Home-Based Carers' Use of the Finnish Diabetes Risk Score Tool to Assess Diabetes Mellitus Patients at Ga-Dikgale Village, South Africa: A Feasibility Study

by

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DECLARATION

I, **Thanana Thomas Molepo**, declare that "Home-Based Carers' Use of the Finnish Diabetes Risk Score Tool to Assess Diabetes Mellitus Patients at Ga-Dikgale Village, South Africa: A Feasibility Study" submitted for an MCur degree at the University of Limpopo, has not previously been submitted for a degree at this or any other university, and that it is my own work in design and execution and that all reference material contained herein has been duly acknowledged.

T.T. Molepo   **:**   ....

Date Signed   **:**   ....

DEDICATION

I dedicate this study to my my wife, Ramadimetja Evelyn Mothapo, and children, Nana, Tebogo (Nzele), Mahula and Tlou (Zaza), for being there and understanding my frustrations of doing research. I also dedicate this study posthumously to the following people.

- My mother, Mokgadi Joyce Molepo

- My grandmother, Mapeu Cathrine Molepo

- My special grandmother, "Koko Nelly Mothiba"

- Ntina Mothapo, "A true humanitarian at Red Cross Mokopane"

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ABSTRACT

Introduction: Diabetes mellitus has become a worldwide problem that is continuing to rise resulting in morbidity and mortality in developing countries.Finland developed the FINDRISC tool. Canada uses the Finnish Diabetes Risk Score (FINDRISC) tool and the Canadian Diabetes Risk Questionnaire (CANRISC), Germany has developed the German Diabetes Risk Score (GDRS). These risk scores are all self-assessment tools meant for assessing the risk of diabetes. They cover variables such as age, waist circumference, height, history of hypertension, physical activity, consumption of alcohol, coffee, whole grains and red meat (Buijsse, Simmons, Griffin & Schulze, 2010).

Aim: To determine the feasibility of Home-Based Carers (HBCs) on the use of the FINDRISC tool to assess diabetes mellitus (DM) patients at Ga-Dikgale Village, South Africa.

Methodology: A quantitative, descriptive cross–sectional design has been used to describe knowledge and practices of HBCs in using FINDRISC tool to assess the Diabetes Mellitus patient at the Dikgale village. Fifty two (52) HBCs have been assessed and homogeneous purposive convenience sampling has been used. A modified (tool) has been used by the HBCs to assess the risk status of people to determine diabetes risk status while the researcher scored the HBCs on the utilisation of modified FINDRISC tool after they have demonstrated all sections of the risk assessment tool. Data analysis has been done using (Statistical Package for Social Sciences) IBM

SPSS version 24 software and Microsoft excel sheet.

Results: This study has found that HBCs can play in important role in the assessment of patients at risk of developing diabetes in the communities by using the assessment tool. The knowledge and skills of the HBCs that have been acquired throughout the years can be augmented by strengthening the primary health care re-engineering programme and in-service training that can be tailored for proper functioning of the HBCs within the health care team.

Conclusion and recommendation: The burden of DM can be alleviated through the use of FINDRISC tool by determining diabetes risk status and employ necessary precautions to assist people who are at risk. This study recommend that the FINDRISC tool be modified in order to be relevant to the African perspective by validating of the tool through taking blood samples from people who are at risk .

Keywords: diabetes mellitus, home-based carers, Finnish diabetes risk score tool, feasibility, assessment of patients at risk

LIST OF ACRONYMS AND ABBREVIATIONS

BMI	Body Mass Index
CANRISC	Canadian Diabetes Risk Questionnaire
CDC	Centers for Disease Control and Prevention
DM	Diabetes Mellitus
DT1	Diabetes Mellitus Type 1
T2D	Diabetes Mellitus Type 2
FINDRISC	Finnish Diabetes Risk Score
FPG	Fasting Plasma Glucose
GDRS	German Diabetes Risk Score
HBCs	Home-Based Carers
IFG	Impaired Fasting Glucose
NCDs	Non-Communicable Diseases
NHANES	National Health and Nutrition Examination Survey
NHLBI	National Heart, Lung and Blood Institute
NIH	National Institutes of Health
OGTT	Oral Glucose Tolerance Test
OSCE	Objective Structured Clinical Examination
PHC	Primary Health Care
SPSS	Statistical Package for Social Sciences
STATSSA	Statistics South Africa
STEPS	Stepwise Approach to Surveillance
TPB	Theory of Planned Behaviour
TREC	Turfloop Research Ethics Committee

WHO World Health Organization

DEFINITIONS OF CONCEPTS

Home-Based Carers

Home-based carers (HBCs) are defined as the persons who provide comprehensive health care to the community, which is delivered specifically to the family or individual at home. It includes direct nursing care in the form of a person-to-person interaction, as well as indirect contact when the professional community health nurse acts as a consultant and overseeing such health provision (Hattingh, Dreyer and Roos, 2013). In this study, HBC shall mean a person who is trained to render health care in a community setting and will be referred to as HBC or carers in this study.

Finnish Diabetes Risk Score

The Finnish Diabetes Risk Score (FINDRISC) is the one-paged risk score containing eight sections, with categorised answers about age, BMI, waist circumference, physical activity, daily consumption of fruits, berries or vegetables, history of antihypertensive drug treatment, history of high blood glucose and family history of diabetes (Saaristo, Peltonen, Lindstrom, Saarikoski, Sundvall, Erikson and Tuomilehto, 2005; Tankova, Chakarova, Atanassova and Dakovska, 2011). The FINDRISC shall mean risk assessment score of asymptomatic people with diabetes mellitus type 2 (T2D) patients.

Diabetes Mellitus

Diabetes Mellitus (DM) is defined as a group of metabolic diseases characterised by increased levels of glucose in the blood (hyperglycemia) resulting from

defects in insulin secretion, insulin action or both (Grunier, Merkle-Reid, Fisher, Reeimer, Ma and Ploeg, 2016). Diabetes in this study shall mean diabetes mellitus type 2 (T2D).

Assess   To assess is to examine for the purpose of evaluation in order to improve the quality of service (Mosby's Dictionary, 2013). In this study, to assess is to test knowledge and ability of HBCs to use the FINDRISC tool to assess asymptomatic people with DM.

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CHAPTER 1

OVERVIEW OF THE STUDY

1.1 Introduction

Diabetes mellitus (DM) has become a worldwide problem that is continuing to rise resulting in morbidity and mortality in developing countries (Okonta, Ikombele & Ogunbanjo, 2014). In 2012, non-communicable diseases (NCDs) such as DM and hypertension were responsible for more than 16 million premature deaths (under the age of 70) worldwide. The majority of the premature deaths occurred in low and middle income countries (WHO, 2015).

Diabetes Mellitus Type I (DT1) constitutes 5% to 10% of people with DM. Its onset is usually before 30 years. Genetic susceptibility is a common underlying factor in the development of DT1. People do not inherit DT1, but rather have a genetic predisposition (Smeltser, Bare, Hinkle & Cheever, 2012). Most people, approximately 90% to 95%, are affected by DM Type 2 (T2D) which occurs more commonly among people who are older than 30 years of age and obese (Smeltser *et al.*, 2012; WHO, 2015).

Buijsse, Simmons, Griffin and Schulze (2010) indicated that the use of multivariate risk scores, for example, the Finnish Diabetes Risk Score (FINDRISC) have been developed and implemented in some western countries in recent years with the aim of predicting diabetes risks for individuals, and such risks scores are recommended in current practice guidelines for DM prevention and care. Edwardson, Gray, Yates, Barber,

Khunti and Davies (2014) indicated that FINDRISC is a quick and simple way of identifying individuals at high risk of developing diabetes. FINDRISC is a questionnaire containing 8 questions, including age, Body Mass Index (BMI), abdominal circumference, physical activity, diet, presence of other illnesses, anti-hypertensive and DM drug use, and family history of DM (Naranjo, Rodriquez, Liera & Aroche, 2013).

Renzaho (2015) indicated that DM is one of the NCDs which is rising rapidly in Sub-Saharan African countries and posing a threat to the socio-economic and cultural fabric of Sub-Saharan Africa. The 2030 agenda for sustainable development recognise the huge impact of NCDs, including DM worldwide, as an issue that the Millennium Development Goals (MDGs) did not address. The aim of the 2030 agenda for sustainable development is to reduce premature deaths from NCDs, including DM, by one-third by 2030 (WHO, 2015).

The Strategic Plan for the Prevention and Control of Non-Communicable Diseases (2013) stated that one of the central priorities of the South African government is "A long and healthy life for all''. This strategic plan is aimed at addressing the quadruple burden of diseases, including NCDs such as DM. This strategic plan is aimed at establishing a framework for reducing morbidity and mortality from NCDs in order to achieve health reform in South Africa by promoting health for all individuals. Reducing mortality and morbidity due to DM is one of the four outputs of the Negotiated Service Delivery Agreement signed between the Minister of Health and the President of South Africa as the health sector's contribution to ''healthy life for all'' (Strategic Plan for the Prevention and Control of Non-Communicable Diseases, 2013).

Task shifting is onother important evolution in addressing NCDs; it is the process whereby less professional tasks are shifted to other categories of workers such as Home-Based Carers (HBCs) in the provision of Primary Health Care (PHC). Task shifting to HBCs in the management of DM patients have focused on the improvement of adherence to medication or lifestyle modifications and screening, however, whether the feasibility of using HBCs in the screening of people with DM remains unclear (Gaziano, Abrahams-Gessells, Denman, Montano, Khanam, Puoane & Levitt, 2015). One of the problems is increased number of people at risk or with DM and a workforce that has not the capacity to address this. So, task shifting is needed in addressing risk assessment of patients on suspected diabetes. In the South African context, HBCs could play an important role.

In South Africa a few studies have been done in relation to task shifting in DM and home-based care:

A rapid assessment of a community health worker pilot programme to improve the management of hypertension and DM in Emfuleni sub-district of Gauteng Province has been done by Ndou, van Zyl, Hlahlane and Goudje (2013) focusing much on the role of HBCs visits in relation to patients cared for hypertension and DM. The study found that the involvement of HBCs could make an important contribution in the management of NCDs in comparison with the usual clinic care.

The study on non-fatal disease burden caused by T2D in South Africa has been conducted by Bertram, Jaswal, Van Wyk, Levitt and Hofman (2009) which focused on the prevalence of DM and the disability it causes. The study revealed that the burden of NCDs, including T2D, could be prevented through early detection and treatment by health professionals and through

involvement of HBCs in assessment of DM patients in a health facility (Bertram *et al.*, 2009).

Mbombi, Lekhuleni, Mothiba and Malema (2012) conducted a study that focused on the problems faced by newly diagnosed people with DM at the PHC facilities of Limpopo Province in South Africa. It was found that the health care system needs to review the strategies and policies as well as the necessity for the patients to be routinely screened for DM and information on early signs, symptoms and counselling be communicated to patients. Amongst the strategies and policies that can be reviewed are utilisations of health professionals in treating the disease and HBCs in detection of early manifestations of diabetes and assessment of unknown diagnosis so that complications for DM can be avoided although the study did not use the DM risk assessment tool (Mbombi *et al.*, 2012).

1.2 Research Problem

Polit and Beck (2012) defined the problem statement as expressed dilemma or a troubling situation that needs intense investigation and provides for a new inquiry. Therefore, in this section the researcher has outlined the problem statement for this study by indicating what could be a problem in the context of this study. Statistics South Africa (STATSSA) indicates that metabolic disorders including DM contribute to 6% of death in South Africa (STATSSA, 2013).

The current situation is burdening the PHC service because a portion of the budget that would have been used on other aspects of the health care is spent on chronic illnesses including DM that is preventable through early detection (Bertram *et al.*, 2009).

In the context of this study, there seems to be a problem as there is no tool designed to assess the risk of DM patients by HBCs in South Africa, especially in rural areas such as Ga-Dikgale Village. In South Africa, the Oral Glucose Tolerance Test (OGTT) and Fasting Plasma Glucose (FPG) are indicated for diagnosing asymptomatic high risk individuals, which are invasive and expensive methods used to detect DM (Smeltzer *et al.*, 2012). The researcher was not sure whether HBCs would be able to use such a tool in daily practice or not. Therefore, the general aim of this study is to determine the feasibility of Home-based carers' using the Finnish Diabetes Risk Score tool to assess people with DM at a rural village, Ga-Dikgale Village, South Africa.

