, Pietermaritzburg.	Frequency distributions Pearson's correlations	Significant at $p < 0.05$

FHL scores were determined by marking the response to the questionnaire on the raw data sheets while responses were still in isiZulu. This was done to ensure that the researcher could not become inadvertently biased towards certain responses. Total scores were then tallied and a percentage derived from the correct answers. These percentages were then used as a continuous variable during data analysis.

3.12 Conclusion

A cross-sectional, descriptive survey was conducted to determine the functional health literacy (FHL) of male and female black diabetic outpatients attending an outpatient clinic at Edendale Hospital, Pietermaritzburg in KwaZulu-Natal. Knowledge related to diabetes was assessed using scenario-based question as used in the NVS test, which made the survey questionnaire more appropriate for the target population. The questionnaire was translated and back-translated into and from isiZulu to ensure the content of the questionnaire was reliable and valid. Due to time and cost constraints, this survey was conducted between August and September 2014, as there were severe space constraints at the hospital with very little space to interview patients. The questionnaire was administered by a fieldworker, fluent in isiZulu, who was trained prior to the commencement of the survey. FHL scores were determined by marking the response to the questionnaire on the raw data sheets while responses were still in isiZulu and were then used as a continuous variable during data analysis using the statistical analysis SPSS. Data generated from the analysis will be further discuss in the following chapters.

Chapter 4. RESULTS

4.1 Introduction

In this chapter the results will be expressed using the objectives outlined in Chapter One, (Section 1.3) as a guideline. Data was analysed using SPSS statistical analysis software.

4.2 Background data of study group as a whole

The background data of the study participants were collected, and presented in Table 4.1 as a whole. These variables include age, various biochemistry values, the FHL score and the age of first diagnosis.

Table 4.1 General characteristics of the study group as a whole

Variables	N	Reference range	Mean	Standard Deviation
Age	89	N/A	53.0	10.7
HbA1c	89	< 7.5%	11.9	3.7
Glucose	89	4.0 – 7.0 mmol/l	13.9	14.7
Blood pressure – systolic	89	120 mm Hg	137.0	20.0
Blood pressure – diastolic	89	80 mm Hg	84.0	12.0
Urea	56	2.5 – 7.5 mmol/l	4.9	2.6
Creatinine	56	60 – 110 umol/l	79.2	47.2
FHL %	89	N/A	47%	13%
Age of first diagnosis of diabetes	84	N/A	45.0	10.7

The mean age for the study sample was 53 ± 10.7 years. Age of first diagnosis of diabetes for the study sample was 45 years. Patients have therefore lived with diabetes for at least an average of 8 years prior to this survey taking place. HbA1c and glucose levels indicated that most patients that participated in the study did not have good glycometabolic control. Urea, creatinine and systolic and diastolic blood pressure levels fell within the normal reference range for the general population.

4.3 Description of functional health literacy by gender

In order to discuss the various parameters of the study sample, the functional health literacy percentage was first determined and homogeneity of data between genders tested using Levene's Equality of Variances statistical analysis.

Table 4.2 Functional Health Literacy % of Participants

Gender	Number	Mean FHL %	Standard Deviation	P value * ($p < 0.05$)
Male	20	48,155	16,21	0,025
Female	69	46,713	12,26	

* Levene's Test for Equality of Variances

A significant difference in the functional health literacy between males and females were measured ($p = 0.025$). Due to this finding, all data from here on forward were presented by gender.

4.4 Variables of study sample outlined by gender

The background data of the study participants were collected, and presented in Table 4.1 as a whole. Table 4.3 discusses these variables but distinguishes between male and female participants.

Table 4.3 General characteristics of the study group by gender

Variables	Gender	N	Mean	Standard Deviation
Age	Male	20	54.9	11.7
	Female	69	52.4	10.3
HbA1c	Male	20	12.3	3.3
	Female	69	11.8	3.8
Glucose	Male	20	12.2	6.8
	Female	69	14.5	16.3
Blood pressure – systolic	Male	20	137.8	21.9
	Female	69	136.7	20.1
Blood pressure – diastolic	Male	20	84.6	10.34
	Female	69	84.1	12.7
Urea	Male	13	5.6	3.4
	Female	43	4.7	2.4
Creatinine	Male	13	97.8	68.0
	Female	42	73.4	37.9
FHL %	Male	20	48.2	16.2
	Female	69	46.7	12.3
Age of first diagnosis of diabetes	Male	20	49.1	12.2
	Female	64	43.3	9.8

* Independent sample t-test (only $p<0.05$ considered significant)

Table 4.4 Summary of the various pharmacological treatment regimens received by the patients that volunteered to participate in the study

Treatment option	Male	Female	p-value*
Oral hypoglycaemics only	5% (n=1)	0% (n=0)	NS
Insulin only	0% (n=0)	3% (n=2)	NS
Oral hypoglycaemics and non-diabetic medication	25% (n=5)	29% (n=20)	NS
Insulin and non-diabetic medication	15% (n=3)	20% (n=14)	NS
Oral hypoglycaemics, insulin and non-diabetic medication	55% (n=11)	45% (n=31)	NS

*does not differ significantly between males and females for the same treatment option ($p<0.05$; Chi-square test)

Male and female participants were not prescribed different treatment regimens. From Table 4.4 it is evident that the majority of patients were prescribed a combination of oral hypoglycaemics, insulin and other non-diabetic medication. Only one male patient was prescribed oral hypoglycaemics only. The diabetic clinic at Edendale hospital is a referral clinic and only treats patients when first-line therapy (such as oral hypoglycaemics) has failed. This accounts for the higher reported use of combination therapy.

Table 4.5 Highest level of education achieved by participants in study sample

Level of Education	Male	Female	p-value*
No formal education	15% (n=3)	3% (n=2)	NS
Grade 1	0%	0%	NS
Grade 2	5% (n=1)	1% (n=1)	NS
Grade 3	0%	10% (n=7)	NS
Grade 4	0%	6% (n=4)	NS
Grade 5	5% (n=1)	3% (n=2)	NS
Grade 6	0%	6% (n=4)	NS
Grade 7	15% (n=3)	10% (n=7)	NS
Grade 8	5% (n=1)	10% (n=7)	NS
Grade 9	0%	9% (n=6)	NS
Grade 10	10% (n=2)	15% (n=10)	NS
Grade 11	30% (n=6)	15% (n=10)	NS
Grade 12	15% (n=3)	13% (n=9)	NS
Tertiary education	0%	0%	NS

*($p<0.05$; Chi-square test)

More than 60% of participants (both male and female participants) had a high school education of Grade 8 or above (see Table 4.5.). Nearly a third of male participants had completed Grade 11, whilst the level of education for females was more varied, with the highest percentage of women (15% Grade 10; 15% for Grade 11) completing Grade 10 and 11, respectively. None of the participants reported to have any tertiary education.

Table 4.6 Mechanism of diagnosis and first point of contact with health care system

Question Number	Variable	Male (n=20)	Female (n=69)
1	Do you know what diabetes is and how it affects your body?		
	• Only explains symptoms of diabetes	55% (n=11)	61% (n=42)
	• Diabetes kills / causes death / I am going to die	5% (n=1)	3% (n=2)
	• Explains symptoms and mentions that it kills	0%	4% (n=3)
	• Explains lack of insulin in the body (does not mention glucose)	5% (n=1)	6% (n=4)
	• Does not know what diabetes is or what it does	25% (n=5)	12% (n=8)
	• Explains that there is too much glucose in the blood	5% (n=1)	13% (n=9)
	• Explains the etiology of diabetes and how it affects food metabolism	5% (n=1)	1% (n=1)
3	How did you know you had diabetes?		
	• Had symptoms of diabetes and went to the clinic	50% (n=10)	73% (n=50)
	• Had symptoms of diabetes and went to the hospital	25% (n=5)	12% (n=8)
	• Collapsed at home and taken to hospital	10% (n=2)	1% (n=1)
	• Suffered traumatic event, taken to hospital where they were diagnosed	10% (n=2)	4% (n=3)
	• Diagnosed during pregnancy at antenatal classes	N / A	10% (n=7)
	• Routine checkup at clinic	10% (n=2)	0%
	• Went to the pharmacy as I was experiencing symptoms	5% (n=1)	0%

The majority of participants of this study in both gender groups (55% for males and 61% for females, respectively) could only explain the symptoms of diabetes, but could not explain the functions of insulin and glucose on metabolism, as can be seen in Table 4.6. A small number of participants also responded that they felt diabetes was a death sentence. 1 in 4 male participants, and one in ten female participants, did not know what diabetes was or how it worked, despite attending a diabetic clinic for more than 3 months.

Most participants were diagnosed at primary health care level in 50% of male cases and 73% of female cases. Only 25% of males and 12% of females were diagnoses at hospital. 10% of female participants were diagnosed during pregnancy whilst attending antenatal classes. 20% of males either suffered a traumatic event (such as an accident or stroke) or collapsed at home and was then later diagnosed whilst admitted at hospital, whilst only 5% of female respondents chose this as a diagnostic event.

4.5 FHL by gender

Table 4.6 and Table 4.7 outlines the responses received from male (4.6) and female (4.7) participants – these responses where used to determine FHL % outlined in Table 4.2

Table 4.7 A summary of the responses to the FHL questionnaire for males

Question Number	Variable	Male (n=20)
5	Why is it important to drink your tablets / use you insulin every day?	
	• It keeps my blood sugars normal	80% (n=16)
	• It heals diabetes	10% (n=2)
	• The doctor prescribed them to me	5% (n=1)
	• I don't know	5% (n=1)
6	It is important to eat healthy when you have diabetes, because…	
	• It ensures that my sugars levels are controlled	75% (n=15)
	• It prevents me from being hungry	15% (n=3)
	• It prevents me from shaking	10% (n=2)
7	What does it mean if you have hyperglycaemia?	
	• My blood sugar is more than 14	60% (n=12)
	• My blood sugar is more than 10	35% (n=7)
	• I don't know	5% (n=1)
8	What is HbA1c?	
	• I don't know	95% (n=19)
	• Blood test monitoring my daily sugars	5% (n=1)
	• Blood test that monitor my glucose for the last 3 months	0%
9	Which fruits are safe for a diabetic to eat?	
	• Green apples	75% (n=15)
	• All of the above options given	15% (n=3)
	• Bananas	5% (n=1)
	• I don't know	5% (n=1)
10	If my sugar is too high, the symptoms include:	
	• All of the above options given	80% (n=16)
	• Frequent urination – I go to the toilet a lot	15% (n=3)
	• Blurred vision – I cannot see properly	5% (n=1)
11	When my sugar is very low, I should:	
	• Eat 3 sweets and a sandwich	55% (n=11)
	• Eat a fruit	30% (n=6)
	• Take my medicine immediately	10% (n=2)
	• I don't know	5% (n=1)
12	Eating healthy means that I should	
	• Eat lots of vegetables and fruit	45% (n=9)
	• Eat small regular meals that are low in sugar and fat	20% (n=4)
	• Eat foods that are specially made for diabetics	20% (n=4)
	• Drink tea with brown sugar, not white sugar	5% (n=1)
13	How often should you check your blood sugar with a fingerprick test?	
	• Once a day	70% (n=14)
	• Once a week	10% (n=2)
	• I don't know	10% (n=2)
	• Twice a week	5% (n=1)
	• Once a month	5% (n=1