1.3 Literature Review

Literature review refers to the search of the existing knowledge based on similar studies related to the topic that will help in developing guidelines for clinical practice (Brink, van der Walt & van Rensburg, 2012). Polit and Beck (2012) defined a literature review as an introduction to a report that provides readers with existing evidence documented by other researchers and contribute to the argument for a new study. In this study, the literature review has been based on the discussion relevant to the prevalence of risk factors, prevention, causes of DM and the use of different tools to assess people with DM by health care professionals, including HBCs.Databases for literature review such as google, google scholar, science direct, BMC health services research and research gate has been consulted.

1.4 Prevalence of Diabetes Mellitus in Different Countries

It has been estimated that 29.1 million people in the United States have been diagnosed with DM in 2012, 21.0 million are diagnosed and 8.1 million people

amounting to 27.8% are undiagnosed for all ages. The 20 years or older age groups amount to 28.9 million, that is, 12.3% of people with DM. People of 20 to 44 years of age constitute 4.3 million undiagnosed, that is, 4.1% of people with diabetes. People of 45-64 years amount to 13.4 million which is 16.2, while 65 years or older constitute 11.2 million which is 25.9% f people with DM (Centers for Disease Control and Prevention / CDC, 2014).

Tumbo and Nkadima (2013) indicated that Bojanala is one of the four districts in North West Province, with about 40% of the 3.3 million being rural populations. Tumbo and Nkadima (2013) further stated that DM is one of the four top chronic conditions in the Bojanala district of North-West Province in South Africa, with an estimated prevalence of 19.5% amongst the adult population. The fact that 40%, that is, 3.3 million of the North West Province is rural with the estimated prevalence of 19.5% amongst the adult population there is evidence that there is a need for a user-friendly DM risk assessment tool to be designed and implemented in the rural communities using the HBCs. This will help in the detection of new cases as well as the re-enforcement of life style modifications for people who are at risk of DM (Tumbo & Nkadima, 2013). Maimela, Alberts, Modjadji, Choma, Dikotope, Ntuli, and Van Geertruyden (2016) showed that at Ga-Dikgale in Limpopo Province area the prevalence of high blood glucose was equal to or above 7.0 mmol/l in the study undertaken which was about 12.5% of the total population. It is also indicated that the high fasting blood glucose was higher in older participants.

1.5 Usage of Different Diabetic Assessment Tools in Different Countries

Finland has developed the Finish Diabetes Risk Score (FINDRISC), a self assessment tool to assess the incidences of DM as a concise model covering 8 variables that are also used in CANRISC and FINDRISC (Edwardson *et al.*,

2014) The Canadian Task Force on Health Care (2012) reported that the United Kingdom and Canada also use the FINDRISC and Canadian Diabetes Risk Assessment Questionnaire Score (CANRISK) and this is recommended for screening asymptomatic adults for DM and not recommended for those people with symptoms of DM or DT1. CANRISK uses similar variables that are used in the FINDRISC tool.

Germany has developed the German Diabetes Risk Score (GDRS) which is a self-assessment tool for incidences of diagnosed and undiagnosed DM covering information on age, waist circumference, height, history of hypertension, physical activity, consumption of alcohol, coffee, whole grains and red meat (Buijsse *et al.*, 2010). In the United States of America, the Framingham Offspring Diabetes Risk Score is used which it is a personal model including variables such as age, sex, parental history and BMI (Buijsse *et al.*, 2010). The United Kingdom uses Cambridge Diabetes Risk Score which covers variables such as age, sex, BMI, smoking status, corticosteroid use, antihypetensive use and family history in predicting undiagnosed DM (Buijsse *et al.*, 2010).

Indian Diabetes Risk Score (IDRS) is used in India and it bears variables such as age, waist circumference, family history and physical activity in predicting undiagnosed DM.

1.5.1 Health Professionals' Knowledge and Usage of the Diabetic Assessment Tool

It is indicated that risk calculation may be performed by other health professionals who have, in a range of settings for instance at the clinical facility or at home. The screening of DM is aimed at family physicians

however; other health professionals such as registered nurses, pharmacists and dieticians can play a role in prediction of undiagnosed people with DM (Canadian Task Force on Preventive Health Care, 2012). Health professionals such as ophthalmologists and dieticians have an additional role in the in dealing with DM in general either using risk assessment tool or other diagnosis they can follow. By using FINDRISC, ophthalmologist can manage prevent complications related to DM, medical practitioners and physicians can assess for DM and dieticians can give advice on diet (Mashige, Notshweleka, Moodley, Rahmtoola, Sayed, Singh & Sardiwalla, 2008).

General practitioners, nurses, healthcare assistants and professionals in primary healthcare and the community can deliver brief interventions for DM prevention (Nice Public Health Guidance, 2012). Diabetes Mellitus prevention can be delivered on one to one basis or in a group with the aim of improving the patient's diet and help them to be physically active (Nice Public Health Guidance, 2012). It is indicated that DM risk scores have hypothesised a clinical mechanism of action whereby individual's clinicians target individual assessment and advice patients on self-assessment measuring their own risk of DM (Noble, Mathur, Dent, Meads & Geenhalgh, 2011).

1.5.2 South African Usage of the FINDRISC Tool

There is no evidence that indicate that multivariate risk score on DM has been utilised in South Africa as FINDRISC is used in Finland, GDRS is used in Germany and Cambridge used in United Kingdom (Edwardson *et al.*, 2014). Instead Scharges (2013) indicated that the new research by Human Sciences Research Council and Medical Research Council shows that the rise of NCDs including DM is an epidemic that destabilises the already fragile health care systems.

These indicate that there is no tool such as FINDRISC that has been used in South Africa in dealing with risk factors of people with DM assessed by HBCs and health professional. Scharges (2013) indicate that a research- driven manual to enhance health care providers with knowledge and skills that will enable them to effectively motivate and assist patients to make healthier lifestyle choices is required.

1.5.3 Method to be Used for Assessing HBCs in Using FINDRISC Tool

Zayyan (2011) indicates that Objective Structured Clinical Examination (OSCE) is a versatile multipurpose evaluative tool that can be utilised to assess health care professionals in a clinical setting. In this study HBCs have been assessed in using FINDRISC tool to assess patients at risk of diabetes. Therefore, OSCE has been used as a method to assess the HBCs in using this tool. An impromptu, where the HBCs are not exposed the tool before being assessed has been used to assess the competence of the HBCs. It is further indicated that OSCE assesses competency, based on objectives testing through direct observation. Therefore, the principles of OSCE have been applied in this study.

1.6 Theoretical Framework

Theoretical framework is the overall conceptual underpinnings of the study. Theory is a systematic, abstract explanation of some aspects of reality (Polit & Beck, 2012). Theory of Planned Behaviour (TPB) has been used as a theoretical framework because the study is about assessing Home-Based Carers' use of the Finnish Diabetes Risk Score tool to assess DM patients at Ga-Dikgale, South Africa: A feasibility study. TPB is based on the prediction of intention by the researcher in assessing the Home-Based Carers' use of the Finnish Diabetes Risk Score tool to assess people with DM.

1.7 Objectives of the Study

The objectives of this study were to:

- Describe knowledge and skills of HBC at Ga-Dikgale Village, South Africa regarding use of the different components of the FINDRISC tool to assess people with DM.

- Recommend training content and strategies for HBCs to use FINDRISC tool to assess the DM at Ga-Dikgale Village based on the study results.

1.8 Research Methodology

A quantitative research method has been used in this study. Burns and Grove (2011) indicate that quantitative research is the systemic organised process of generating numerical information about the new world. This method has been used by the researcher in order to describe the knowledge and practices of HBCs at Ga-Dikgale Village, South Africa regarding use of the FINDRISC tool to assess people with DM.

1.8.1 Study Site

The study has been conducted at Ga-Dikgale Village Capricorn District, Limpopo Province, South Africa. The health care structure of Ga-Dikgale consists of Dikgale Clinic, Seobi Dikgale Clinic, Sebayeng Clinic and, Makotopong Clinic. All these clinics provide PHC services and use Emergency Medical Services in case of referring the patients to hospital which is about 18 kilometres to Mankweng Hospital. Ga-Dikgale Village is situated along the R81 road north of Polokwane City.

1.8.2 Research Design

In this study a quantitative, descriptive cross-sectional design has been used to describe knowledge and practices of HBCs in using FINDRISC to assess people with DM at the Dikgale village. Polit and Beck (2012) state that research design is the overall plan for obtaining answers to the research question. Cross-sectional study examines a group of subjects simultaneously in various stages of development, levels of education, severity of illness or stages of recovery to describe changes of phenomena across stages (Grove, Gray & Burns, 2015). A cross-sectional study has been used in order to obtain numerical data about the broad perspective of the HBCs operating at Ga-Dikgale Village. Grove *et al*. (2015) indicate that descriptive research is the exploration and description of phenomena in a real life situation. This method has been used by the researcher in order to describe the feasibility of HBCs to use the FINDRISC tool to assess the risk of people with DM at Ga-Dikgale Village.

1.8.3 Population and Sampling

Polit and Beck (2012) indicated that population is the entire aggregation of cases in which researcher is interested in studying. The target population was all HBCs who serve under Ga-Dikgale Village, thus Dikgale clinic, Sebayeng Clinic, Seobi Dikgale clinic and Makotopong Clinic. The total number of HBCs assessed at Ga-Dikgale was 52. The HBCs have been assessed on using FINDRISC tool in assessing the people at risk of diabetes. In this study a Homogenous purposive convenience sampling has been used. Homogenous purposive convenience sampling bears the same characteristics in terms of composition, culture, and dependence on PHC services for minor and chronic ailments (Mothiba, Jooste & Nolte, 2012).

1.8.3.1 Inclusion Criteria

HBCs who can read and write and currently serving at any of the 4 (four) clinics at Ga-Dikgale Village has been included in the study. This is because HBCs have been assessed on the using FINDRISC tool to assess people with DM. This tool requires basic literacy on the part of the carers. Age, experience, level of training and qualifications have not been considered.

1.8.3.2 Exclusion Criteria

HBCs who are on leave during the period of the study has not been included in the study. HBCs who are currently not serving at any of the 4 (four) clinics at Ga-Dikgale Village has been excluded in the study. HBCs who cannot read and write has not participated in the study as HBCs were assessed on the ability to use FINDRISC tool on assessing people with DM. This tool required basic literacy on the part of the HBCs.

1.9 Data Collection

Polit and Beck (2012) define data collection as the gathering of information to address a research problem. A modified (tool) questionnaire (Appendix A) FINDRISC tool has been used by the HBCs to assess risk status of people with DM. The researcher has scored the HBCs on the modified FINDRISC tool (Appendix B) after the HBCs have demonstrated all sections of the risk assessment tool. The HBCs have therefore, scored the patient on the adopted (Appendix C) FINDRISC tool which has been piloted at Mapodu Clinic, Mamabolo village and (5) five HBCs have been included in the pilot and this has assisted the researcher to restructure the questionnaire.

The FINDRISC questionnaire tool consists of the following sections.

ℂ Section A: Biographic data.

ℂ Section B: Body Mass Index.

ℂ Section C: Waist Circumference.

ℂ Section D: Physical Activity.

ℂ Section E: Diet.

ℂ Section F: Presence of other illnesses.

ℂ Section G: Any medication taken for Hypertension and Diabetes.

ℂ Section H: Previous Diagnosis of any member of the family with DM.

1.10 Data Analysis

Data analysis refers to giving meaning to the data and study results are translated and interpreted to become findings and conclusions (Grove *et al.*, 2015). Brink *et al.* (2012) state that before data can be analysed, the researcher must examine the accuracy and completeness of the data collected so that incomplete and inaccurate completed questionnaires can be discarded. Polit and Beck (2012) indicate a preliminary step is to enter the data onto computer files for analysis therefore data has been entered into the (Statistical Package for Social Sciences) IBM SPSS version (24) twenty-four software and excel sheet for analysis in this study.

1.10.1 Analysis of HBC's Knowledge

During data collection the HBCs have been scored based on a rating scale of zero to 1 (one) on all sections of the FINDRISC tool. Zero point has been regarded as not competent and 1 (one) was regarded as competent.The total score on the assessment tool is 17 points where zero to (9) nine will indicate

that the HBCs is not competent; between 10 and 16 points indicating moderately competent and 17 points indicating that the HBCs is fully competent. For the patient to be fully assessed to be at risk of diabetes it was important for the HBCs to be assessed in all variables correctly. All variables are dependent on each other which implies that if HBCs fails to assess or to demonstrate only 1 (one) variable will render the whole assessment incorrect. The data obtained from the HBCs have been analysed using IBM SPSS version (24) twenty-four and Microsoft excel.

1.13.2 Reliability

The FINDRISC tool has been piloted at Mapodu Clinic and modifications on the assessment tool have been done where necessary to ensure reliability. Brink *et al.* (2012) describe reliability as a degree to which the instrument can be dependent enough to yield consistent results if used repeatedly over time on the same person or if used by two researchers. Key concepts were identified and adapted in the FINDRISC tool. The FINDRISC tool was subjected to the peers in the field of General Nursing Science and Community Nursing Science and nursing education. The study supervisors, the University of Limpopo senior degree committee has made an input in each item on the FINDRISC tool with regard to the degree to which the variables to be tested were represented.

In this study FINDRISC tool has been modified to assess the knowledge of HBCs in using FINDRISC tool to assess people with DM at Ga-Dikgale Village.

1.14 Ethical Considerations

The following ethical standards were adhered to throughout the duration of

conducting this research study:

1.14.1 Permission to Collect Data

Botma, Greef, Mulaudzi and Wright (2010) states that the principle of respect of people should be adhered to when conducting research. In this study ethical clearance has been sought from University of Limpopo Turfloop Research Ethics Committee (TREC). Permission to collect data in health care facilities has been sought from the Limpopo Provincial Department of Health Research committee, the Capricorn District Manager of Primary Health Care, Manager of Dikgale Local area and operational manager at different Dikgale clinic.

1.14.2 Avoidance of Harm

de Vos, Strydom, Fouche and Delport (2011) state that the researcher should ensure that no harm will be done to the participants in a study. The researcher ensured that patients understand the impact of the study as diagnosis of DM shall mean continuity of care at PHC level. The patients have been informed about the potential benefit of obtaining the medical intervention that otherwise they would not access if the study has been not conducted. The HBCs have been informed about the potential benefit of knowing their capability of using FINDRISC tool to assess people with DM, assessment they would not access if the study has not been conducted.

1.14.3 Informed Consent

Polit and Beck (2010) state that the important procedure to safeguard participants in a study is to obtain their informed consent. The consent forms for the participants have been drawn and attached to questionnaires indicating the rights of the participants in the study. Informed consent has

been obtained by explaining to the participants the risks and benefits in the language that they understand the scope of the study that has been proposed.

1.14.4 Confidentiality and Anonymity

Anonymity refers to revealing the identity of the participants in a research or its findings by the readers (Babbie, 2013). Anonymity of the respondents have been ensured by not writing names on the questionnaires. The completed questionnaires have been kept under lock and key in order to maintain anonymity of the participants.

1.14.5 Debriefing and Referral

Polit and Beck (2010) indicate that to show respect to the participants in a study by sharing study findings or by making appropriate referrals to health, social or psychological care. In this study HBCs have not been referred to any appropriate care but debriefed after the data collection session as OSCE has been used to assess HBCs.

1.14.6 Bias

Bias is activities that produce errors in interpretation and it affects quality of study results (Polit & Beck, 2012). Homogeneous purposive convenience sampling as a sampling method has been used and it should be noted that there was a risk of possible sampling bias in using this method (Botma *et al*., 2010). The sampling size has led the researcher to select the homogeneous purposive convenient sampling as each clinic contains less than (20) twenty HBCs. Ga-Dikgale Village consists of 4 (four) clinics with 52 HBCs. The following mechanisms to detect bias and to curb it when it exists has been put in place during the study and has been taken into account in interpreting

the findings (Polit & Beck, 2012). The researcher has guarded against subjectivity by not bringing own experiences in the study and by not communicating expectations to the HBCs before assessment could began.

1.15 Significance of the Proposed Study

The significance of this study was based on the findings. The Limpopo Province, Department of health can adopt and implement the use of FINDRISC tool in the PHC facilities in order to increase the scope of HBCs in early detection of DM in the PHC settings. This tool might assist reduction on incidences of DM.

1.16 Layout of the Study

Chapter 1: Overview of the Study

Chapter 2: Literature Review

Chapter 3: Research Methodology

Chapter 4: Interpretation and Discussion of the Results

Chapter 5: Theoretical Framework

Chapter 6: Summary, Recommendations and Conclusions

1.17 Conclusion

This chapter outlined introduction and background related to the problem studied and literature related to the use of FINDRISC tool by the HBCs. Preliminary literature review was presented which gave an overview of different tools which the different countries are using in order to assess risk status of diabetes in the population. The research methodology was followed and outlined. Data analysis method which was used to analyse the

quantitative data was outlined. Ethical standards which were maintained during the period of the study were presented.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Chapter 2 encompasses the literature review relevant to Home-Based Carers' use of the Finnish Diabetes Risk Score tool to assess Diabetic Mellitus patients at Ga-Dikgale Village, South Africa: A feasibility study. Literature review is the search of the existing knowledge based on similar studies related to the topic that will help in developing guidelines for clinical practice (Brink, van der Walt & van Rensburg, 2012). Polit and Beck (2012) defines literature review as an introduction to a report that provides readers with existing evidence done by other researchers and contribute to the argument for a new study. Literature review addressed aspects related to screening of people for diabetes and also tools used during assessment of DM people in different countries including South Africa. The literature also focused on who assess these people in communities to exclude diabetes.

2.2 Overview of Diabetes Mellitus

Non-communicable diseases are viewed as an epidemic that can be prevented through by early detection of the underlying risk factors such as obesity timeously.The study is intended at assessing the HBCs in identifying the individual at risk.This will results in behavior change that predisposes the individulas to have risk of DM as a strategy to prevent NCDs.The other

screening programmes such a HIV counseling and testing for the patients who comes to the clinics for the care of other opportunistic infections are also screened (Strategic plan for the Prevention and Control of Non-Communicable Diseases, 2013). Dugee, Janchiv, Jousilahti, Sakhiya, Palam, Nuorti, and Peltonen (2015) indicate that T2D is a common disease and the numbers are increasing around the world. It is estimated that half the individuals are undiagnosed with T2D. The disease is manifesting by long asymptomatic pre-clinical stage with the disturbances in glucose metabolism such as impaired fasting glucose and impaired glucose tolerance. T2D can undergo stages associated with the metabolic syndrome as well as other risk factors for vascular diseases and are associated with development of micro and macro vascular complications in the course of the disease.Thus undiagnosed DM and disturbances in glucose metabolism are associated with increased risk of death by much as three times (Dugee et al., 2015).

2.3 Home-Based Health Care Services in South Africa

Department of Health (2011) indicated that during the last two decades there was a proliferation of lay or HBCs in South African health and social development sectors. The training received by this HBCs ranged from 2 weeks to 4 years and others have undergone skill-based programmes registered with National qualification framework. The most recent audit done by National Department of Health indicated that there was a total number of 49042 HBCs in South Africa of which 8443 are in Limpopo Province.

Strategic plan for the Prevention and Control of Non–Communicable Diseases (2013) found that HBCs who are skilled in palliative home - based

care for the chronic patients are assisting to spread the preventive messages in the communities in relation to management of diseases. In this study HBCs were utilised in the assessment of risk status of people with DM at Dikgale clinics. Their previous interaction with the community in health matters were utilised in an effort to implement the ministerial strategic plan.

Richardson, Willig, Agne and Cherrington (2015) indicate that HBCs have been seen as a potential interventions to improve NCDs care and in an effort to reduce problems that are related to DM. This is the reason that HBCs have been used in this feasibility study. It has also been found that the HBCs' role includes the liaison within the healthcare system as they have access to information, are knowledgeable, have personal experience in managing DM or and assisting family members with DM. In this study HBCs have been user friendly in the assessment of DM patients at Ga-Dikgale Village.

Neupane, Kallestrup, McLachlan and Perry (2014) have found that there is a problem of not prioritising the NCDs including DM on the global agenda despite of the call for 25% reduction by 2025. It is further indicated that in a UN review half the member states of WHO have less than one physician per 1000 population. There is 1.3 million HBCs worldwide that contribute to task shifting. These HBCs have limited training, education, experience and expertise and it is evident that they are mobilised to reduce mortality and morbidity hence the study is intended in using the HBCs.

It is further indicated in a study done in Pakistan that HBCs could carry out health promotions to the patients resulting in lowering of blood pressure levels in the population. Neupane *et al.* (2014) further indicated that the ability to use the non-physician health worker to detect and manage DM and High Blood Pressure have been shown in countries such as South Africa and Iran.

This global shortage of health professional is still present in South Africa that is why HBCs have been used in this study. Neupane *et al.* (2014) indicated that almost half the member states of WHO has one physician per 1000 population, but improvement on the health of the population have been seen with a major contribution by HBCs although they are not recognised.

According to WHO there are 1.3 million HBCs worldwide although they do not have a formal education and expertise; they have proved that they can be mobilised to reduce mortality and morbidity in the communities that they are operating in. Mcdermott, Schmidt, Preece, Owens, Taylor, Li and Esterman (2015) in their study indicated that a culturally safe community health care worker model is the effective care of DM care program in the rural areas of Australia where there is poor access to PHC services although it needed longer term evaluation to capture accrued benefits. This indicates the feasibility of utilising the HBCs in the dealing with problems posed by DM.

Rosenthal, Brownstein, Rush, Hirsch, Willaert, Scott, Holderby and Fox (2010) has found that the widespread shortages of the health care workforce and an increasingly diverse population, Minnesota has recognised that a strengthened workforce of HBCs would help deliver high quality culturally competent care in the populations. In this way, it has been found that the shortage of staff in many countries outsources the HBCs in the management of DM.

2.4 Home-Based Carers As Part of the Solution

Rosenthal *et al.* (2010) indicated that HBCs are globally recognised as the integral part in the provision of PHC especially in the underserved and neglected rural and poor communities. It is further indicated that in the United States of America there are 120,000 HBCs assisting in the provision of health

care in the neighborhood, health departments, clinics and hospitals. Many of them are on short-term funded projects, volunteers but more than two thirds are paid. Their roles and responsibilities include liaison between health systems and communities and enhancing quality and culturally competent medical care on primary health level.

The responsibilities of the HBCs in United States of America include individual coaching, outreach education and capacitating the community where there is a knowledge deficit. Amongst other responsibilities that HBCs have is the development of peer-to-peer relationship of trust with the patient rather than provider – patient relationship. HBCs in the United States has contributed in the improvement of health care in relation to asthma, hypertension, DM and HIV and AIDS as well as immunisations and maternal health in general (Rosenthal *et al.*, 2010).

McDermott *et al.* (2015) has also found that indigenous Australians have the highest prevalence and incidence of DM. It is also indicated that complications as a results of DM and other diseases can be prevented through the PHC level management but high turnover of health staff in remote setting as a result culturally competent high quality care of DM is not evident. It has been found that this has resulted in high rates of diabetes–related avoidable hospitalisations for people in remote areas. It have been found that HBCs can contribute to improved DM care and outcomes in high risk and underserved patients in Australia.

In South Africa studies have been done in relation to the management of DM by HBCs. Center for health policy (2015) has found that Gauteng Provincial government of Health launched a pilot program at one clinic in Emfuleni Sub–District with a non-governmental organisations which included the HBCs. The

program was aimed at improving the hypertension and DM management by delivery of medication and assessment of clinical indicators in relation the NCDs. Strategic plan for the prevention and control on non-communicable diseases (2013) indicated that HBCs with competencies in palliative care in the home enhances the preventive messages for the people living with NCDs and for the family members.