Table 4.7 (continued) A summary of the responses to the FHL questionnaire for males

15	Taking my tablets / insulin is important, because	
	• It prevents diabetic complications	60% (n=12)
	• The doctor said so	25% (n=5)
	• It cures diabetes	10% (n=2)
	• I don't know	5% (n=1)
16	If my blood sugar is constantly high, I am going to	
	• All of the above options given	65% (n=13)
	• Have to use insulin injections	10% (n=2)
	• Develop kidney problems	5% (n=1)
	• Have problems with my eyesight	5% (n=1)
17	The only time I should not drink my tablets is when	
	• I have not eaten	70% (n=14)
	• I have a headache	10% (n=2)
	• I am going to the doctor	10% (n=2)
	• All of the above	5% (n=1)
	• I don't know	5% (n=1)
18	Having diabetes means that my body cannot:	
	• I don't know	55% (n=11)
	• Make enough insulin	35% (n=7)
	• Make enough sugar	5% (n=1)
	• Use sugar in my blood	5% (n=1)
19	Insulin is a:	
	• Injection they give to control your blood sugar	40% (n=8)
	• I don't know	30% (n=6)
	• Hormone in my body and is used to control my blood sugar	15% (n=3)
	• Injection that cures my diabetes	15% (n=3)
20	The risk factors for Type 2 diabetes include	
	• Having a family member with diabetes	45% (n=9)
	• All of the above	35% (n=7)
	• Being overweight	5% (n=1)
	• Being a member of a high-risk population / community	0%
21	Type 2 Diabetes can be prevented or delayed by:	
	• All of the above	70% (n=14)
	• Regular exercise	20% (n=4)
	• Losing weight	5% (n=1)
	• Following a healthy diet	5% (n=1)
23	Which food are the highest in carbohydrates / starch?	
	• Bread, rice and potatoes	80% (n=16)
	• Margarine, sunflower and cooking oil	15% (n=3)
	• I don't know	5% (n=1)
24	What is fibre?	
	• I don't know	60% (n=12)
	• Roughage in food that helps with digestion / prevents constipation	40% (n=8)
26	The best type of fluid to drink when you have diabetes is:	
	• 100% pure fruit juice	60% (n=12)
	• Tea with brown sugar	20% (n=4)
	• None of the above option given	20% (n=4)
27	When I'm making a sandwich, the healthiest bread spread would be:	
	• Peanut butter	60% (n=12)
	• I don't know	30% (n=6)
	• All of the above	10% (n=2)
	• Fruit jam	0%
	• Syrup	0%

Table 4.7 (continued) A summary of the responses to the FHL questionnaire for males

29	Because I have diabetes, I have to eat • Healthy, balanced meals with no sugar • Only eat boiled vegetables • Eat differently from the rest of my family	 50% (n=10) 30% (n=6) 20% (n=4)
30	Eating a balanced meal means • Only eating vegetables that have been boiled • Having all three food groups on my plate during a meal • I don't know	 50% (n=10) 40% (n=8) 10% (n=2)

The majority of male participants understood the importance of adhering to medication and eating a balanced and healthy diet (Table 4.7). However, more than half of participants did not understand the action of insulin in the body and the role of the hormone in diabetes. Nearly 60% of participants could not explain what hyperglycaemia is and none of participants could define HbA1c. Although participants acknowledged the importance of a healthy, balanced diet - the details therefore was not fully understood. Eight out of ten participants could, for example, successfully identify foods items higher in carbohydrates, but could not explain what fibre is. 80% of participants also thought that fruit juice and tea with brown sugar is the healthiest type of fluid to drink when you have diabetes (as oppose to water). Nearly a third to a half of participants surveyed thought that a healthy, balanced meal entailed eating foods that are boiled.

Table 4.8 A summary of the responses to the FHL questionnaire for females

Question Number	Variable	Female (n=69)
5	Why is it important to drink your tablets / use you insulin every day? • It keeps my blood sugars normal • It heals diabetes • The doctor prescribed them to me • I don't know	 71% (n=49) 15% (n=10) 12% (n=8) 3% (n=2)
6	It is important to eat healthy when you have diabetes, because… • It ensures that my sugars levels are controlled • It prevents me from being hungry • It gives me more energy • It prevents me from shaking • I don't know	 78% (n=54) 15% (n=10) 4% (n=3) 2% (n=1) 1% (n=1)
7	What does it mean if you have hyperglycaemia? • My blood sugar is more than 14 • My blood sugar is more than 10 • My blood sugar is more than 5 • I don't know	 65% (n=45) 29% (n=20) 3% (n=2) 3% (n=2)
8	What is HbA1c? • I don't know • Blood test monitoring my daily sugars • Blood test that monitor my glucose for the last 3 months	 93% (n=64) 4% (n=3) 3% (n=2)

Table 4.8 (continued) A summary of the responses to the FHL questionnaire for females

9	Which fruits are safe for a diabetic to eat?	
	• Green apples	87% (n=60)
	• All of the above	12% (n=8)
	• I don't know	1% (n=1)
	• Bananas	0%
10	If my sugar is too high, the symptoms include:	
	• All of the above	80% (n=55)
	• Blurred vision – I cannot see properly	12% (n=8)
	• Frequent urination – I go to the toilet a lot	6% (n=4)
	• I don't know	3% (n=2)
11	When my sugar is very low, I should:	
	• Eat 3 sweets and a sandwich	71% (n=49)
	• Take my medicine immediately	20% (n=14)
	• Eat a fruit	4% (n=3)
	• I don't know	4% (n=3)
12	Eating healthy means that I should	
	• Eat small regular meals that are low in sugar and fat	30% (n=21)
	• Eat lots of vegetables and fruit	30% (n=21)
	• Eat foods that are specially made for diabetics	28% (n=19)
	• I don't know	9% (n=6)
	• Drink tea with brown sugar, not white sugar	3% (n=2)
13	How often should you check your blood sugar with a fingerprick test?	
	• Once a day	68% (n=47)
	• Once a week	10% (n=7)
	• I don't know	10% (n=7)
	• Once a month	7% (n=5)
	• Twice a week	4% (n=3)
15	Taking my tablets / insulin is important, because	
	• It prevents diabetic complications	39% (n=27)
	• It cures diabetes	32% (n=22)
	• The doctor said so	26% (n=18)
	• I don't know	3% (n=2)
16	If my blood sugar is constantly high, I am going to	
	• All of the above	54% (n=37)
	• Have to use insulin injections	20% (n=14)
	• Have problems with my eyesight	17% (n=12)
	• Develop kidney problems	4% (n=3)
	• I don't know	4% (n=3)
17	The only time I should not drink my tablets is when	
	• I have not eaten	77% (n=53)
	• I don't know	12% (n=8)
	• I have a headache	6% (n=4)
	• All of the above	6% (n=4)
	• I am going to the doctor	0%
18	Having diabetes means that my body cannot:	
	• I don't know	51% (n=35)
	• Make enough insulin	22% (n=15)
	• Use sugar in my blood	12% (n=8)
	• Use energy for sugar	9% (n=6)
	• Make enough sugar	7% (n=5)
19	Insulin is a:	
	• Injection they give to control your blood sugar	57% (n=39)
	• I don't know	28% (n=19)
	• Injection that cures my diabetes	15% (n=10)
	• Hormone in my body and is used to control my blood sugar	2% (n=1)

Table 4.8 (continued) A summary of the responses to the FHL questionnaire for females

20	The risk factors for Type 2 diabetes include • Being overweight • Having a family member with diabetes • All of the above • I don't know • Being a member of a high-risk population / community	 42% (n=29) 33% (n=23) 19% (n=13) 6% (n=4) 0%
21	Type 2 Diabetes can be prevented or delayed by: • All of the above • Regular exercise • Following a healthy diet • Losing weight	 66% (n=45) 20% (n=14) 10% (n=7) 4% (n=3)
23	Which food are the highest in carbohydrates / starch? • Bread, rice and potatoes • Margarine, sunflower and cooking oil • Carrots, cabbage and beetroot • I don't know	 97% (n= 67) 2% (n=1) 1% (n=1) 0%
24	What is fibre? • I don't know • Roughage in food that helps with digestion / prevents constipation • Pure fruit juice • Breakfast cereal for diabetes	 55% (n=38) 35% (n=24) 7% (n=5) 3% (n=2)
26	The best type of fluid to drink when you have diabetes is: • 100% pure fruit juice • Tea with brown sugar • None of the above • I don't know	 48% (n=33) 25% (n=17) 25% (n=17) 3% (n=2)
27	When I'm making a sandwich, the healthiest bread spread would be: • Peanut butter • I don't know • Syrup • Fruit jam • All of the above	 74% (n=51) 15% (n=10) 6% (n=4) 3% (n=2) 1% (n=1)
29	Because I have diabetes, I have to eat • Healthy, balanced meals with no sugar • Only eat boiled vegetables • Eat differently from the rest of my family • I don't know	 44% (n=30) 29% (n=20) 25% (n=17) 3% (n=2)
30	Eating a balanced meal means • Only eating vegetables that have been boiled • Having all three food groups on my plate during a meal • I don't know	 58% (n=40) 38% (n=26) 4% (n=3)

Most female participants understood the importance of adhering to medication and eating a balanced and healthy diet (Table 4.8). However, more than half of participants did not understand the action of insulin in the body and the role of the hormone in diabetes. Nearly seven out of ten female participants could not explain what hyperglycaemia is and only 3% of female participants could define HbA1c correctly. Although participants acknowledged the importance of a healthy, balanced diet - the details therefore was not fully understood. 90% of participants could, for example, successfully identify foods items higher in carbohydrates, but just over a third of participants could define fibre correctly. Nearly half

of participants thought that fruit juice was an appropriate fluid choice and a quarter of participants thought tea with brown sugar was the best type of fluid to drink when you have diabetes (as oppose to water). Participants surveyed thought that a healthy, balanced meal entailed eating foods that are boiled in more than 30 – 58% of cases. One in four patients also thought that they would have to eat different from their family members.

4.6 Preferred source of education by gender

Table 4.9 Preferred source of education by gender

Question number	Variable	Male (n=20)	Female (n=69)
4	Where did you go first for advice after you found out you had diabetes?		
	• The doctor at the hospital / clinic	75% (n=15)	44% (n=30)
	• The nurse sister at my local clinic	25% (n=5)	54% (n=37)
	• The pastor / support group at our church	0%	2% (n=1)
	• The traditional healer	0%	0%
	• I don't know	0%	2% (n=1)
14	If the doctor and the nurse gives you advice that is not the same, would you		
	• Listen to the doctor	90% (n=18)	96% (n=66)
	• Listen to the nurse	10% (n=2)	2% (n=1)
	• Ask the traditional healer	0%	3% (n=2)
22	I will drink imbiza if		
	• If the doctor or nurse said I can	45% (n=9)	41% (n=28)
	• None of the above options given	35% (n=7)	45% (n=31)
	• It will cure my diabetes	15% (n=3)	10% (n=7)
	• I don't know	5% (n=1)	2% (n=1)
	• If my family bought it for me	0%	3% (n=2)
25	How would you prefer receiving information about diabetes		
	• From the nurse or doctor at the hospital / clinic	75% (n=15)	75% (n=52)
	• Reading a pamphlet	25% (n=5)	20% (n=14)
	• Watching a video	0%	4% (n=3)

Table 4.9 indicates that 75% of men went to the doctor at the hospital or clinic for advice on diabetes, compared to only 44% of the participating women. Female participants received advice from the nurse at their local clinic when first diagnosed, whilst only 25% of male participants mentioned this as a first point of contact. Three out of four male and female participants reported that they would prefer to receive information on diabetes from a nurse or a doctor, with written materials (such as pamphlets) only being an option for 20 – 25% of participants. Both male and female participants would trust a doctor's advice over that of a nurse's advice on diabetes management. Imbiza, a traditional herbal drink often prescribed by traditional healers, would be consumed by 15% of male participants, and 10% of female participants, if it was known to cure diabetes. Four out of ten participants (both male and female) responded that they would drink imbiza if a nurse or doctor told them that they could.

4.7 Correlation between variables for the study group as a whole

Table 4.10 Pearson correlations between general study variables for the group as a whole

Variable	Correlations	Age	Highest Grade	FHL %	Age at diagnosis
Age	Pearson Correlation	1	-0.415	-0.286	0.816
	Significance (2-tailed)		0.000	0.007	0.000
	Sample number	N=89	N=89	N=89	N=84
Highest grade achieved	Pearson Correlation	-0.415	1	0.341	-0.343
	Significance (2-tailed)	0.000		0.001	0.001
	Sample number	N=89	N=89	N=89	N=84
FHL %	Pearson Correlation	-0.286	0.341	1	-0.297
	Significance (2-tailed)	0.007	0.001		0.006
	Sample number	N=89	N=89	N=89	N=84
Age at diagnosis	Pearson Correlation	0.816	-0.343	-0.297	1
	Significance (2-tailed)	0.000	0.001	0.006	
	Sample number	N=84	N=84	N=84	N=84
HbA1c	Pearson Correlation	0.214	-0.113	-0.232	0.125
	Significance (2-tailed)	0.044	0.290	0.028	0.257
	Sample number	N=89	N=89	N=89	N=84
Glucose	Pearson Correlation	0.109	-0.161	0.086	0047
	Significance (2-tailed)	0.309	0.132	0.424	0.673
	Sample number	N=89	N=89	N=89	N=84
Blood pressure – systolic	Pearson Correlation	0.065	-0.021	-0.050	0.051
	Significance (2-tailed)	0.546	0.844	0.643	0.644
	Sample number	N=89	N=89	N=89	N=84
Blood pressure – diastolic	Pearson Correlation	-0.081	0.014	0.047	-0.054
	Significance (2-tailed)	0.448	0.896	0.661	0.623
	Sample number	N=89	N=89	N=89	N=84
Urea	Pearson Correlation	0.256	0.024	0.148	0.060
	Significance (2-tailed)	0.057	0.860	0.277	0.671
	Sample number	N=56	N=56	N=56	N=52
Creatinine	Pearson Correlation	0.268	0.047	0.208	0.114
	Significance (2-tailed)	0.48	0.731	0.128	0.425
	Sample number	N=55	N=55	N=55	N=51

Table 4.10 indicates highly significant correlations at the p=0.01 level between the age of the participant, the highest grade achieved at school, the functional health literacy % and age at which

diabetes was diagnosed. Significant correlations at the p=0.05 level were achieved between FHL%, age of participant and HBA1c.

Table 4.11 Correlations between glycometabolic control variables for study group as a whole

Variable	Correlations	HbA1c	Glucose	BP – systolic	BP - diastolic	Urea	Creatinine
Age	Pearson Correlation	0.214	0.109	0.065	-0.081	0.256	0.268
	Significance (2-tailed)	0.044	0.309	0.546	0.448	0.057	0.048
	Sample number	N=89	N=89	N=89	N=89	N=56	N=55
Highest grade achieved	Pearson Correlation	-0.113	-0.161	-0.021	0.014	0.024	0.047
	Significance (2-tailed)	0.290	0.132	0.844	0.896	0.860	0.731
	Sample number	N=89	N=89	N=89	N=89	N=56	N=55
FHL %	Pearson Correlation	-0.232	0.086	-0.050	0.047	0.148	0.208
	Significance (2-tailed)	0.028	0.424	0.643	0.661	0.277	0.128
	Sample number	N=89	N=89	N=89	N=89	N=56	N=55
Age at diagnosis	Pearson Correlation	0.125	0.047	0.051	=0.054	0.060	0.114
	Significance (2-tailed)	0.257	0.673	0.644	0.623	0.671	0.425
	Sample number	N=84	N=84	N=84	N=84	N=52	N=51
HbA1c	Pearson Correlation	1	0.279	-0.059	-0.018	-0.044	-0.005
	Significance (2-tailed)		0.008	0.582	0.866	0.746	0.973
	Sample number	N=89	N=89	N=89	N=89	N=56	N=55
Glucose	Pearson Correlation	0.279	1	-0.005	0.003	0.001	-0.102
	Significance (2-tailed)	0.008		0.964	0.977	0.994	0.459
	Sample number	N=89	N=89	N=89	N=89	N=56	N=55
Blood pressure – systolic	Pearson Correlation	-0.059	-0.005	1	0.559	-0.104	-0.209
	Significance (2-tailed)	0.582	0.964		0.000	0.447	0.125
	Sample number	N=89	N=89	N=89	N=89	N=56	N=55
Blood pressure – diastolic	Pearson Correlation	-0.018	0.003	0.559	1	-0.341	-0.371
	Significance (2-tailed)	0.866	0.977	0.000		0.010	0.005
	Sample number	N=89	N=89	N=89	N=89	N=56	N=55
Urea	Pearson Correlation	-0.044	0.001	-0.104	-0.341	1	0.758
	Significance (2-tailed)	0.746	0.994	0.447	0.010		0.000
	Sample number	N=56	N=56	N=56	N=56	N=56	N=54
Creatinine	Pearson Correlation	-0.005	-0.102	-0.209	-0.371	0.758	1
	Significance (2-tailed)	0.973	0.459	0.125	0.005	0.000	
	Sample number	N=55	N=55	N=55	N=55	N=54	N=55

Highly significant correlations ($p<0.01$) between glucose and HbA1c, diastolic and systolic blood pressure, diastolic blood pressure and creatinine, and urea and creatinine (Table 4.11). Significant correlations at the $p=0.05$ level were found between age and HbA1c, HbA1c and FHL%, diastolic blood pressure and urea, and age and creatinine.

4.8 Conclusion

Chapter 4 reported on the major statistical findings of the study and compared various outcomes between males and females. Chapter 5 will utilise these findings, elaborate on the results and discuss major outcomes and its application to health literacy education models.

Chapter 5: Discussion

5.1 Introduction

In order to ensure that diabetes self-management care programmes are successful and cost-effective, cognisance needs to be taken of the target audience's level of education and functional health literacy (AADE 2011). The aim of this study was to determine the functional health literacy and associated glucose control of black South Africans, 30 years and older, with Type 2 Diabetes attending the Diabetes Outpatient clinic at Edendale Hospital, Pietermaritzburg, KwaZulu-Natal.

5.2 Sample Characteristics

The mean age of the study sample (N=89) was 53 ± 10.7 years. Basic biochemical markers, such as HbA1c, glucose, urea and creatinine, as well as blood pressure were recorded from the participant's medial charts in order to ascertain glycometabolic control as well as blood pressure control on the day of the study.

5.2.1 HbA1c and Post-prandial blood glucose levels

Amod *et al* (2012) reports that in the majority of patients the target HbA1c should be below 7%; whilst in the elderly and high risk patients the aim should be below 7.5%. According to Amod *et al* (2012), citing Stratton *et al* (2001), patients with Type 2 diabetes and an HbA1c of higher than 7.5%, have a two- to five-fold greater risk of developing microvascular complications and peripheral artery disease. The participants in this study's had a mean HbA1c of 11.9, hence it being higher than the target value set by SEMDSA and the IDF (Amod *et al* 2012). Only four participants maintained an HbA1c value of < 7.5%, with none achieving a value of below 7%.

The mean glucose levels of the participants was 13.9 (± 14.7), indicating poor glucose control. Over a third (34.7%) of participants had a normal post-prandial glucose level on the morning of the study, with the target value for majority of patients being between 4.0 – 7.0 mmol/l. This major discrepancy between glucose control, indicated by HbA1c, versus that of post-prandial glucose indicates the importance of

assessing glycometabolic control using HbA1c together with glucose as a means of assessing glycometabolic control (Amod *et al* 2012).

The mean age for the study sample was 53 years, with the mean age of diabetes diagnosis being 45 years. This implies that the majority of patients have been living with diabetes for an average of 8 years. The lack of glycometabolic control is of utmost concern, in that patients receiving specialised treatment from a regional hospital, which includes free healthcare and medicine, optimal glucose control is still not achieved in the majority of the study sample. The reason for this discrepancy could be explained by Mbombi, Lekhuleni, Mothiba & Malema (2012) who conducted a study in the Mopani district, Limpopo Province to determine the problems faced by newly diagnosed patients with diabetes mellitus who receive treatment from the district's primary healthcare facilities. Study participants indicated that their diagnosis of Type 2 diabetes adversely affected their and their family's daily lives, due to their food intake, cooking methods as well as their ability to generate an income requiring an adjustment. Patients also indicated that an inability to accept their diagnosis of Type 2 diabetes resulted in feelings of denial, anger and depression. As a result, patients often refused to take their medication due to the effect of psychological distress on diagnosis (Mbombi *et al* 2013).