2.5 Burden of Diabetes Globally and in South Africa

Statistically it is indicated that DM is regarded as the health burden globally ranging at 194-246 million worldwide and the number is to increase to estimated 333-380 million individual by 2015. The data mentioned is due to the increased lifestyle, and cultural habits that the individuals are presently indulging in, this include dietary habits, poor body exercise amongst other things that predisposes people to NCDs (El Sherbiny, 2015).

It is currently estimated that that approximately 7.8% population have undiagnosed DM and 57 million in America who have pre diabetes. It is further indicated that in 2005 and 2006 the prevalence of DM amongst ≤ 20 years was 12% of which approximately 40% of cases were undiagnosed whereas in the United Kingdom the overall prevalence of DM was 91% of which 1.7% was undiagnosed and 18.5% were undiagnosed out of these cases Gossain and Aldasougi (2010). Ahmed (2015) indicated that India is the country that its statistics is estimated at 40 million people making it the largest country with DM today. Many people in India are not diagnosed, as this is the disease that is very silent. In Canada the recent statistic shows that the prevalence of diabetes has increased by 70% and the new diagnosed people were at the age ranging from 45-64 years (Canadian Task Force on Preventive Health Care, 2012).

In Cuba DM is also a public health problem resulting in burdening of social life and economy. In 2010 there were about 22,000 hospitalisations due to DM. In Cuba the prevalence of DM was 47.7 per 1000 population and diabetes was the leading cause of death with a mortality rate of 11.5 per 100,000 population (Naranjo, Rodriquez, Liera & Aroche, 2013).

Egypt is rated as the top ten countries with DM in the world. It was 9.4% in 2007 and the figures are increasing in the Eastern Mediterranean region (El Sherbiny, 2015). Peer, Steyn, Lombard, Lambert, Vythilingum and Levitt (2012) indicate that in Tanzania rates has been increased from 0, 3 % in the 1990s to 4,6% in 1996 in accordance with WHO criteria.

In South Africa DM was regarded as the top leading cause of adult death in 2000.There is no evidence of study undertaken on the prevalence of DM in urban South Africa as they form the majority of the population except the study conducted in the urban population of Cape Town in 1990 (Peer *et al.*, 2012). Gossain and Aldasougi (2010) indicated that the global prevalence DM will double by the year 2030. Globally the number of people with pre-diabetes (impaired glucose tolerance) was estimated at about 308 million in 2007 and is expected to increase to 418 million by the year 2025 within the ages ranging 20-79. Maina, Ndegwa, Njenga, and Mucheni (2011) indicated that the majority of the people are within the productive ages ranging from 45-64 years which is the ages in which an individual is productive. The same individuals are the people who are expected to drive the economy of their countries in order to meet the expected developmental goals.

Diabetes mellitus puts pressure on human, social and economic costs globally. In relation to health burden, DM also imposes serious financial burdens on national health care systems (da Rocha Fernandes, Ogurtsova,

Linnerkamp, Guariguata, Seuring, Zhang, Cavan & Makaroff, 2016). It is estimated that 310 billion US dollars is spent on DM-related problems in the United States of America. It is not surprising that the South East Asia and Africa regions have DM spending of 2% of the global health with less than average spent per person than the global average.

The DM expenditure includes amputations, nephropathy, retinopathy and cardiovascular diseases. There are different expenditures in US and in Colombia where in US the total medical costs DM was due to inpatient care and 18% were due to complications whereas diabetes related complications were 49% of the direct costs per person and 53% of the total amount of expenditures. Expenditures in low income countries is estimated to be 54-66% of diabetes-related expenditures and the vast of the money is directed to supplies such as oral drugs, insulin, syringes, glucose meters and test strips. Hence, the large economic burden imposed by DM globally and in Africa cannot be ignored. Likewise, the DM health expenditures is rising dramatically because of the increase in DM globally. It is still possible to employ cost saving strategies that can lead to reduction of economic impact posed by the condition as well as the reduction of incidences of T2D.

2.6 Diagnosing Diabetes Mellitus and Pre-Diabetes

Gossain and Aldasougi (2010) indicated that pre-diabetes as diagnosed by Impaired Fasting Glucose (IFG) or Impaired Glucose Tolerance (IGT) progresses to overt diabetes at the rate of 5% per year unless some interventions are implemented. DM leads to the risk of diabetic retinopathy, nephropathy and neuropathy which are of micro vascular in nature as well as myocardial infarction, stroke or peripheral vascular diseases which are macro vascular in nature. The above mentioned complications of T2D can lead to

death more especially if the diagnosis is missed. This indicated that the diagnosis of DM is complicated and not easy to diagnose. Gossain and Aldasougi (2010) further state that the risk of progression to overt diabetes looks the same with isolated IFG or IGT. This risk is higher in people with combination of both IFG and IGT. A review of several studies indicated that with lifestyle modifications there was a reduction of risk to DM ranging from 28% to 67%. In the light of this argument there is a reason to undertake aggressive screening for DM in order to reduce the overall burden of the disease. It is further stated that the recommendation in accordance with American Diabetes Association was to screen all adults who are overweight and having one of the following additional risk factors such as physical inactivity,first degree relative with DM, members of high risk ethnic populations amongst other things (Gossain & Aldasougi, 2010).

2.7 Diagnosing Diabetes Mellitus Using Risk Assessment Score Globally

India uses IDRS which uses the same anthropometric and demographic variables in order to identify individuals at high risk of diabetes. It was concluded that IDRS was a simple and cost effective risk score and can assist in classifying T2D versus non T2D among clinic patients in India (Ahmed, 2015). Buijsse *et al.* (2010) indicate that United States has use Framingham Offspring Diabetes Risk Score using variables such as age, sex, parental history and body mass index. Wilson, Meigs, Sullivan, Fox, Natham and D'Agostino (2007) has found Framingham Offspring Diabetes Risk Score to be a better predictor of T2D in the United States of America. GDRS was developed in Germany using risk assessment variables as age, waist circumference, height, hypertension, physical activities, smoking, and consumption of whole grain bread, red meat, coffee and moderate alcohol. Mühlenbruch, Joost, Boeing and Schulze *(*2014*)* concluded that the GDRS allowed the prediction of risk for developing T2D within 5 years based on the exclusivity non invasive risk factors.

2.8 Addressing Diabetes Through the Use of FINDRISC in South Africa

DM is a development issue as unhealthy behaviour that could result in loss of income and loss of productivity due to diseases, disability and premature death. NCDs and their risk factors contribute to household poverty and are closely related. Affordable and accessible PHC services for early detection, effective treatment and prevention of complications are often inadequate in developing countries (Gossain & Aldasougi, 2010).

The Strategic plan for the Prevention and Control of Non-Communicable Diseases (2013) indicate that the underlying risk factors of NCDs are largely preventable as interventions at community level through diagnosis and cost-effective management is required. NCDs are referred to as the diseases of lifestyle and are associated with increasing wealth and the burden is high in rural and poor socio-economic areas.

It is further acknowledged that effective prevention requires a broad multi-sectoral approach involving different government departments, civil organisations such as home-based care groups, the private sector, media as well as individuals themselves.

A shift from governmental departments of health to operate in isolation should be avoided as a strategy to deal with NCDs. Amongst other strategies required in dealing with HBCs is research. Hence, this study in assessing the HBCs in using FINDRISC tool to assess people with DM in Dikgale Area which is a feasibility study (Strategic plan for the Prevention and Control of Non-Communicable Diseases, 2013).

It is further recognised that research is required to understand and influence the macro economic and social determinants of NCDs and the exposure to

NCDs and risk factors, promotion of healthy lifestyles, cost effectiveness in screening and other intervention approaches.

2.9 Models Utilised In Risk Assessment of Diabetes Mellitus Patients

Cherrinton, Ayala, Amick and Scarinci (2008) stipulated that HBCs have recently been identified as the key components in successful DM self-management problems. The community health worker model has been given recognition and support by organisations that support the management of DM such as Centers for Disease Control and Prevention (CDC), Division of Diabetes Translation. This implies that the HBCs can be utilised globally in the implementation of FINDRISC at PHC level.

Cherington *et al.* (2008) further presented evidence that HBCs have been successful in the promotion of health and behaviour change. The HBC has been part of the solutions about in solving health-related problems owing to rapidly changing demographics and epidemiological profiles in the United States. Erb (2012) further indicated the four main roles of the HBCs, namely, promotion of access to health, providing education, advocacy and service delivery are the cornerstone in being assessed in using the FINDRISC tool, as will be applied this study.

Frymus, Kok, de Koning and Quain (2013) indicated that HBCs are important cadres in the achievement of MDGs, Universal Health Coverage and the Post-2015 Health Agenda. Further evidence indicated that the HBCs have evolving tasks and responsibilities ranging from preventive and promotional activities to elevation of diagnosing management and care of their communities. Furthermore, there is poor evidence indicating that HBCs are effective when utilised in other areas of health care.

On the other hand, it is has been found that much is already known about the effectiveness of HBCs in areas such as health education, promotion and management of diseases and other health care activities, although the effectiveness of HBCs as compared to other health professionals is not researched. Rosenthal *et al.* (2010) further indicated that HBCs are deemed important members of health care teams in an effort to provide patient-centered health care. It is further recommended in their study that HBCs need their profession to be recognised and understood and there should be expanded training programmes for the HBCs, and their supervisors should be provided with certificates and be properly financed to pay HBCs and cover costs of other related activities.

2.10 The Role of PHC Re-Engineering as Part of Care of NCDs

Strategic plan for the Prevention and Control of Non–Communicable Diseases (2013) indicated that the PHC re-engineering care has been planning the establishment of the PHC outreach teams in every community in South Africa. This involves the inclusion of HBCs who will visit households directly. Amongst other activities that the HBCs will perform include informing community members of the importance of healthy lifestyles that form part of their healthy living. The HBCs have supported participant patients at risk of diabetes by promoting good health through lifestyle modifications and medication adherence. The Strategic plan for the Prevention and Control of Non–Communicable Diseases (2013) indicated that in PHC re-engineering, the health promoter forms part of the PHC outreach team to support the HBCs and to conduct health promotion activities within their communities. PHC re-engineering supports the idea of assisted self-management in the care of NCDs such as DM through HBCs as a primary personnel operating at community level.

2.11 The Scope and Competencies of HBCs in PHC Re-Engineering in South Africa

The role of HBCs in PHC re-engineering are reminders for the patients to take medications, reminders to come to the reviews assistance with nutritious food intake and counselling in general health care matters such as curbing smoking and alcohol intake (The Strategic plan for the Prevention and Control of Non–Communicable Diseases, 2013). Currently in South Africa, HBCs fulfil the role required as a community health worker, amongst other tasks:

- ✍ Conducting household assessments of approximately 35% of households in a year, health promotion and prevention, including chronic diseases, conducting simple screening for potential health problems, refer and receive referrals from other health services (Department of Health, 2011).

The scope of practice of the HBCs includes:

- ✍ Striving for the improvement of quality life to the communities by facilitating improved access to PHC, promote health and prevent illness as delineated scope, conduct structured household assessment to identify health needs and to conduct community assessments and mobilise around community needs.

This has been achieved by HBCs through home visits and interviews of community members and the use of effective communication skills. The HBCs identify and manage minor health problems, as HBCs understand the principles of PHC and the services supporting it. HBCs further support the continuum of care through service co-ordination with other relevant service providers as they have the ability to assist community members to access

health care services (Department of Health, 2011).