Bayliss, Steiner, Fernald, Crane & Main (2003) studied the barriers to effective healthcare in patients with non-communicable diseases and found that barriers to self-management include physical and financial limitations as well as a lack of knowledge regarding the management of the disease. It therefore seems that although basic healthcare can be provided, external psychosocial factors such as work, family, education and finances will also have an impact on the patient's glycometabolic control.

5.2.2 Blood pressure control

The mean blood pressure levels for study participants was 137 mm Hg for systolic blood pressure and 84 mm Hg for diastolic blood pressure. 16 (18%) participants were also previously diagnosed with hypertension as a co-morbidity and had been receiving anti-hypertensive treatment. A normal blood pressure measurement is defined as 120 mm Hg systolic over 80 mm Hg diastolic, however prevention of cardiovascular complications are still seen at a lower level of 105 mm Hg systolic over 60 mm Hg diastolic (WHO 2013b). It is therefore evident that the mean blood pressure levels recorded for study participants can be classified as hypertensive.

Mayosi, Flisher, Lalloo, Sitas, Tollman & Bradshaw (2009) evaluated the impact that non-communicable diseases, such as hypertension and diabetes, have on the South African health care system and found that non-communicable diseases are becoming more prevalent in rural and semi-urban areas. As a result, it has resulted in an increase in the demand and cost for health care. The South African National Health and Nutrition Examination Survey (SANHANES-1) study, found that levels of hypertension has steadily increased in the last 15 years, despite the availability of cost-effective medical care (Shisana O, Labadarios D, Rehle T, Simbayi L, Zuma K, Dhansay A, Reddy P, Parker W, Hoosain E, Naidoo P, Hongoro C, Mchiza Z, Steyn NP, Dwane N, Makoae M, Maluleke T, Ramlagan S, Zungu N, Evans MG, Jacobs L, Faber M & SANHANES-1 Team 2013). The above findings therefore echo the findings of the current study.

Cois and Ehrlich (2014) used data from the National Income Dynamics Study to determine the socioeconomic determinants linked to hypertension and found that income and education might have an effect on hypertension control. This finding was echoed within the SANHANES-1 study (2013) where the knowledge of hypertension and treatment thereof had not increased, resulting in unnecessary complications, despite an increase in hypertension rates over the last 15 years.

5.2.3 Urea and creatinine levels

Amod *et* al (2012) stated that together with hypertension, urea, creatinine and microalbuminuria levels should be monitored to facilitate the early diagnoses of kidney disease in diabetics. Kidney disease is often found in populations with long-term uncontrolled non-communicable diseases such as diabetes and hypertension, with an estimated 40% of diabetic patients eventually developing chronic kidney disease (Amod *et al* 2012).

Urea and creatinine levels were both within the normal range for the participants. Only one participant (1.1%) within the study had been diagnosed with chronic kidney disease. Hence, kidney disease was not prevalent amongst the study sample.

5.2.4 Pharmacological treatment regimens

The majority of study participants received a combination of oral hypoglycaemic agents, insulin therapy and other non-diabetic related. There was no significant difference between the male and female

participant's treatment options – with 55% of males receiving oral hypoglycaemics, insulin and non-diabetic medications, compared to 45% of female participants.

Amod *et al* (2012) designed a SEMDSA treatment algorithm for patients with Type 2 diabetes in order to escalate treatment if HbA1c remains > 7% for more than three months (see Figure 5.1).

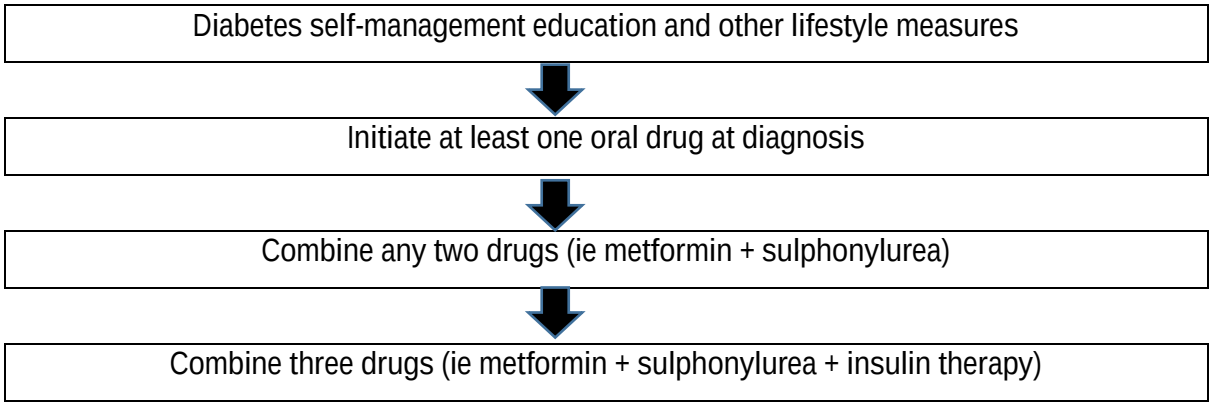

Figure 5.1 Simplified SEMDSA treatment algorithm for type 2 diabetes

Source: Amod *et al* (2012)

As can be seen from Figure 5.1, escalation of therapy is seen as a necessary and crucial step when glycometabolic targets (such as HbA1c) is not met. The majority of participants in the current study had already progressed to the third step where a combination of two drugs where given to aim for glycometabolic control, with 55% of male and 45% of female participants already receiving a combination of oral hypoglycaemics and insulin therapy. Although escalation of therapy is considered to be inevitable due to the natural history of type 2 diabetes, it is important to note that the escalation of therapy is done to maintain or achieve glycometabolic control (Amod *et al* 2012). The participants in this study did not achieve glycometabolic control with the mean HbA1c for male participants being 12.3% (±3.3) and those of female participants being 11.8% (3.8%). This indicates that despite the necessary escalation of pharmacologic treatment, glycometabolic control was not achieved in the majority of participants. This is a possible indicator that lifestyle measures such as level of knowledge and lack of understanding regarding diabetes self-management plays a role in the glycometabolic control of the participants in this study.

Although escalation of therapy is essential when HbA1c targets are not met, Amod *et al* (2012) states that any pharmacological treatment should be accompanied by ongoing diabetes self-management education and other lifestyle measures. This sentiment is echoed by the American Association of

Diabetic Educators (2011) as well as the National Institute for Health Care and Excellence (2014) and the World Health Organisation (2013b).

5.2.5 Highest level of education attained

South Africa has historically been divided in terms of the level and quality of education available between different races during the Apartheid era between 1948 and 1994. The Bantu Education Act in 1953 ensured the black South Africans were denied the same educational opportunities and resources available for white South Africans (Heaton, Amoateng & Dufur 2014). As a result, there has been a chasm within the education system – even after the political transition post-1994 (Heaton *et al* 2014). Education is a major determinant of functional health literacy and has been identified by Sorensen *et al* (2012) as both situational and personal determinants.

The study participants, falling within the age group of 30 – 70 years of age, attended school during 1952 and 1992 – hence being schooled in the Apartheid era. Functional health literacy is often defined by a participant's level of schooling, with participants not attaining a Grade 7 level of education being seen as functional illiterate (Stats SA 2012). Fourty percent of male participants and 39 percent of female participants attained Grade 7 or lower schooling level. This classifies them as functionally illiterate. Although more than 60% of both male and female participants had some form of high school education, considering the discrepancies in the level of education during the Apartheid era, it is possible that participants might still not have the necessary knowledge base to adequately manage their diabetes.

Amod *et al* (2012) has indicated that diabetes self-management education (DSME) should be available to all people, "irrespective of language, ethnicity, culture, educational level or socioeconomic status". Assessment of functional health literacy is therefore considered to be the first step in adapting DSME to patients who are functionally illiterate.

5.2.6 Diagnosis of diabetes and interaction with health care system.

The South African healthcare system has changed drastically since the fall of Apartheid in 1994. With the complex transition between infectious diseases, such as HIV/AIDS and TB, and non-communicable diseases within the last two decades; the South African Department of Health has made important changes in policy to address the epidemic (Mayosi, Lawn, Van Niekerk, Bradshaw, Karim & Coovadia

2012). A part of these changes have been focused on re-engineering primary health care to make it accessible to all South Africans.

In order to ensure that DSME is targeted at the right audience and at the correct point of contact, it is important to understand where patients aggregate and is diagnosed. The majority of participants in this study were diagnosed at a primary health care level in 50% of males and 73% of females. This indicates the immense focus that needs to be placed on strengthening primary health care services within the public health department, especially when focusing on diabetes and other non-communicable diseases (Mayosi *et al* 2012).

This deviation in focus has led to an integrated approach to the prevention and management of non-communicable diseases. Mohan, Seedat & Pradeepa (2013) indicated that the interventions chosen to halter the rising trend of non-communicable diseases should be cost effective, financially and logistically feasible and should be available for implementation within all areas of healthcare, whether at primary or tertiary level (Mohan *et al* 2013). 55% of male participants and 61% of female participants were able to explain the symptoms of diabetes. This indicates that although patient knowledge might be lacking in certain aspects of self-care management, health education at primary health care level has made an impact to a certain extent.

Health education has been on numerous cases shown to be both cost-effective and invaluable when treating long-term health conditions such as diabetes (NICE 2014). Literacy levels however, has a direct link to effective health education interventions and should be determined prior to a DSME program being implemented (AADE 2011).

5.3 Functional Health Literacy

Functional health literacy (FHL) can be defined as the extent to which patients acquire, process and understand basic health information that is needed to make appropriate health decisions (Jeppesen *et al* 2009). A more expanded definition used by the WHO states that "health literacy is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise and apply health information in order to make judgements and take decisions in everyday life concerning health care, disease prevention and health promotion to maintain or improve quality of life during the life course" (WHO 2013).

A significant difference in functional health literacy was found between male and female participants ($p<0.025$) when Levene's test for Equality of Variances was applied to the statistics. Male participants had a mean FHL % of 48.155 (±16.21) and female participants had a mean FHL% of 46.713 (±12.26).

Weis *et al* (2005), using a NVS-FHL test adapted for Spanish-speaking participants, found no significant difference between men and women's FHL scores. However, Weis *et al* (2005) did find a significant difference between genders when the TOFHLA was tested, with men scoring significantly lower than women ($p<0.001$), which was attributed to level of education. In this study, participants had no significant differences between levels of education, as more than 60% of both male and female participants had some form of high-school education. Pearson's correlation drawn between FHL% and the highest grade achieved by participants also showed no significant differences at $p<0.05$.