2.12 Contributory Factors Associated with Diabetes Mellitus in Rural Areas

Maina *et al.* (2011) indicated that urbanisation has been blamed as a contributory factor to escalating statistics of DM because of abandonment of the healthier 'traditional lifestyles' by people in developing countries. It is further implied that such traditional lifestyles were characterised by regular and vigorous physical activities, accompanied by diets high in whole grain-based fibre, rich in vegetables and fruits that was added to their daily food intake. The behaviour of the people in rural areas changed to the extent of poor physical activity whereby there was over reliance on motorised transport and overconsumption of unhealthy diets rich in carbohydrates, fats, sugars and salts that are of detriment to individual health. It is further stated that these changes in lifestyle have led to a rise in obesity and overweight, hence the risk of DM. The 2003 Kenyan Demographic Health Survey found that 20% of women and 7% of men were overweight and obese. Recent studies showed that 60.3% and 19.5% for women and men, respectively, were overweight and obese in rural areas. The epidemiological landscape changed to the extent that NCDs are becoming a contributory factor to the disease burden globally and in Africa. Maina *et al.* (2011) further underscored that besides reduced productivity due to DM, a high economic burden is imposed on the health care system and the generally poor economic growth. This study was aimed at curbing the scourge of DM through public health intervention that is aimed at delaying the onset of its complications.

Maina *et al.* (2011) further realised that this will entail intensive lifestyle modifications for those at risk of DM and aggressive treatment for those with the disease. This study was aimed at imparting knowledge and providing

information to the HBCs who will be able to assess the DM patient using FINDRISC and, in turn, the patients using this information as a weapon in the fight against DM. Information so gathered may assist people to assess their risk of DM, motivate them to seek proper treatment and care and inspire them to take charge of their disease. This study is part of a comprehensive health promotion strategy aimed at curbing DM and its related risk factors.

Dugee *et al.* (2015) indicated that in assessing DM patients it is likely that T2D will be early detected which will result in the individuals benefiting in the process in relation to early management of the disease and its comorbidities. This will also result in the improvement of health of the population and the reduction of social burden posed by DM. Dugee *et al.* (2015) further indicated that it is evident that through adaptation and validation of existing European- and American-based diabetes risk score tools potential screening efficacy can be achieved.

2.13 Method to be Used for Assessing HBCs in Using the FINDRISC Tool

Objective Structured Clinical Examination (OSCE) is a versatile multipurpose evaluative tool that can be utilised to assess health care professionals in a clinical setting. In this study, HBCs were evaluated on their use of the FINDRISC tool to assess people at risk of diabetes, therefore, OSCE has been used as a method to assess the HBCs in using this tool. An impromptu appraisal where the HBCs were not exposed the tool before being assessed has been used to assess the competence of the HBCs. OSCE assesses competency, based on objective testing through direct observation. Therefore, the principles of OSCE have been applied in this study.

OSCE comprises of one or several stations in which the examinees are

expected to perform a variety of clinical tasks within a specified period against criteria formulated, thus demonstrating competency of skills and attitude. OSCE is a reliable, valid and objective and covers aspects such as problem solving, communication skills, decision-making and patient management although it is costly, which is a major drawback (Zayyan, 2011).

2.14 Anthropometric Measurements in the FINDRISC Tool to be Used by HBCs

2.14.1 Body Mass Index

Kolimechkov (2014) indicated that BMI is a measure of relative weight based on an individual's mass and height. Nowadays, the BMI is commonly used to classify underweight, overweight and obesity. BMI has been adopted by the government health departments in both developed and underdeveloped countries in an effort to promote healthy living and eating habits. Amongst other variables that the HBCs have been assessed on has been demonstration of the calculation of BMI. Included for the purpose of calculating BMI is demonstration of weighing and measuring of height for calculating BMI. It is indicated that BMI is calculated by dividing an individual's weight in kilograms by his height in metres, then dividing the answer by his height again for example the following formula has been provided:

$$\text{BMI (kg/m}^2) = \text{Body weight (kg) / Height (m)}^2$$

$$\text{For instance: BMI} = 66 \text{ kg / } (1.69 \text{ m}^2) = 66 / 2.86 = 23.08 \text{ kg/m}^2$$

2.14.2 Waist Circumference

Waist circumference is one of the anthropometric measurements required in

using the FINDRISC tool. The HBCs have been assessed on using the FINDRISC tool to assess patients at risk of T2D based on the above procedure of measuring waist circumference. The following factors have been considered in assessing the HBCs on waist circumference:

2.14.2.1 Placement of the Tape

According to WHO STEPS (Stepwise Approach to Surveillance) protocol, United States (US) National Institute of Health (NIH) protocol, he protocol used in the US National Health and Nutrition Examination Survey (NHANES) for measuring waist circumference, instructs that waist circumference be made at the approximate midpoint between the lower margin of the palpable rib and the top of the iliac crest. The NHI has also provided a protocol for the measurement of waist circumference for the multi-ethnic study of an atherosclerosis study and indicated that the tape measure be placed at the level of the navel. It is further stated that in published reports that measurements of waist circumference made at the level of umbilicus may underestimate the true waist circumference. Other studies indicated that waist circumference could be measured at the point of the minimal waist. As this study has used the adapted FINDRISC tool to assess the HBCs using the tool to assess patients at risk of T2D, although the published reports this as may underestimate the true waist circumference (WHO, 2011).

2.14.2.2 Tightness and Type of Tape

The WHO STEPS protocol states that in measuring waist circumference, the tape should be snug around the body, but not pulled so tight that it is constricting. The protocol also recommends the use of a stretch-resistant tape that provides a constant 100 g of tension through the use of a special indicator buckle. For accuracy in measurement of waist circumference, the

use of this type of tape reduces differences in tightness and enhances the accuracy of readings. Both the HNI and (NHLBI Obesity Education Initiative, 2000) and the NHANES III protocols recommend that the measurements be made with the tape held snugly, but not constricting the abdomen of the person measured (WHO, 2011).

2.14.2.3 Posture of the Patient during Assessment

Posture can influence the accuracy of waist circumference measurements. The WHO STEPS protocol recommends that the patient stand with the arms at the side, feet positioned close together, and weight evenly distributed across the feet. The NHANES III protocol recommends that the subject be standing erect, with the body weight evenly distributed (WHO, 2011).

2.14.2.4 Phase of Respiration at the Exact Point of Measurement

The accuracy of waist circumference measurement can be disturbed as the phase of respiration determines the extent of fullness of the lungs and position of the diaphragm at the time of measurement. The WHO STEPS protocol suggests that the waist circumference should be measured at the end of a normal expiration, when the lungs are at their functional residual capacity. The NHANES III protocol states that the waist circumference should be measured at minimal expiration (WHO, 2011).

2.14.2.5 Abdominal Tension at the Point of Measurement

The WHO (2011) indicated that accuracy in measurement of waist circumference can be influenced by tension of the abdominal pain. Lowering the tension of the abdominal wall increases waist circumference whereas increasing the tension by sucking in reduces waist circumference. Relaxed posture is the best for taking measurements. The WHO STEPS protocol

recommends advising the subject to relax and take a few deep, natural breaths before the actual measurement is made, to minimise the inward pull of the abdominal contents during the waist measurement.

2.14.2.6 Influence of Stomach Contents at the Time of Measurement

According to WHO (2011), the accuracy of waist circumference can be affected by the amount of water, food or gas in the gastrointestinal tract. Waist circumference is measured after the patients have fasted overnight. It is further indicated that none of the protocols evaluated addressed this issue as it meant that the patients be notified in advance of the measurement so that they are present the morning of an overnight fast.

Factors such as type of tape measure to be used, placement of the tape on the patient, tightness and the tape will be considered for the accuracy of the measurement. Other factors related to posture of the patient such as posture of the subjects during the measurement, phase of respiration during measurement, abdominal tension at the point of measurement and the influence the stomach content at the time of measurement have been considered for the accuracy when assessing the HBCs.

2.15 Conclusion

Chapter 2 described the literature review in detail and how it fits in this study. This chapter includes discussion amongst other things the relationship between diabetes and other NCDs, cost of managing diabetes, and methods used to assess HBCs in using the FINDRISC tool. Chapter 3 will provide details of the research methodology used in this study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology that guided the processes in this study which included research design, research setting, population and sampling, data collection, data analysis, ethical standards and reliability.

3.2 Research Methodology

According to Creswell (2014), research design is an approach that is followed in order to select a specific direction for procedures to guide the processes carried out during a research project that include qualitative, quantitative and mixed research methods. In this study, the quantitative research method was used in order to achieve the aim of this study. The aim of this study was to determine the feasibility of home-based carers on the use of the Finnish Diabetes Risk Score tool to assess people with DM at Ga-Dikgale Village, South Africa.

3.2.1 Research Design

de Vos, Strydom, Fouche and Delport (2011) outlines that research design is as an integrated statement and justification for more technical decisions involved in planning a research project. Furthermore, research design focuses on the end product and all the steps and processes to achieve anticipated outcomes. Polit and Beck (2012) also stated that research design is the overall plan for obtaining answers to the research question. In this

study, a quantitative, descriptive cross-sectional design has been used to describe knowledge and practices of HBCs in using FINDRISC to assess the people with DM at the Dikgale village. A cross-sectional survey is a design in which a study is done at a specific point in time and information is collected on the participants at the same time. Furthermore, a cross-sectional survey is a design that can be used to determine whether a particular problem exists and the extent of that problem in a particular group (Brink, van der Walt & van Rensburg, 2012; de Vos *et al.*, 2011). Additionally, Grove, Gray and Burns (2015) outlined that a cross-sectional study examines a group of subjects simultaneously in various stages of development, levels of education, severity of illness or stages of recovery to describe changes of phenomena across stages.

A cross-sectional study was used as it is more manageable, time saving, cost effective and it is the best method that can be used by health professionals (Brink *et al.*, 2012). Burns and Grove (2011) indicated that a descriptive study is designed at gaining more information about the characteristics of a problem studied in a specific field. Grove *et al.* (2015) suggested that descriptive research is the exploration and description of phenomena in a real life situation. Descriptive studies usually involve a large number of groups and are conducted in natural settings with no manipulation of the situation.

A cross-sectional study was used in order to obtain numerical data about the broad perspective of the HBCs operating at Ga-Dikgale Village. HBCs were individually assessed for their competence on using the FINDRISC tool. Data collection was done once per clinic per day and the researcher ensured that all respondents were available on that day so that they did not tell each other about the assessment done. This method was used by the researcher in order to describe the feasibility of HBCs to use the FINDRISC tool to assess

the risk of people with DM at Ga-Dikgale Village.

3.2.2 Study Site

The Department of Health (2016) pointed out that the Limpopo Province is the fifth largest of South Africa's (9) nine provinces covering an area of 12,575 square kilometres, which is about 10.3% of South Africa's total land area. The Limpopo Province Department of Health consists of 2 tertiary hospitals, namely, Mankweng and Polokwane Hospital Complex, 5 regional hospitals, 30 district hospitals, 3 specialised hospitals and 14 private hospitals (Figure 3.1).
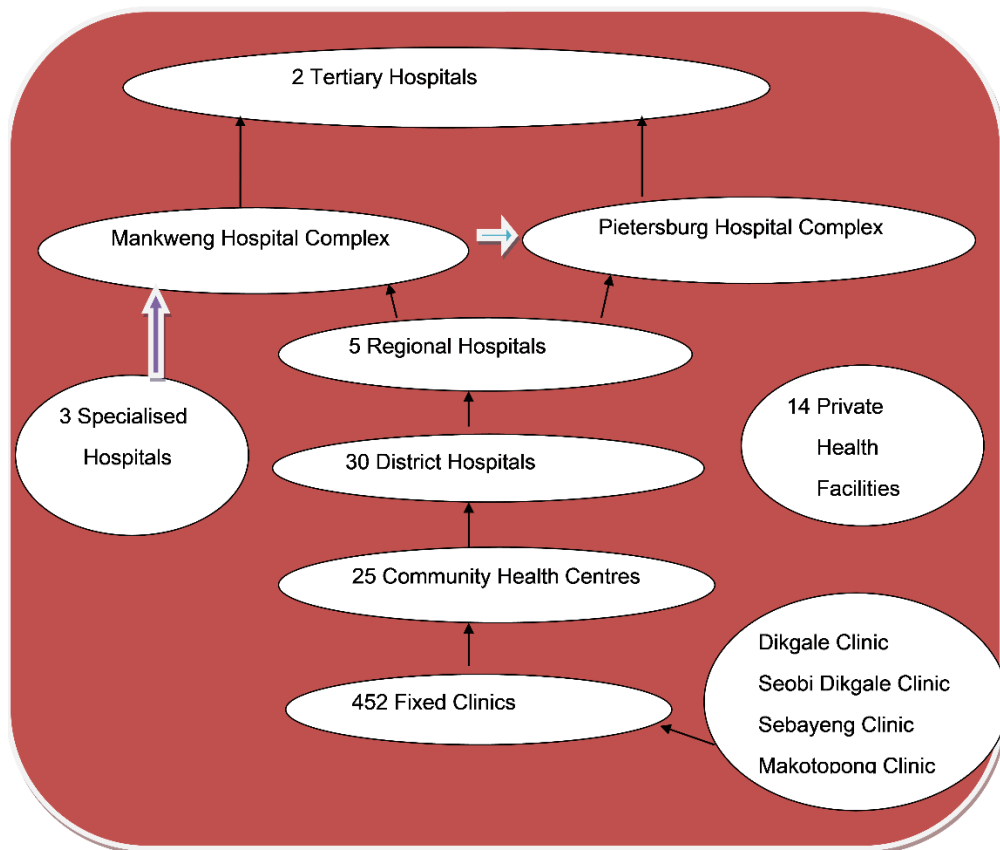
Figure 3.1: Limpopo Province Department of Health services