The significant difference in between male and female participant's FHL could however be attributed to the preferred source of healthcare where education was received. Female participants were more likely to attend primary healthcare clinics when experiencing symptoms of diabetes, or any other illness, with 73% of female participants being diagnosed at their local clinic. Male participants reported to prefer to go to their local hospital to receive healthcare and were more likely to be diagnosed at hospital level than that of their female counterparts. This preferred source of healthcare might affect the level and type of health education received by patients, as there is currently no formal education programme for diabetic patients at clinic level. This is in stark contrast with hospital level diabetes education programmes, where dietitians are more likely to be based, to provide health education. This disparity in the lack of education resources have in some way been addressed by the Department of Health by the introduction of nutrition advisors at local clinic level in an attempt to revitalize the primary healthcare available in South Africa. However, formulised programmes on diabetes self-management education, do not yet exist for patients attending public health care in South Africa.

5.3.1 Significant correlations between study variables

Pearson correlations were generated between the variables of the group as a whole, significant correlations at $p < 0.001$ were found between the following variables related to FHL including age of the participant, highest grade attained, FHL % and age at diagnosis of diabetes.

A highly significant correlation was found between the highest grade attained by participants in the study versus the age of the participant (Pearson value = -0.415; $p = 0.000$, N=89). This is in keeping with the

educational disparity seen in black South Africans attending their primary and secondary schooling during the Apartheid era. A significant correlation was also found between FHL% and the age of the participant (Pearson value -0.286; p 0.007; N=89). This ties in with the correlations between highest grade vs age of participant, as participants with a higher age were less like to have advanced schooling, which then affected FHL%. A significant correlation was found between the age of the participant and their HbA1c levels (Pearson value = 0.214; p = 0.044; N = 89), which could be attributed to lower FHL% being found in older patients with lower levels of schooling.

A highly significant correlation was found between the FHL % and highest grade achieved (Pearson value = 0.341; p = 001; N = 89). A highly significant correlation was also found between age at diagnosis of diabetes and the highest grade achieved (Pearson value = -0.343; p – 0.001; N = 84). This indicates that participants who attained higher grades at school, where less likely to be diagnosed with Type 2 diabetes at an earlier age than their counterparts in the study, and would have a higher FHL %. This could be due to participants with higher levels of schooling being more likely to find better paying jobs, which results in them achieving higher socio-economic status.

A significant correlation was found between HbA1c and FHL% (Pearson value = -0.232; p = 0.028; N = 89) indicating that functional health literacy has an effect on the blood glucose of participants. Although this finding is expected, it is important to note that FHL% was affected by the age of participants and highest grade attained at school. It is therefore important that any diabetes self-management education programs consider not just the literacy of patient, but the age of participants and their degree of schooling.

5.4 Conclusion

Chapter 5 discussed the significant differences found between the FHL% between males and females. The significant difference in between male and female participant's FHL could be attributed to the preferred source of healthcare where education was received, with female participants were more likely to attend primary healthcare clinics whilst male participants reported to prefer to go to their local hospital to receive healthcare. Most participants attended primary and secondary schooling during the Apartheid era, which might have affected their literacy levels due to discrepancies in schooling during that time.

Chapter 6 will summarise all major findings of the study, and include recommendations to improve diabetes self-management education using functional health literacy.

Chapter 6. Conclusion and recommendations

6.1 Introduction

The prevalence of DM in low- and middle income countries is rapidly increasing due to urbanisation and a change in dietary habits and lifestyle (Whiting *et al* 2011). In South Africa, recent data has shown that diabetes was the fifth leading cause of death from natural causes in 2012 and that mortality as a result of diabetes, has steadily increased from 3.9% to 4.4% for the period 2010 - 2012 (Stats SA 2014). The World Health Organisation recommends that diabetes self-management education become the cornerstone of care for all patients with diabetes mellitus. The SEMDSA recommends that education programmes specifically targeted at diabetes management and care, promotes compliance and adherence by facilitating behavioural change (SEMDSA 2012). However, DSME programmes are only successful if the interventions address a patient's socio-economic status, financial stability, level of education and health literacy (AADE 2011).

The WHO has health literacy is linked to literacy and includes people's knowledge, motivation and competences to understand and apply health information in order to make judgements and take decisions in everyday life concerning their health care (WHO 2013a). In order to develop any successful DSME programme, a baseline measurement of the target population's health literacy needs to be conducted to ensure that health interventions are aimed at patient-appropriate levels of literacy and understanding.

6.2 Conclusion

Functional health literacy (FHL) can be measured using a variety of tools, including the REALM test (using word recognition and comprehension), the s-TOFHLA (testing numeracy and word comprehension) as well as the Newest Vital Sign test (using scenario-based questions) (Tang *et al* 2007). These tests have been used in a variety of studies that determined FHL, but have often required adaptation to account for the study population's demographics, including language differences and cultural beliefs (Dowse *et al* 2010). Although it would seem that there is a general paucity of data when measuring FHL within the South African context, studies have consistently shown that an adapted FHL test will have to be designed to ensure that language differences, cultural beliefs and reading ability are accounted (Dowse *et* al 2010).

In order to assess the FHL of diabetics, scenario-based questions were designed based on the NVS test for FHL, rather than using generic literacy and numeracy questions (Weiss *et al* 2005). This made the questionnaire used in the current study more appropriate for the target population and ensured that potential participants did not withdraw from the study due to an inability to read or write. Questions were designed based on the SEMDSA guidelines on knowledge of disease and diet adjustments required for diabetes self-management education programs (SEMDSA 2012).

The resultant questionnaire was translated from English into isiZulu, the indigenous language most commonly spoken in KwaZulu-Natal. The isiZulu version of the questionnaire was subsequently back-translated into English and the two English versions were compared for errors and discrepancies to ensure that the questionnaire was reliable and valid. Due to time and cost constraints, the survey was conducted between August and September 2014, by a trained fieldworker who was fluent in both isiZulu and English. FHL scores were determined by scoring the response to the questionnaire on the raw data sheets. Responses were captured on a spreadsheet prepared on the Statistical Package for Social Sciences (SPSS) version 21, whilst still in isiZulu, to prevent coder-bias. Open-ended questions were converted into categorical variables by the researcher with the necessary input from the fieldworker who was conversant in both English and isiZulu. Continuous variables were captured on the same spreadsheet.

A significant difference in functional health literacy was found between male and female participants ($p<0.025$). Male participants had a mean FHL score of 48.2% (±16.2) and female participant had a mean FHL score of 46.7% (±12.3). Weis *et al* (2005) found significant differences between the FHL of genders when the TOFHLA test was used, with men scoring significantly lower than women. The latter study finding was attributed to level of education. However, in the current study, there was no significant difference between genders in terms of level of education, as more than 60% of both male and female participants had some form of high-school education. A correlation drawn between FHL score and the highest level of schooling (grade) achieved by male and female participants, also found no significant differences at $p<0.05$ between genders.

The significant difference between male and female participant's FHL score could however be attributed to the preferred source of healthcare where education was received. Female participants were more likely to attend primary healthcare clinics when experiencing diabetic symptoms, or any other illness, with 73% of female participants being diagnosed at their local clinic. Male participants preferred to go to their local hospital for receipt of healthcare and were more likely to be diagnosed as diabetic at hospital level

than their female counterparts. This preferred source of healthcare might have affected the level and type of health education received by patients, as there is currently no formal education programme for diabetic patients at clinic level. This is in stark contrast with hospital-based diabetes education programmes, where dietitians are more likely to be based and are responsible for conducting health education. Formalised programmes regarding diabetes self-management education do not yet exist for patients attending public health care in South Africa. Therefore, the level and scope of diabetes health education received, depends solely on the healthcare facility that the diabetic patient attends.

A highly significant correlation was found between the highest level of schooling (grade) attained by study participants versus participant age. This finding is in keeping with the educational disparity that exists among black South Africans attending their primary and secondary schooling during the Apartheid era. A significant correlation was also found between FHL score and participant age. This finding concurs with the correlations documented for highest grade of education attained versus participant age, as older participants were less like to have attained a higher level of secondary schooling, which in turn had an impact on FHL score. A significant correlation was found between participant age and their HbA1c levels. This correlation could be attributed to a lower FHL score among older patients with lower levels of school attainment.

A highly significant correlation was found between FHL score and highest grade achieved, as well as between the age at diagnosis of diabetes and the highest grade of schooling attained. This infers that participants who attained a higher level of education at school, were less likely to be diagnosed with Type 2 diabetes at an earlier age than their study counterparts and would have a higher FHL score. This could be due to participants having attained higher levels of schooling, being more likely to find better paying jobs, which results in them having a higher socio-economic status.

A significant correlation was found between HbA1c and FHL score, indicating that FHL has an effect on the blood glucose levels of study participants. Although this finding is to be expected, it is important to note that FHL score was affected by the age of participants and highest grade attained at school. It is therefore important that any diabetes self-management education programs consider not just the literacy of patient, but the age of participants and their degree of schooling.

6.3 Study limitations

The study was only conducted on outpatients attending the Diabetic Outpatient clinic at Edendale Hospital, Pietermaritzburg, KwaZulu-Natal. Edendale Hospital was chosen as the study centre as it serves a wide community of people and is the main referral centre for patients with diabetes after being diagnosed. Due to severe space constraints due to the Diabetic outpatient clinic being relocated to a temporary building whilst this survey was conducted, which resulted in space being a limiting factor. Space constraints within the departments also affected the amount of time available to access patients during the outpatient clinic days, as patients were triaged much quicker through the outpatient system. Patients were also transferred to their base hospital or clinic as soon as their treatment was stabilised, which meant that participant access time was limited.

Cost was also a limiting factor, as the financial funding was not available to increase the geographical scope of the survey. Future research should focus on increasing the geographical scope of the survey to obtain data on FHL scores in different geographical regions of South Africa, which will give a more complete view of functional health literacy in diabetes in South Africa.

6.4 Recommendations for DSME and further research

Although DSME is known to be the cornerstone of diabetes management, it is often neglected due to time and financial constraints. The latter is often experienced in the public health sector. It is for this reason that educational resources used during DSME should consider not only the language of the target audience, but their functional health literacy. It is therefore imperative that DSME should not be initiated without having a baseline FHL score for the target population. Although this adds an additional step in the DSME process, it ensures that the DSME is adequately targeted, well received and internalised by the target population.

In the South African public health sector, it is important to note that patients are often functionally illiterate due to the educational disparities that were present during the Apartheid era (Mayosi *et al* 2012). The latter was evident in the Edendale hospital catchment area of Pietermaritzburg. It is for this reason that steps should be implemented, not only to improve literacy amongst the community at large who received primary and secondary education during the apartheid era, but to ensure that FHL is considered when public awareness programmes are designed. For this reason, health education being conducted via print media such as pamphlets and posters, might not be the most effective way of communicating a health

message to target populations with limited literacy and therefore FHL. Verbal media such as health talks conducted by registered nutritional professionals, as well messages using social media such as television and radio, might be a more effective way of imparting health education. When pamphlets or posters are used to supplement verbal media, it is suggested that these should be pre-tested on the target population so that they make an optimal contribution towards health education?

Due to the paucity of published research on FHL in a South African setting, it is suggested that further research into FHL in diabetes should be conducted in different populations within South Africa. Due to the disparity in literacy rates seen in South African, the adapted FHL on diabetes questionnaire, designed and used in this study, might be of value when adapted for use among other diabetic population groups in South Africa.

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Appendix A

EDENDALE HOSPITAL

DIABETES HEALTH LITERACY QUESTIONNAIRE

Patient Code:					**File nr:**	
					Age:	
Diagnosis:	Type 1 DM		Type 2 DM		**Sex:**	
	Hypertensive		Hypercholesterolaemia		**Race:**	

Name of Medication	Dosage
Metformin / Glucophage	
Gliclazide	
Actraphane	
Protophane	
Glibenclamide	

Medical History	

BIOCHEMISTRY

Date	HbA1c	Glucose	Blood pressure	Urea	Creatinine

EDENDALE HOSPITAL

DIABETES HEALTH LITERACY QUESTIONNAIRE

Q 1:	**Do you know what diabetes is and how it affects your body? Please explain to me….**		
Q 2:	**How old were you when were you first diagnosed with diabetes?**		
Q 3:	**How did you know you had diabetes?**		
Q 4:	**Where did you go first for advice after you found out you had diabetes?**		
	a)	The nursing sister at my local clinic	
	b)	The doctor at the hospital/clinic	
	c)	The pastor / support group at our church	
	d)	The traditional healer	
	e)	Friends/family	
		Other. Please explain.	
Q 5:	**Why is it important to drink your tablets/use your insulin every day?**		
	a)	It keeps my blood sugars normal	
	b)	The doctor prescribed them to me	
	c)	It allows me to eat biscuits and cakes	
	d)	It heals the diabetes	
	e)	Other response (*please record response below)*	
Q 6:	**It is important to eat healthy when you have diabetes, because….**		
	a)	It prevents me from shaking	
	b)	It ensures that my sugar levels are controlled	
	c)	It prevents me from being hungry	
	d)	It gives me more energy	
	e)	Other response (*please record response below)*	

EDENDALE HOSPITAL

DIABETES HEALTH LITERACY QUESTIONNAIRE

Q 7:	**What does it mean if you have hyperglycaemia?**		
	a)	My blood sugar is more than 14	
	b)	My blood sugar is more than 10	
	c)	My blood sugar is below 5	
	d)	My blood sugar is more than 2	
	e)	Other response (*please record response below)*	
Q 8:	**What is HbA1c?**		
	a)	Blood test that monitor my glucose for the last 3 months	
	b)	Blood test monitoring my daily sugars	
	c)	Blood test that looks at my kidneys and how well they work.	
	d)	Blood test that looks at my eyes and how well they work.	
	e)	Other response (please record response below)	
Q 9:	**Which fruits are safe for a diabetic to eat?**		
	a)	Green apples	
	b)	Bananas	
	c)	Strawberry	
	d)	All of the above	
	e)	Other response (*please record response below)*	
Q 10:	**If my sugar is too high, the symptoms include:**		
	a)	Blurred vision - I cannot see properly	
	b)	Excessive thirst - I am very thirsty	
	c)	Frequent urination - I wee a lot	
	d)	All of the above	
	e)	Other response (*please record response below)*	
Q 11:	**When my sugar is very low, I should:**		
	a)	Take my medicine immediately	
	b)	Eat 3 sweets and a sandwich	
	c)	Eat a fruit	
	d)	Exercise for 30 min	
	e)	Other response (*please record response below)*	
Q 12:	**Eating healthy means that I:**		
	a)	Eat small, regular meals that are low in sugar and fat	
	b)	Eat lots of vegetables and fruit every day	
	c)	Eat foods that are specially made for diabetics	
	d)	Drink tea with brown sugar, not white sugar	
	e)	Other response (*please record response below)*	

EDENDALE HOSPITAL

DIABETES HEALTH LITERACY QUESTIONNAIRE

Q 13:	**How often should you check your blood sugar with a fingerprick test?**		
	a)	Every day	
	b)	Every week	
	c)	Twice a week	
	d)	Once a month	
	e)	Other response *(please record response below)*	
Q 14:	**If the doctor and the nurse gives you advice that is not the same/is different , would you:**		
	a)	Ignore both the doctor and the nurses	
	b)	Listen to the doctor	
	c)	Listen to the nurse	
	d)	Ask the traditional healer	
	e)	Other response *(please record response below)*	
Q 15:	**Taking my tablets/insulin is important, because**		
	a)	The doctor said so	
	b)	It prevents diabetic complications	
	c)	It cures diabetes	
	d)	My family said I need to drink/use it	
	e)	Other response *(please record response below)*	
Q 16:	**If my blood sugar is constantly high, I am going to**		
	a)	Develop kidney problems	
	b)	Have problems with my eyesight as I get older	
	c)	Have to use insulin injections	
	d)	All of the above	
	e)	Other response *(please record response below)*	
Q 17:	**The only time I should not drink my tablets is when:**		
	a)	I have a headache	
	b)	I have not eaten	
	c)	I am going to doctor	
	d)	All of the above	
	e)	Other response *(please record response below)*	
Q 18:	**Having diabetes means that my body cannot:**		
	a)	Use sugar for energy	
	b)	Make enough insulin for my body to use	
	c)	Make enough sugar for my body to use	
	d)	Use the sugar in my blood	
	e)	Other response *(please record response below)*	

EDENDALE HOSPITAL

DIABETES HEALTH LITERACY QUESTIONNAIRE

Q 19:	**Insulin is a:**		
	a)	Hormone in my body and is used to control my blood sugar	
	b)	Injection they give to control your blood sugar	
	c)	Type of medication/treatment for diabetes	
	d)	Injection that cures my diabetes	
	e)	Other response *(please record response below)*	
Q 20:	**The risk factors for Type 2 diabetes include**		
	a)	Being overweight	
	b)	Having a family member with diabetes	
	c)	Being a member of a high-risk population/high risk community	
	d)	All of the above	
	e)	Other response *(please record response below)*	
Q 21:	**Type 2 Diabetes can be prevented or delayed by:**		
	a)	Losing weight	
	b)	Regular exercise	
	c)	Following a healthy, balanced diet	
	d)	All of the above	
	e)	Other response *(please record response below)*	
Q 22:	**I will drink Imbiza if:**		
	a)	It will cure my diabetes	
	b)	If the doctor / nurse said I can	
	c)	If my family bought it for me	
	d)	None of the above	
	e)	Other response *(please record response below)*	
Q 23:	**Which foods are the highest in carbohydrates / starch?**		
	a)	Fish, chicken and beans	
	b)	Margarine, sunflower and other cooking oil	
	c)	Bread, rice and potatoes	
	d)	Carrots, cabbage and beetroot	
	e)	Other response *(please record response below)*	
Q 24:	**What is fibre?**		
	a)	100% pure fruit juice	
	b)	Roughage in food that helps with digestion/prevents constipation?	
	c)	Breakfast cereals for diabetics	
	d)	A new chocolate made for diabetics	
	e)	Other response *(please record response below)*	

EDENDALE HOSPITAL

DIABETES HEALTH LITERACY QUESTIONNAIRE

Q 25:	**How would you prefer receiving information about diabetes?**		
	a)	From the nurse or doctor at the hospital / clinic	
	b)	Watching a video or listening to a programme on radio	
	c)	Reading a pamphlet	
	d)	Talking to my traditional healer	
	e)	Other response *(please record response below)*	
Q 26:	**The best type of fluid to drink when you have diabetes is:**		
	a)	Imbiza	
	b)	Tea with brown sugar	
	c)	100% pure fruit juice	
	d)	None of the above	
	e)	Other response *(please record response below)*	
Q 27:	**When I am making a sandwich, the healtiest bread spread would be:**		
	a)	Peanut butter	
	b)	Fruit jam	
	c)	Syrup	
	d)	All of the above	
	e)	Other response *(please record response below)*	
Q 28:	**When I was diagnosed with diabetes,**		
	a)	I thought I was going to die	
	b)	I thought I was going to loose my legs	
	c)	I did not know anything about diabetes	
	d)	I knew a little bit about diabetes	
	e)	Other response *(please record response below)*	
Q 29:	**Because I have diabetes, I have to eat**		
	a)	differently from the rest of my family	
	b)	buy expensive food from health shops	
	c)	only eat vegetables that have been boiled	
	d)	healthy, balanced meals with no sugar	
	e)	Other response *(please record response below)*	
Q 30:	**Eating a balanced meal means…**		
	a)	having all three foodgroups on my plate during a meal	
	b)	buying expensive food from health shops	
	c)	only eat vegetables that have been boiled	
	d)	weighing my food before I eat it	
	e)	Other response *(please record response below)*	

EDENDALE HOSPITAL

DIABETES HEALTH LITERACY QUESTIONNAIRE

Patient Code:					**File nr:**	
					Age:	
Diagnosis:	Type 1 DM		Type 2 DM		**Sex:**	
	Hypertensive		Hypercholesterolaemia		**Race:**	
Highest level of education obtained: (any formal education - grade 7, 12, no						

Name of Medication	Dosage
Metformin / Glucophage	
Gliclazide	
Actraphane	
Protophane	
Glibenclamide	

Medical History	

BIOCHEMISTRY					
Date	**HbA1c**	**Glucose**	**Blood pressure**	**Urea**	**Creatinine**

ISIBHEDLELA SASE EDENDALE

IMBUZO MPENDULO YESIFO SASHUKELA

Q 1: Uyasazi ukuthi siyini isifo sashukela nano kuthi senzani emzimbeni? Ngicela ungichazele.....