The study was conducted at Ga-Dikgale Village, Capricorn District, Limpopo Province, South Africa. The health care structure of Ga-Dikgale consists of Dikgale Clinic, Seobi Dikgale Clinic, Sebayeng Clinic and, Makotopong Clinic. All these clinics provide PHC services and use Emergency Medical Services in case of referring the patients to hospital which is about 18 kilometres to Mankweng Hospital. Ga-Dikgale Village is situated along the R81 road north of Polokwane. From Ga-Dikgale, Polokwane is about 40 kilometres away. Polokwane is the capital city of the Limpopo Province.

3.2.3 Population and Sampling

de Vos *et al.* (2011) described a population as the number of persons, events, organisation units, case records or other sampling units with which the research problem is interested in studying. However, a sample are elements or subset of the population that is required for the inclusion of subjects or participants in a study during data collection. Polit and Beck (2012) indicated that population is the entire aggregation of cases in which researcher is interested in studying. The target population was all HBCs who serve under Ga-Dikgale Village, thus Dikgale Clinic, Sebayeng Clinic, Seobi Dikgale Clinic and Makotopong Clinic. The total number of HBCs studied at Ga-Dikgale was 52. de Vos *et al.* (2011) stated that the use of a sample can result in more accurate information that might have been used if the whole population is studied.

Homogenous purposive convenience sampling method was relevant in this study as patients bear the same characteristics in terms of composition, culture, and dependence on PHC services for minor and chronic ailments (Mothiba, Jooste & Nolte 2012). de Vos *et al.* (2011) indicated that purposive sampling is also called judgemental sampling, whereas purposive sampling is

the sample composed of the most characteristics and attributes of the population that best serve the purpose of the study. Burns and Grove (2011) defined sampling as the process of selecting a group of people, events, behaviours or other elements with which to conduct a study. Additionally, a sample is a subset of the population that is selected in a particular study.

In this study a Homogenous purposive convenience sampling has been used to include the respondents with the same characteristics as follows:

- All HBCs are partially trained for the palliative care including the care of NCDs such as diabetes and other diseases.

- HBCs operate on voluntary basis under non-governmental organisations and their income is a monthly stipend.

During data collection all HBCs from different clinics where given an opportunity to respond to the questionnaire. The purposive convenient part of the sampling technique was achieved through including the HBCs who has knowledge regarding the problem studied, that is, care provision to people with diabetes on treatment. A total of 52 HBCs at Ga-Dikgale Village was included in the data collection sessions.

3.2.4 Inclusion and Exclusion Criteria

Lobiondo-Wood and Haber (2010) indicated that the researcher should have the ability to identify the population descriptors that form the basis for the inclusion and exclusion criteria in selecting the sample from a group of people to be studied. Additionally, the researcher must demonstrate that the criteria used to decide whether an individual would be selected as a member of a given population have been specifically portrayed (Lobiondo -Wood & Haber,

2010). The inclusion and exclusion criteria have been put in place to control bias that would limit the strength of evidence contributed by the sampling plan in relation to the design of the study resulting in contamination of data collected (Lobiondo -Wood & Haber, 2010). The inclusion and exclusion criteria used in this study were as follows:

3.2.4.1 Inclusion Criteria

HBCs who can read and write and currently serving at any of the 4 clinics at Ga-Dikgale Village have been included in the study. This is because HBCs have been assessed on their ability to use the FINDRISC tool on people with DM. This tool requires basic literacy on the part of the carers. Only HBCs, both male and female, have participated in the study.

3.2.4.2 Exclusion Criteria

HBCs who were on leave during the period have not been included in the study. This exclusion was done to avoid financial implications on the part of HBCs such as paying transport fee to come to the clinic and to be paid overtime as they would be on leave. HBCs who were currently not serving at any of the 4 (four) clinics at Ga-Dikgale Village were excluded in the study. This exclusion has been ensured because the setting of the study was based on the Dikgale, Seobi Dikgale, Sebayeng and Makotopong clinics. HBCs who cannot read and write have not participated in the study as HBCs were going to be assessed on their ability to use the FINDRISC tool on assessing people with DM. This tool required basic literacy on the part of the carers. Only 1 (one) member of the HBCs couldn't be included as she cannot read and write.

3.3 Data Collection

Polit and Beck (2012) defined data collection as the gathering of information to address a research problem. Structured questionnaires or a tool could be drawn using pre-determined questions that are verbally or non-verbally administered (Supino & Borer, 2012). Grove *et al.* (2015) indicated that data collection is not only to collect and record correct data in a study, but also to document how the study was implemented. In this study, a modified (tool) questionnaire (Appendix F) of FINDRISC tool has been used by the HBCs to assess risk status of people with DM. The researcher has assessed both the oral and practical part using a modified tool (Appendix G). This was done to measure how the HBCs probes and question the patients in assessing their risk status of diabetes.

The researcher has scored the HBCs on the adapted FINDRISC tool (Appendix H) after the HBCs have demonstrated all sections of the risk assessment tool. This was done for assessing the HBCs knowledge and competency level on the part of the HBCs on the use of the FINDRISC tool. The HBCs were supposed to score, the patient on the adopted (Appendix H) FINDRISC tool based on how they have assessed.

Based on the results of the study an adopted (Appendix H) FINDRISC tool has not been used by the all HBCs as they could not score 17 (seventeen) points to qualify the patient to be risk assessed.All variables on the adapted tool are dependent on each other which implies that all variables should be correctly done. A pilot study is a mini study that is undertaken before the main study is done. The results of the pilot study are not included in the main study (Joubert, Ehrlich, Katsenellenbogen & Karim, 2012). The questionnaire has been piloted at Mapodu Clinic, Mamabolo Village and 5 (five) HBCs have been included in the pilot and this has assisted the researcher to restructure

and adopt the tools as follows:

- ❧ Appendix F was an adapted tool meant to be used by the HBCs and it was found to have no problems to be used in the study.

- ❧ Appendix G had a problem with the Likert scale which was confusing where points per variable has been allocated up to 3 (three) and it was changed to 2 (two). This was done to award zero to the variable not done to be incompetent and 1 (one) to the variable done to be competent. Fully competent was to be awarded in the space provided at the end of the Appendix G when the HBCs have been assessed on all the 17 variables done correctly.

- ❧ Appendix G was an adapted FINDRISC form, which was meant to be used by researcher in completing the assessment of HBCs.

The FINDRISC questionnaire tool consists of the following sections:

❖ Section A: Biographic Data

HBCs were assessed on how to ask the age of the patient and to verify this by asking the date of birth to confirm the age.

❖ Section B: Body Mass Index

HBCs were assessed on demonstration of weighing of the patient and measuring BMI.

❖ Section C: Waist Circumference

HBCs were assessed on demonstration of measuring waist circumference.

❖ Section D: Physical Activity

HBCs were assessed on asking questions related to physical activity, how it is done and how often.

❖ Section E: Diet

HBCs were assessed on asking questions related to diet and how often such a diet is taken.

❖ Section F: Presence of Other Illnesses

HBCs were assessed on asking questions related to illness specifically high blood glucose in illness or pregnancy.

❖ Section G: Any Medication Taken for Hypertension and Diabetes

HBCs were assessed on how patient takes medication for blood pressure and adherence thereto.

❖ Section H: Previous Diagnosis of Any Member of the Family with Diabetes Mellitus

HBCs were assessed on asking previous diagnosis of diabetes or hypertension in the family or relatives.

3.4 Data Analysis and Analysis of HBC's Knowledge

Data analysis refers to the processing of collected information in order to provide meaning to the data and study results are translated and interpreted to become findings and conclusions (Grove et *al*., 2015). Brink *et al*. (2012) stated that before data can be analysed, the researcher must examine the accuracy and completeness of the data collected so that incomplete and inaccurately completed questionnaires can be discarded. Polit and Beck (2012) indicated a preliminary step is to enter the data into computer files for analysis. In this study, there was no incomplete questionnaires. The collected

data have been entered into a Microsoft Excel spreadsheet and IBM SPSS Version 24 data sheet for analysis. Data are presented using counts, percentages and graphs.

During data collection the HBCs have been scored based on a rating scale of zero to one(one) on all sections of the FINDRISC tool, where zero was the incompetent and 1(one) rated as competent per variable assessed. The total score on the assessment tool is 17 (seventeen), where zero to 9 (nine) indicate that the HBC is not competent; between 10 (ten) and 16 (sixteen) points indicate moderately competent and 17 (seventeen) points indicate that the HBCs is fully competent. All variables in the FINDRISC tool are dependent on each other to the extent that when 1 (one) variable is not correctly demonstrated result in HBCs not fully competent.

The data obtained from the HBCs while using the modified FINDRISC tool were analysed using SPSS Version 24 and the classes that have been conducted by the statistician has been attended in order to analyse data. Statistical techniques are the procedures put in place to examine, reduce and give meaning to the numerical data collected in a study. The statistical test used in this study is Pearson Chi-square test. As the relationships between the variables in this study have been compared, Pearson's correlation coefficient has been used in order to determine the relationship in percentages in terms of variances explained (Grove *et al.*, 2015; Binu, Mayya & Dhar, 2014).

3.5 Reliability

Reliability is defined as the matter of whether a particular technique, applied repeatedly on the same objects will yield the same results each time (Babbie & Mouton, 2010). Kimberlin and Winterstein (2008) defined reliability in

research as a manner in which errors and inconsistencies of the instruments used in a study are detected in order to minimise such errors.

The tool has been piloted at Mapodu Clinic and modifications have been done where necessary to ensure reliability. Brink *et al.* (2012) described reliability as a degree to which the instrument can be dependent enough to yield consistent result if used repeatedly over time on the same person or if used by two researchers. The following reliability test has been done in this study.

Table 3.1: Cronbach's alpha reliability test

Reliability Statistics		
Cronbach's Alpha	N of Items	
.837	17	No item is deleted
Reliability Statistics		
Cronbach's Alpha	N of Items	
.841	16	1 Item is deleted
Reliability Statistics		
Cronbach's Alpha	N of Items	
.861	13	3 items are deleted

Table 3.1 indicates the results of Cronbach's Alpha (internal consistency reliability test) that has been done to test the reliability of the FINDRISC tool in this study. Tavakol and Dennick (2011) indicated that the acceptable values of alpha range from 0.70 to 0.95. Table 3.1 shows results all 17 variables and the results of reduced items. On both Cronbach's Alpha Reliability test and Kuder-Richardson formula 20 FINDRISC tool is reliable to be used by another researcher and will yield the same results. Table 3.2 shows the results of Kuder-Richardson formula 20 with 2 items deleted, which yielded the normal reliability ranges as compared to Cronbach's Alpha

test with the average of between 0.83 and 0.86.

Table 3.2: Kuder-Richardson formula 20

Reliability Statistics			
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	
.845	.849	15	2 items deleted

Table 3.2 shows the results of Kuder-Richardson formula 20 with (2) two items deleted. The results on Kuder-Richardson formula 20 with (2) two deleted items has yield the normal reliability ranges as compared to Cronbach's Alpha test with the average of between 0,83 and 0,86.

3.6 Ethical Considerations

The following ethical standards have been adhered to throughout the duration of conducting this research study:

3.6.1 Permission to Collect Data

Botma, Greef, Mulaudzi and Wright (2010) stated that the principle of respect of people should be adhered to when conducting research. In this study ethical clearance has been sought from University of Limpopo Turfloop Research Ethics Committee (TREC) (Appendix A). Permission to collect data in health care facilities have been sought from the Limpopo Provincial Department of Health Research Committee, the Capricorn District Manager of Primary Health Care, Manager of Dikgale Local area and operational

managers at different Dikgale Clinics (Appendix B).

3.6.2 Avoidance of Harm

de Vos (2012) affirmed that the researcher should ensure that no harm will be done to the participants in a study. The researcher ensured that patients understood the impact of the study as diagnosis of DM shall mean continuity of care at PHC level. To avoid harm to the participants' treatment and follow up has been given to the patients who are at risk. Polit and Beck (2010) indicate that the researcher has a duty to protect the participants by conducting risk benefit assessment in order to determine the social, monetary, physical and emotional acceptability of the study. The patients have been informed about the potential benefit of obtaining the medical intervention that otherwise they would not access if the study was not conducted (Appendix D). The HBCs have been informed about the potential benefit of knowing their capability of using FINDRISC tool to assess people with DM, assessment they would not access if the study was not conducted.

3.6.3 Informed Consent

Polit and Beck (2010) stated that the important procedure to safeguard participants in a study is to obtain their informed consent. The consent forms for the participants have been drawn and attached to questionnaires indicating the rights of the participants in the study. Informed consent has been obtained by explaining to the participants the risks and benefits in the language that they understood and the scope of the study, which was proposed (Appendix E). The researcher has addressed the risks through application of risk benefit assessment. The HBCs have been requested to voluntarily sign a consent form before they could participate in the study (Brink *et al.*, 2012).

3.6.4 Confidentiality and Anonymity

Anonymity refers to the revealing the identity of the participants in a research or its findings by the readers (Babbie, 2013). Anonymity of the respondents have been ensured by not writing names on the assessment questionnaire. The completed questionnaires have been kept under lock and key in order to maintain anonymity of the participants. Participants have been requested to partake voluntarily and have been advised about withdrawal at any time during the study and that no penalty would be imposed for that because the study was voluntary activity.

3.6.5 Debriefing and Referral

Polit and Beck (2010) indicated that to show respect to the participants in a study is shown by sharing study findings or by making appropriate referrals to health, social or psychological care. In this study, no HBCs have been referred as no problems have been encountered during assessment. The contents of the study have been shared with the patients and HBCs after the data had been analysed and reports submitted to the provincial department.

3.7 Bias

Bias is activities that produce errors in interpretation and it affects quality of study results (Polit & Beck, 2012). Homogeneous purposive convenient sampling has been used and it should be noted that there was a risk of possible sampling bias in using this method (Botma *et al.*, 2010). The sampling size has led the researcher to select the homogeneous purposive convenient sampling as each clinic contains approximately less than 20 HBCs. Ga-Dikgale Village consists of 4 (four) clinics with approximately 80 HBCs or less.The following mechanisms to detect or measure bias and to curb it when it exists have been put in place during the study and have been

taken into account in interpreting the findings. The researcher has guarded against lack of openness by participants and when the participants presented responses not reflecting the present situation. The researcher eliminated subjectivity by not bringing own experiences into the study and not communicating expectations to the participants before the study. This have been made clear on the consent form. The researcher has selected the study design that could minimise bias during the study (Polit & Beck, 2012).

3.8 Limitations of the Study

Polit and Beck, (2012) indicated that limitations of the study can result in the integrity of the study to be questioned. The researcher was in a position to reveal sample deficiencies, for instance, in relation to design drawbacks and problems encountered in data collection. The researcher has identified the following limitation in the study:

The exact number of HBCs was 52. The information about the exact number could not be sought before ethical clearance of the study was granted by both the university TREC and Provincial Department of Health Research Committee. This had serious implications on the chosen sampling method and generalisation of findings.

3.9 Conclusion

In this chapter, the researcher provided a detailed description of the research design and methodology that was applied in this study. This chapter includes discussion on the study setting, data collection and analysis as well as ethical considerations and limitations of the study. Chapter 4 discusses the research findings, theoretical framework applied during data analysis and interpretation of the findings.

CHAPTER 4

INTERPRETATION AND DISCUSSION OF THE RESULTS

4.1 Introduction

This chapter entails the analysis of data that were collected using FINDRISC by HBCs and Pearson Chi-squared statistical test. Data were analysed using frequency tables, counts and charts. The respondents were HBCs. Each HBC was assessed on using FINDRISC form to assess risk status of the patient. The aim of this study was to determine the feasibility of home-based carers on the use of the Finnish Diabetes Risk Score tool to assess people with DM at Ga-Dikgale Village, South Africa. The researcher has selected quantitative descriptive cross-sectional design and used the adapted tool to collect data. Appointments with the HBCs were made through their coordinators and the operational managers of the clinics. Detailed data analysis shall follow in the following frequency tables. The descriptive analysis techniques in the form of frequencies, percentages and graphs have been achieved through IBM SPSS version 24 Microsoft Excel (Burns & Grove, 2011)

The number of HBCs was assessed for their ability to use the FINDRISC tool dependent on the catchment areas which is served by that clinic as well the inclusion and exclusion criteria met by the HBCs on the days of data collection. A total number of 52 (fifty-two) HBCs who met the eligibility criteria were assessed. Seobi Dikgale consisted of 10 (ten) HBCs, Makotopong consisted of 13 (thirteen) HBCs, Sebayeng consisted of 13 (thirteen) HBCs

and Dikgale consisted of 16 HBCs. This study was done at 4 clinics that falls under Ga-Dikgale as depicted in Table 4.1.

Table 4.1: Health care institutions where HBCs have been assessed

Name of HBC Group	Number of HBCs	Percentage
Seobi Dikgale HBC	10	19.2
Makotopong HBC	13	25
Sebayeng HBC	13	25
Dikgale HBC	16	30.8
Total	**52**	**100**

The use of HBCs as volunteers or partially paid personnel within the health care spectrum of cadres of care workers is an international phenomenon. HBCs play a huge role in several of parts of Africa and the world in relation to health care. Their daily activities are preventive and promotive community work while others provide curative and rehabilitative services and the rest doing combinations of these (Dennil & Rendall-Mkosi, 2012). Table 4.2 indicates the number of points or variables that the HBCs were exposed to as well as the competency level. The points range between zero and 17 (seventeen).

Table 4.2 clarifies the meaning of incompetence, moderately competence and fully competence respectively.

Table 4.2: Key of interpreting the results

0 to 9 points = Incompetent
10 to 16 points = Moderately Competent
17 points = Fully Competent

In South Africa, 50% and over is required for a learner or student to be

regarded as competent in most of the assessments done (Umalusi, 2013). In this study, 17 variables were tested on the competence of HBCs. Scoring 17 (seventeen) points implied that the HBCs were fully competent on all variables of the FINDRISC tool on assessing people at risk of diabetes, 10 (ten) to 16 (sixteen) points implied that the HBCs were moderately competent and zero to 9 (nine) points implied that the HBCs were incompetent in most of the aspects of the FINDRISC tool. The competence and incompetence bracket have been formulated based on the nature of variables in the FINDRISC questionnaire, knowledge and experience of HBCs in re-engineering of the PHC. This key of results will serve as a basis for the data analysis and interpretation of outcomes of this study.

As indicated in the literature review, the FINDRISC tool comprised of 8 (eight) variables. Therefore, the HBCs were assessed on competency on all these variables. The variables contain both subjective and objective data where it was expected of the HBCs to ask the patients specific questions guided by the tool as well as demonstration of weighing the patient and measuring of waist circumference. Impromptu was deliberately applied on assessing the HBCs to get the true reflection of their knowledge, skills and attitude. On the other hand OSCE was applied. The adapted FINDRISC tool has been used and applied in this study as it has been argued as the versatile multipurpose evaluative tool that can be utilised to assess health care professionals in a clinical setting (Zayyan, 2011). The adapted FINDRISC tool consisted of 8 (eight) variables that have been divided on sections and the results of analysis are as follows.

4.2 Results of All Variables Per Section

4.2.1 Section A: Biographic Data

Table 4.3 presents the results of the HBCs proficiency to ascertain biographic data (age) of patients with DM.

Table 4.3: Biographic data

FINDRISC Tool Item	Question Asked	Competency Level	Number of Respondents
Biographic Data	Did the HBCs ask the patient his/her age?	Incompetent	0/52
		Moderately competent	52/52
		Fully competent	0/52
	Did the HBCs ask the patient his/her date of birth to confirm age?	Incompetent	0/52
		Moderately competent	52/52
		Fully competent	0/52

Table 4.3 indicates the proficiency on variable age under demographic data. The HBCs have been assessed on whether they have the ability to ask patients their age in accordance with the FINDRISC tool and to confirm their ages. Fifty-two (52) HBCs have been able to demonstrate the variable and were fully competent in all the 4 (four) clinics. The results concur with the cross-sectional study done to assess HIV and TB knowledge and skills of HBCs working in the North West Province of Sourh Africa. It was found that on variables such as questions that were dichotomous (binary) in nature requiring yes or no as responses scores more points on assessment. HBCs performed extremely well as compared to variables that required 3 (three) multiple options and open-ended questions.

Those are the questions that required duration of taking treatment with a (mean score of 96%) because they are simple to assess. On the contrary, questions that required HBCs to define terms had a mean score of 14% (Engelbrecht, Letsoalo & Chirowodza, 2017). In this study, the results

indicate that HBCs performed well on the variables related to biographic data such as asking the patients their age. All the HBCs have been able to ask all patients a question related to age accordingly in which the score on this variable was a 100% positive responses.

4.2.2 Section B: Body Mass Index

Table 4.4 presents the results on body mass index.

Table 4.4: Body mass index

FINDRISC tool Item	Question asked	Competency level	Number of respondents
Body Mass Index	Did the HBCs demonstrate weighing of the patient using a scale?	Incompetent	13/52
		Moderately competent	39/52
		Fully competent	0/52
	Did the HBCs demonstrate measuring of body mass index of the patient?	Incompetent	42/52
		Moderately competent	10/52
		Fully competent	0/52

Table 4.4 indicates the demonstration on the variable weighing of the patient using a scale under BMI. The results indicate that 39 (thity-nine) HBCs are moderately competent and 13 (thirteen) are incompetent in this variable. Weighing of the patient and measuring of BMI was a combined procedure in this study. The HBCs have been assessed on whether they have the ability to demonstrate weighing of the patient using a scale for the purpose of calculation of the BMI. Statistical analysis using the Pearson Chi-Square correlation coefficient indicatesd that there was no significant relationship between performance and demonstration of weighing the patient by HBCs using scale (X^2 = 2.948, df = 1 p ≥ 0.86). The mean score with regard to the

relationship between demonstration of weight was high as this was attributed to the fact that in the scope of training of the HBCs weighing of the patient is a common item that they are taught. The results suggest that HBCs are competent in this variable although the Chi-square statistics revealed no significant association between the performance (results) and weighing of patients. Engelbrecht *et al.* (2017) concurred with the mean score in this variable in a cross-sectional study done to assess HIV and TB knowledge and skills of HBCs, which indicated the relationship between type of questions asked and the skills assessed on HBCs as explained by the results (Table 4.4).

Another question asked was proficiency on the variable BMI. The HBCs have been assessed on whether they have the ability to demonstrate BMI of the patient using a BMI wheel or any other method they know for the purpose of calculation of BMI. Forty-two (42) HBCs were incompetent in this variable and 10 (ten) HBCs were competent. The 10 (ten) HBCs who were competent are from Sebayeng. Sebayeng has most of the resources that Seobi Dikgale, Makotopong and Dikgale do not have. Amongst the resources that Sebayeng posesses are an electronic scale with stadiometer and BMI wheels. HBCs at Sebayeng have been trained to use these resources.