Q 2: **Wawuneminyaka emingaki ngenkathi kutholakala ukuth unesifo sashukela?**

Q 3: **Wazi kanjani ukuthi unesifo sashukela?**

Q 4: **Ngenkathi uthola ukuthi unesifo sashukela wayaphi kuqala ukuze ululekwe ngaso?**

a)	Kunesi wase mtholampilo ongasekha?	
b)	Kudokotela wasesibhedlela noma emtholampilo?	
c)	Kumfundisi noma kubantu base nkonzweni?	
d)	Kumuntu osebenzisa imithi yesintu?	
e)	Abangani / umndeni	
f)	Eminye imibono(sicela ubhale impendulo ngezansi)	

Q 5: **Yindaba kusemqoka ukuthi uphuze amaphilisi akho zinsuku zonke?**

a)	Kugcina ushukela wami wegazi usezingeni elifanele	
b)	Ngoba ngawanikwa udokotela	
c)	Kungivumela ukuthi ngidle amabhisikidi namakhekhe	
d)	Kulapha isifo sashukela	
e)	Eminye imibono(sicela ubhale impendulo ngezansi)	

Q 6: **Kusemqoka ukuthi uma unesifo sashukela udle ukudla okunempilo, ngoba…**

a)	Ukuze ngingabi nedumbe	
b)	Kuqinisekisa ukuthi ushukela wami wasegazini ukahle	
c)	Ukuze ngingalambi	
d)	Ukuze ngibe nomfutho omningi	
e)	Eminye imibono(sicela ubhale impendulo ngezansi)	

ISIBHEDLELA SASE EDENDALE

IMBUZO MPENDULO YESIFO SASHUKELA

Q 7:	**Kuchaza ukuthini ukuba noshukela ophezulu**		
	a)	Ushukela wami usuke ungaphezu ka14	
	b)	Ushukela wami usuke ungaphezu ka10	
	c)	Ushukela wami usuke ungaphansi ka 5	
	d)	Ushukela wami usuke ungaphezu ka 2	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 8:	**Yini iHbA1c?**		
	a)	Ukuhlola kwashukela wasegazini wezinyanga eziwu 3 ezadlula	
	b)	Ukuhlola ushukela wasegazini nsuku zonke	
	c)	Ukuhlola ukuthi izinso zami zisebenza kanjani	
	d)	Ukuhlola ukuthi amehlo ami abona kahle yini	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 9:	**Iziphi izithelo ezifanele ukudliwa abantu abanesifo sashukela?**		
	a)	Ama apula aluhlaza	
	b)	ubhanana	
	c)	istrawberry	
	d)	Zonke lezi ezibalwe ngenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 10:	**Izimpawu ezitshengisa ukuthi ushukela wasegazini uphezulu yilezi:**		
	a)	Ukungaboni kahle	
	b)	Ukunxanwa kakhulu	
	c)	Ukuchama njalo	
	d)	Konke lokhu okubalwa ngenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 11:	**Uma ushukela wase gazini uphansi kakhulu kumele ngenze lokhu okulandelayo:**		
	a)	Ngiphuthume ngiphuze amaphilisi	
	b)	Ngidle uswidi omthathu kanye nesemishi	
	c)	Ngidle izithelo	
	d)	ngijime imizuzu ewu 30	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 12:	**Ukudla ukudla okunempilo kuchaza ukuthi:**		
	a)	Ngidla ukudla okucane kaningi okunoshukela omncane namafutha amancane	
	b)	Ukudla izithelo nezitshalo eziningi nsuku zonke	
	c)	Ukudla ukudla okwakhelwe abantu abano shukela	
	d)	Ukuphuza itiye elinoshukela onsundu, ayiomhlophe.	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	

ISIBHEDLELA SASE EDENDALE

IMBUZO MPENDULO YESIFO SASHUKELA

Q 13:	Kumele ngichofe emva kwesikhathi esingakanani emnweni ukuze ngihlole ushukela wasegazini?		
	a)	Nsuku zonke	
	b)	Njalo ngeviki	
	c)	kabili ngeviki	
	d)	kanye ngenyanga	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 14:	**Uma ulwazi engilithola kudokotela nakunesi lungafani ngingenze njani?**		
	a)	Ngingabaziba bobabili odokotela no nesi	
	b)	Ngingalalela udokotela	
	c)	Ngingalalela unesi	
	d)	Ngingabuza umuntu olapha ngemithi yesizulu	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 15:	**Kubalulekile ukuphuza amaphilisi noma i-insulin ngoba…**		
	a)	Udokotela washo njalo	
	b)	Kuvimbela izinkinga ezibangwa isifo sashukela	
	c)	Kulapha isifo sashukela	
	d)	Umndeni wami wathi kubalulekile ukuthi ngiyiphuze	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 16:	**Uma ushukela wami ulokhu uba phezulu ngizo**		
	a)	Qalwa inkinga yezinso	
	b)	Ngizoba nenkinga yamehlo emva kwesikhathi	
	c)	Kuzomele ngisebenzise umjovo we-insulin	
	d)	Konke lokhu okubalwe ngenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 17:	**Isikhathi la kungamele ngiphuze khona amaphilisi ilapho:**		
	a)	Uma ngiphethwe ikhanda	
	b)	Uma ngingadlile	
	c)	Uma ngiyobona udokotela	
	d)	Konke lokhu okubalwe ngenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 18:	**Isifo sashukela sichaza ukuthi umzimba wami awukwazi uku:**		
	a)	Ukusebenzisa ushukela wegazi ukuthola amandla	
	b)	Ukwakha i-insulin eyanele ezosetshenziswa umzimba wami	
	c)	Ukwakha ushukela wegazi owanele ukuthi usetshenziswe umzimba	
	d)	Ukusebenzisa ushukela egazini lami	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	

ISIBHEDLELA SASE EDENDALE

IMBUZO MPENDULO YESIFO SASHUKELA

Q 19:	**I insulin i/u:**		
	a)	Imizwa emzimbeni wami eyenza ukuthi ushukela ube ezingeni elikahle	
	b)	Umjovo abakunikeza wona owenza ukuthi ushukela ube sezingeni elikahle	
	c)	Umuthi osetshenziswa abantu abanoshukela	
	d)	Umjovo olapha isifo sashukela	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 20:	**Ubungozi bokuthola isifo sikashukela iType 2, bufaka…**		
	a)	Ukuba nesisindo esiphezulu	
	b)	Ukuba nomuntu emndenini onesifo sashukela	
	c)	Ukuba ilunga lomphakathi osengozini yokuphathwa isifo sashukela	
	d)	Konke lokhu okubalwe ngenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 21:	**Isifo sashukela iType 2 singavikeleka ngokuthi:**		
	a)	Wehlise isisindo somzimba	
	b)	Ukuzijwayeza ukuzivocavoca	
	c)	Ukudla ukudla okunomsoco	
	d)	Konke lokhu okubalwe ngenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 22:	**Imbiza ngingayiphuza uma:**		
	a)	Ingalapha isifo sashukela	
	b)	Uma udokotela ethi ngingayiphuza	
	c)	Uma umndeni wami ungithengelile yona	
	d)	Akukho kulokhu okungenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 23:	**Iziphi izinhlobo zokudla ezine stashi esiningi?**		
	a)	Ufishi, inkukhu nobhontshisi	
	b)	Imajarini, amafutha esunflower nawe olive	
	c)	Isinkwa, irayisi kanye namazambane	
	d)	Ukherothi, ikabishi kanye no bhitruthi	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 24:	**Yini ifibre?**		
	a)	Ijusi yezithelo ewu 100%	
	b)	Ukolweni osekudleni owenza ukuthi ukudla kugayeke kalula	
	c)	Izidlo zasekuseni zabantu abane sifo sashukela	
	d)	Inhlobo entsha yashokoledi owakhelwe abantu abanesifo sashukela	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	

ISIBHEDLELA SASE EDENDALE

IMBUZO MPENDULO YESIFO SASHUKELA

Q 25:	**Iyiphi indlela engcono ongancamela yokuthola ulwazi ngesifo sashukela**		
	a)	Ukuzwa ngo nesi noma ngodokotela esibhedlela noma emtholampilo	
	b)	Ukubuka ividiyo noma ukulalela uhlelo emsakazweni	
	c)	Ukufunda ipheshana eliphathelene nesifo sashukela	
	d)	Ukuya kumuntu olapha ngemithi yesi zulu	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 26:	**Uketshezi oluncomekayo olungaphuzwa abantu abaphethwe isifo saskhukela ilolu:**		
	a)	Imbiza	
	b)	Itiye elinoshukela onsundu	
	c)	ijusi yezithelo ewu 100%	
	d)	Akukho kulokhu okungenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 27:	**Uma wenza isemishi isigcobo ongasisebenzisa ilesi:**		
	a)	Ibhotela lamakinati	
	b)	ujamu	
	c)	usiriphu	
	d)	Konke lokhu okubalwe ngenhla	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 28:	**Ngenkathi ngiqala ukuzwa ukuthi nginesifo sashukela**		
	a)	Ngacabanga ukuthi ngizofa	
	b)	Ngacabanga ukuthi ngizonqunywa izinyawo	
	c)	Ngangingazi lutho ngesifo sashukela	
	d)	Nganginolwazi oluncane ngesifo sashukela	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 29:	**Njengoba nginesifo sashukela kumele**		
	a)	Ngidle ukudla okuhlukile kunalokh okudliwa umndeni wami	
	b)	Ngithenge ukudla ukubizayo ezitolo zezinto zinempilo	
	c)	Ngidle izitshalo ezibilisiwe zodwa	
	d)	Ngidle ukudla okunomsoco okungenashukela	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	
Q 30:	**Ukudla ukudla okunomsoco kuchaza ukuthi**		
	a)	Udla izinhlobo zokudla ezihlukahlukene	
	b)	Ukuthenga ukudla okubizayo okuthenge ezitolo ezidayisa izinto zempilo	
	c)	Ngidle izithelo ezibilisiwe zodwa	
	d)	Ukuthola isisindo sokudla ngaphambi kokuthi ngikudle	
	e)	Eminye imibono(sicela ubhale impendulo ngezansi)	

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

18 February 2014

Ms Rene Burns
16 Southview Road
Bellevue
Pietermaritzburg
South Africa
reneburns1905@gmail.com

Dear Ms Burns

PROTOCOL: Functional health literacy and related blood glucose control in black outpatients with Type 2 Diabetes Mellitus attending a clinic at Edendale Hospital, Pietermaritzburg. REF: BE251/13.

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application received on 27 June 2013.

Your responses received by BREC on 05 February 2014 to queries raised on 22 August 2013 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as from 18 February 2014.

This approval is valid for one year from **18 February 2014.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2004), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be **RATIFIED** by a full Committee at its next meeting taking place on **11 March 2014.**

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

Professor D.R Wassenaar
Chair: Biomedical Research Ethics Committee

health

Department:
Health
PROVINCE OF KWAZULU-NATAL

Health Research & Knowledge Management sub-component
10 – 103 Natalia Building, 330 Langalibalele Street
Private Bag x9051
Pietermaritzburg
3200
Tel.: 033 – 3953189
Fax.: 033 – 394 3782
Email.: hrkm@kznhealth.gov.za
www.kznhealth.gov.za

Reference : HRKM300 /13
Enquiries: Mrs G Khumalo
Telephone : 033 – 395 3189

06 November 2013

Dear Ms R Burns

Subject: Approval of a Research Proposal

1. The research proposal titled **Functional health literacy and related blood glucose control in black outpatients with Type 2 Diabetes Mellitus attending a clinic at Edendale Hospital, Pietermaritzburg'** was reviewed by the KwaZulu-Natal Department of Health.

The proposal is hereby **approved** for research to be undertaken at Edendale Hospital.

2. You are requested to take note of the following:
   a. Make the necessary arrangement with the identified facility before commencing with your research project.
   b. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.

3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Mrs G Khumalo on 033-395 3189.

Yours Sincerely

Dr. E Lutge
Chairperson, KwaZulu-Natal Health Research Committee
Date: 08/11/2013

APPENDIX D: Informed Consent Form

UNIVERSITY OF KWAZULU-NATAL

FUNCTIONAL HEALTH LITERACY AND TYPE 2 DIABETES MELLITUS

Title of Study: Functional health literacy and glucose control in African patients with Type 2 Diabetes Mellitus attending an outpatient clinic at Edendale Hospital, Pietermartizburg.

Principal Investigator:

Ms R Burns (RD) as part of her obligation to complete her Masters in Nutrition at University of KwaZulu-Natal's Discipline of Dietetics and Human Nutrition.

Reason for this study:

Type 2 Diabetes is one of the fastest growing diseases of lifestyle in South Africa due to the link between sedentary lifestyles, consumption of unhealthy foods and population and culture shifts due to urbanisation. The International Diabetes Federation has estimated that up to 13% of the South African population will develop diabetes in their lifetime. Focus has been drawn to ways and means of education that will effectively impart knowledge of diabetes in order to prevent and/or treat diabetes. The University of KwaZulu-Natal aims to determine the various factors that influence health literacy in patients with Type 2 Diabetes.

The aims for this study are therefore:

1. To determine the functional health literacy of patients with Type 2 Diabetes that is attending the Diabetic clinic at Edendale Hospital, Pietermaritzburg.
2. To determine glucose control by examining certain biochemistry values already available in your file.
3. Determine whether there is any correlation between the functional health literacy of a patient and glucose control.

RISKS AND BENEFITS:

You will participate in this study by your own free will and you may choose to withdraw from the study at any time. There are no risks involved with the research of the study. Your decision whether or not to participate in this study will not affect the medical care that you receive at the hospital. The results of this study will help in effectively designing health education programs targeted at diabetic patients attending Edendale Hospital.

WHAT WILL BE EXPECTED FROM THE PARTICIPANT?

Your participation in this study will take approximately 20 - 30 minutes to conduct the interview and complete the questionnaire. A trained research assistant will conduct an interview with you and will ask you a standardised set of questions. If you are unsure of anything please do not hesitate to ask the research assistant to explain the section to you again. Your file be reviewed for basic health data (including medication taken, when you were diagnosed and your biochemistry), but both your questionnaire and health data will be kept anonymous.

PAYMENTS:

Please note that no payment will be received from your participation in this study.

PARTICIPANT'S RIGHTS:

If you have read this form and have decided to participate in this project, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. The results of this research study may be presented at scientific or professional meetings or published in scientific journals. However, your identity will not be disclosed. You have the right to refuse to answer particular questions or withdraw from the study at any time.

AUTHORIZATION TO USE YOUR HEALTH INFORMATION FOR RESEARCH PURPOSES

Because information about you and your health is personal and private, it cannot be used in this research study without your written consent. Your information will only be used in accordance with this authorization form and the informed consent form and as required or allowed by law. Please read it carefully before signing it.

IF I SIGN, CAN I REVOKE IT OR WITHDRAW FROM THE RESEARCH LATER?

If you decide to participate, you are free to withdraw your authorization regarding the use and disclosure of your health information (and to discontinue any other participation in the study) at any time. After any withdrawal, your health information will no longer be used or disclosed in the study, except to the extent that the law allows the researcher to continue using your information (e.g., necessary to maintain integrity of research). If you wish to revoke your authorization for the research or disclosure of your health information in this study, or if you wish to ask any questions regarding the study, please phone Ms R Burns on 033 395 4190.

_____

I _____ (Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

_____	_____	_____
Signature of participant	Signature of witness	Date

APPENDIX D: Informed Consent Form

FUNCTIONAL HEALTH LITERACY AND TYPE 2 DIABETES MELLITUS

UNIVERSITY OF KWAZULU-NATAL

Igama lophenyo: Izinga lolwazi ngezempilo kanye nokugcinwa kwashukela wegazi kubantu abamnyama abanesifo sikashukela iType 2 abeza emtholampilo wasesibhedlela i-Edendale, eMgungundlovu.

Umseshi:

UNks. R Burns (RD) njengengxenye yezinto ezidingekayo ukuze aqede i-Masters yakhe kwi Nutrition ngaphansi koMyango we-Dietetics and Human Nutrition eNyuvesi yaKwaZulu Natal.

Isizathu salolu phenyo

Isifo sikashukela i-Type 2 singesinye sezifo ezibhebhetheka ngokushesha eMzansi Afrika ngenxa yobudlelwane phakathi kwaso nempilo yobuvila, ukudla ukudla okungenampilo kanye noshintsho kusikompilo lwabantu olulethwa impucuko. I-International Diabetes Federation isihlawumbisele ukuthi silinganiselwa ku-13% isibalo sabantu abazoba nesifo sikashukela ngokuqhubeka kwezimpilo zabo lapha eMzansi Afrika. Sekuqashwe kakhulu ezindleleni zokufundisa ezizosebenza kahle ekunikezeni abantu ulwazi ngesifo sikashukela ukuze kuvikelwe futhi/noma kulashwe isifo sikashukela. INyuvesi yaKwaZulu-Natal ihlose ukuthola izinto ezahlukene ezinomthelela kwizinga lolwazi ngezempilo kubantu abanesifo sikashukela iType 2.

Ngakho-ke izinhloso zalolu phenyo:

1. Ukuthola izinga lolwazi ngezempilo lwabantu abanesifo sikashukela iType 2 abeza emtholampilo wesifo sikashukela esibhedlela i-Edendale, eMgungundlovu.
2. Ukuhlola ukugcinwa kwezinga likashukela wegazi ngokubheka izinga lezinto ezithize egazini esezivele zibhaliwe kwifayela yakho.
3. Ukuthola ukuthi bukhona yini ubudlelwane phakathi kwezinga lolwazi ngezempilo kumuntu kanye nokugcinwa kwashukela wegazi.

UBUNGOZI KANYE NEZINZUZO

Uzozibandakanya nalolu phenyo ngokungempoqo, futhi ungakhetha ukuyeka ukuba ingxenye yalolu phenyo noma inini. Abukho ubungozi obukhona obuphathelene nalolu phenyo. Isinqumo sakho sokuthi uyazibandakanya noma awuzibandakanyi nalolu phenyo ngeke sibe nomthelela kwizinga lempatho yezempilo oyitholayo lapha esibhedlela. Imiphumela yalolu phenyo izosiza ekutheni kwakhiwe kahle izinhlelo zokufundisa ngezempilo ezibhekiswe kubantu abanoshukela abahambela isibhedlela i-Edendale.

YINI EZOBE ILINDELEKE KUMUNTU OZOZIBANDAKANYA NALOLU PHENYO

Ukuzibandakanya kwakho kulolu phenyo kuzothatha cishe imizuzu engamashumi amabili kuya kwamathathu (20 - 30), ukuphendula imibuzo. Umseshi osizayo oqeqeshiwe uzokubuza uhla lwemibuzo ebhaliwe. Uma kukhona ongakuzwanga kahle, uyanxuswa ukuba ungangabazi ukutshela umseshi osizayo aphinde akuchazele lokho ongakuzwanga kahle. Ifayela yakho izobhekwa kufuneka imininingwane nje ejwayelekile (kubalwa imithi oyitholayo, wathola nini ukuthi unesifo sikashukela kanye namagazi akho), kodwa uhla lwemibuzo kanye nemininingwane yakho kuzoba imfihlo.

INKOKHELO:

Uyacelwa ukuba uqaphe ukuthi angeke ukhokhelwe mali ngokuzibandakanya kwakho kulolu phenyo.

AMALUNGELO OMUNTU OVUME UKUZIBANDAKANYA

Uma usulifundile leli fomu wavuma ukuzibandakanya kulolu phenyo, uyacelwa ukuba uqonde ukuthi ukuzibandakanya kwakho uzikhethela wena futhi unelungelo lokuyeka phakathi noma ungabe usaqhubeka nokuzibandakanya noma inini ngaphandle kokujeziswa noma ukulahlekelwa izinzuzo mhlawumbe obukade uthenjiswe zona. Imiphumela yalolu phenyo kungenzeka yethulwe ezinhlanganweni zososayensi kumbe ikhishelwe emibhalweni yezincwadi zososayensi. Kodwa-ke, igama lakho angeke lidalulwe. Unelungelo lokungayiphenduli eminye imibuzo noma uphume kuphenyo noma inini.

IGUNYA LOKUSEBENZISA IMININGWANE YAKHO YEZEMPILO NGEZINHLOSO ZOPHENYO

Ngesizathu sokuthi imininingwane yakho nangempilo yakho iyimfihlo, ayikwazi ukusetshenziswa kulolu phenyo ngaphandle kwemvumo yakho ebhalwe phansi. Imininingwane yakho izosetshenziswa kuphela ngokuhambiselana naleli fomu legunya kanye naleli fomu lokuvuma ukuzibandakanya nalolu phenyo kanye nokuvumelene nomthetho.

UMA NGISAYINA, NGINGASULA NOMA NGISHIYE PHANSI KULOLU PHENYO NGOKUHAMBA KWESIKHATHI?

Uma uvuma ukuzibandakanya, ukhululekile ukusiphuca igunya lakho mayelana nokusetshenziswa nokudalulwa kwemininingwane yakho yezempilo (kanye nokuyeka okunye futhi obuzibandakanya kukho kulolu phenyo) noma inini. Ngemuva kokuyeka, imininingwane yakho yezempilo ngeke isasetshenziswa noma idalulwe kulolu phenyo, ngaphandle makuvuma umthetho ukuthi umseshi angaqhubeka asebenzise imininingwane yakho (isibonelo ukuthi makubalulekile ukugcina isimilo sophenyo). Uma ngabe ufisa ukusula igunya lakho ngalolu phenyo noma ukudalulwa kwemininingwane yakho yezempilo, noma uma unemibuzo mayelana nalolu phenyo, uyacelwa ukuba ushayele uNks. R Burns kule nombolo yocingo: 033 395 4190.

Mina _____ (Amagama akho aphelele) ngiyaqinisekisa ukuthi ngiyakuqonda konke okuqukethwe lapha kanye nohlobo lwalolu phenyo, futhi ngiyavuma ukuzibandakanya kulolu phenyo.

Ngiyaqonda ukuthi ngivumelekile ukushiya phansi kulolu phenyo noma inini uma nginesifiso sokwenze njalo

_____	_____	_____
Kusayina ozibandakanyayo	Kusayina ufakazi	Usuku