The calculation of BMI depends on the knowledge that will lead to accurate weighing of the patient and to calculate BMI by using a BMI wheel, the calendar type BMI calculator or by manual calculation of BMI using the given formula. The 10 (ten) HBCs at Sebayeng Clinic demonstrated competency in measuring BMI because they have been trained in PHC re-engineering whereas others have not yet been trained. Therefore, the 42 (forty-two) incompetent HBCs are attributed to the knowledge, skill and practice required in measurement of BMI. Statistical analysis using the Pearson Chi-Square

correlation coefficient indicatesd that there was no significant relationship between performance and demonstration measuring BMI by HBCs (X^2 = 758, df = 1 p ≥ 0.384). Skill is required in order to measure BMI. It is indicated that BMI is calculated by dividing an individual's weight in kilograms by his height in metres, then dividing the answer by his height again for example the following formula has been provided: BMI (kg/m^2) = Body weight (kg) / Height $(m)^2$. For instance: BMI = 66kg / (1.69 m^2) = 66 / 2.86 = 23.08 kg/m^2 (Kolimechkov, 2014).

4.2.3 Section C: Waist Circumference

Table 4.5 presents the results on waist circumference.

Table 4.5: Waist circumference

FINDRISC tool Item	Question asked	Competency level	Number of respondents
Waist Circumference	Did the HBCs demonstrate measuring of waist circumference of the patient?	Incompetent	49/52
		Moderately competent	3/52
		Fully competent	0/52

Table 4.5 indicates the proficiency on the variable waist circumference. The HBCs have been assessed on whether they have the ability to demonstrate measurement of waist circumference. Forty-nine (49) HBCs were incompetent in this variable and 3 (three) HBCs were competent. In contrast, on variables that required demonstration such as measuring of waist circumference the results are poor. The rationale behind this poor performance is that knowledge of human anatomy and physiology is required in order to measure waist circumference.

Poor performance on this variable may be due to the fact that most of the

HBCs have experienced waist circumference measurements for the first time. The statistical analysis using Pearson Chi-Square correlation coefficient shows that there was no significant relationship between performance and demonstration measuring waist circumference by HBCs using the measurement scale (X^2 = 195, df = 1 p ≥ 0.659).

This has been attributed to the following factors related to waist circumference that the HBCs should have adhered to: Waist circumference is measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. Factors such as type, tightness and placement of tape measure on the patient have been considered for the accuracy of the measurement. Other factors such as posture of the subjects, phase of respiration, abdominal tension and the influence the stomach content at the time of measurement have been considered for the accuracy when assessing the HBCs (WHO, 2011). Fifty two (52) HBCs were unable to adhere to principles of measurement of waist circumference as they were not exposed to it.

4.2.3 Section D: Physical Activity

Table 4.6 presents the results of physical activity.

Table 4.6: Physical activity

FINDRISC Tool Item	Questions Asked	Competency Level	Number of Respondents
Physical Activity	Did the HBCs ask the patient if s/he they engage in physical activity?	Incompetent	5/52
		Moderately competent	47/52
		Fully competent	0/52
	Did the HBCs ask the patient how does s/he exercise?	Incompetent	4/52
		Moderately competent	48/52
		Fully competent	0/52
	Did the HBCs ask the patient how long or how often?	Incompetent	5/52
		Moderately competent	47/52
		Fully competent	0/52

Table 4.6 indicates HBCs' proficiency on the question "Did the HBCs ask the patient if they engage in physical activity?" Five (5) HBCs were incompetent and 47 (forty-seven) were moderately competent in this question. Another question asked was "Did the HBCs ask the patient how does s/he exercise?" The HBCs have been assessed on whether they have the ability to ask the patient whether they engage in physical activity by giving examples of how the patient exercises. Four (4) HBCs were incompetent in that question and 48 (forty-eight) were moderately competent.

Statistical analysis using Pearson Chi-Square correlation coefficient indicates that there was a significant relationship between performance and

demonstration of HBCs in assessing the patient on how do they engage in physical activity or not (X^2 = 15.594, df = 1 p ≤ 0.001). This indicates that there is strong evidence of a relationship between how the HBCs have demonstrated the variable physical activity and the results.

The 48 (forty-eight) HBCs who were competent in this variable indicated the relationship by performance bearing in mind the level of questions which was supposed to be asked by the HBCs. This was a dichotomous question requiring HBCs asking how does the patient exercise (Engelbrecht *et al.*, 2017). Another question asked was "Did the HBCs ask the patient how long or how often does s/he exercise?"

The HBCs have been assessed on whether they have the ability to ask the patient whether they engage in physical activity by giving examples of how the patient exercises. Five (5) HBCs were incompetent in that question and 47 (forty-seven) were moderately competent.

4.2.4 Section E: Diet

Table 4.7 presents the results of diet. Table 4.7 indicates the performance on the question "Did the HBC ask the patient what they include in their diet e.g. fruits, vegetable or berries?" Four (4) HBCs were incompetent in that question and 48 (forty-eight) were moderately competent. Another question asked was "Did the HBC ask the patient how often do they follow the diet?" The answer expected by the HBCs on this question was daily or sometimes from the patient. Six (6) HBCs were incompetent on this question and 46 (forty-six) were competent.

Table 4.7: Diet

FINDRISC Tool Item	Questions Asked	Competency Level	Number of Respondents
Diet	Did the HBCs ask the patient what they include in their diet, e.g. fruits, vegetables or berries?	Incompetent	4/52
		Moderately competent	48/52
		Fully competent	0/52
	Did the HBCs ask the patient how often do they follow the diet? Daily or Sometimes	Incompetent	6/52
		Moderately competent	46/52
		Fully competent	0/52

Statistical analysis using Pearson Chi-Square correlation coefficient shows that there was a significant relationship between performance and demonstration of HBCs in assessing the patient on how often do they follow the diet? (X^2 = 24,408 df = 1 p ≤ 0.001). This indicates that there is strong evidence of a relationship between how the HBCs have demonstrated in asking this question under this section and the results thereof.

4.2.5 Section F: Presence of Illness

Table 4.8 presents the results of presence of illness.

Table 4.8 indicates the proficiency on the question "Did the HBC ask the client if s/he has any illness diagnosed at present?" Eleven (11) HBCs were incompetent in that question and 41(forty-one) were moderately competent. Another question asked was "Did the HBC ask if the client has ever been found to have high blood glucose in illness or during pregnancy?" Ten (10) HBCs were incompetent in that question and 42 (forty-two) were moderately competent.

Table 4.8: Presence of illness

FINDRISC Tool Item	Questions Asked	Competency Level	Number of Respondents
Presence of Illness	Did the HBCs ask the patient if s/he having any illness diagnosed at present?	Incompetent	11/52
		Moderately competent	41/52
		Fully competent	0/52
	Did the HBCs ask the patient if s/he has ever been found to have high blood glucose in illness or during pregnancy?	Incompetent	10/52
		Moderately competent	42/52
		Fully competent	0/52

4.2.6 Section G: Any Medication Taken for Hypertension and Diabetes Mellitus

Table 4.9 presents the results of any medication taken for hypertension and or DM.

Table 4.9: Any medication taken for hypertension and diabetes mellitus

FINDRISC Tool Item	Questions Asked	Competency Level	Number of Respondents
Any Medication Taken for Hypertension and Diabetes Mellitus	Did the HBCs ask the patient if s/he has taken medication for high blood pressure and diabetes?	Incompetent	2/52
		Moderately competent	50/52
		Fully competent	0/52
	Did the HBCs ask the patient if s/he adhered to medication if taken?	Incompetent	6/52
		Moderately competent	46/52
		Fully competent	0/52

Table 4.9 indicates the performance on the question "Did the HBCs ask the patient if s/he has taken medication for high blood pressure and diabetes?" Two (2) HBCs were incompetent in that variable and 50 (fifty) were moderately competent. Another question asked was "Did the HBC ask if the patient adhere to medication if taken?" Six (6) HBCs were incompetent in that question and 46 (forty-six) were moderately competent.

4.2.7 Section H: Previous Diagnosis of Any Member of the Family with Diabetes Mellitus

Table 4.10 presents the results of previous diagnosis of any member of the family with DM.

Table 4.10: Previous diagnosis of any member of the family with diabetes mellitus

FINDRISC Tool Item	Questions Asked	Competency Level	Number of Respondents
Previous Diagnosis of Any Member of the Family with Diabetes Mellitus	Did the HBCs ask the patient if s/he had history of diabetes in the family or relatives (e.g. not own parent, brother, sister or child)?	Incompetent	7/52
		Moderately competent	45/52
		Fully competent	0/52
	Did the HBCs ask the patient if s/he had history of diabetes in the family or relatives (e.g. own parent, brother, sister or child?	Incompetent	7/52
		Moderately competent	45/52
		Fully competent	0/52

Table 4.10 indicates the performance where HBCs have been assessed on whether they have the ability to ask the patient's history of diabetes in the family or relatives (not own parent, brother, sister or child). Seven (7) HBCs were incompetent in that variable and 45 (forty-five) were competent. Another question asked was "Did the HBC ask if the patient's has history of diabetes in the family or relatives (own parent, brother, sister or child)?" Seven (7) HBCs were incompetent in that variable and 45 (forty-five) were competent.

4.3 Performance of HBCs in Dikgale, Makotopong, Seobi Dikgale and Sebayeng

Figure 4.1 indicates the proficiency of HBCs that have been assessed for using FINDRISC tool. Sixteen (16) HBCs have been assessed and all were moderately competent and they scored 13 (thirteen) points and the biggest score was 16(sixteen) points out of 17 (seven-teen). The average proficiency

of Dikgale HBCs was 14.3%. Figure 4.2 indicates the proficiency of HBCs that have been assessed for using FINDRISC tool at Makotopong HBCs. Thirteen HBCs have been assessed and have performed both incompetently and moderately competent and the least scores were 2 (two), 4 (four) and 9 (nine) points and the highest score was 15 (fifteen) points out of 17 (seventeen). The 3 (three) HBCs who have been rated incompetent within the overall results are from Makotopong. The average proficiency of Makotopong HBC was 11.2% that constituted the lowest average amongst the 4 (four) groups of Home-based carers.
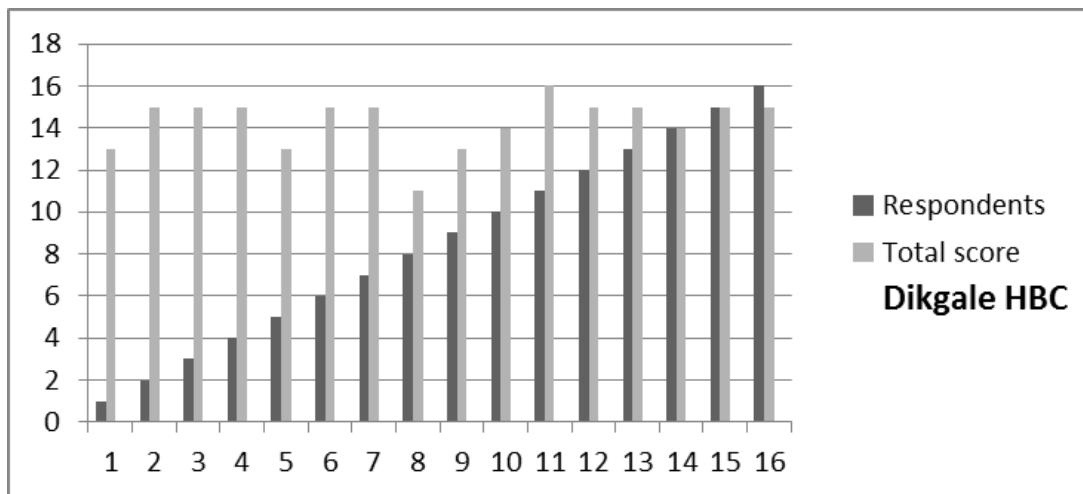
Figure 4.1: Performance of Dikgale HBCs
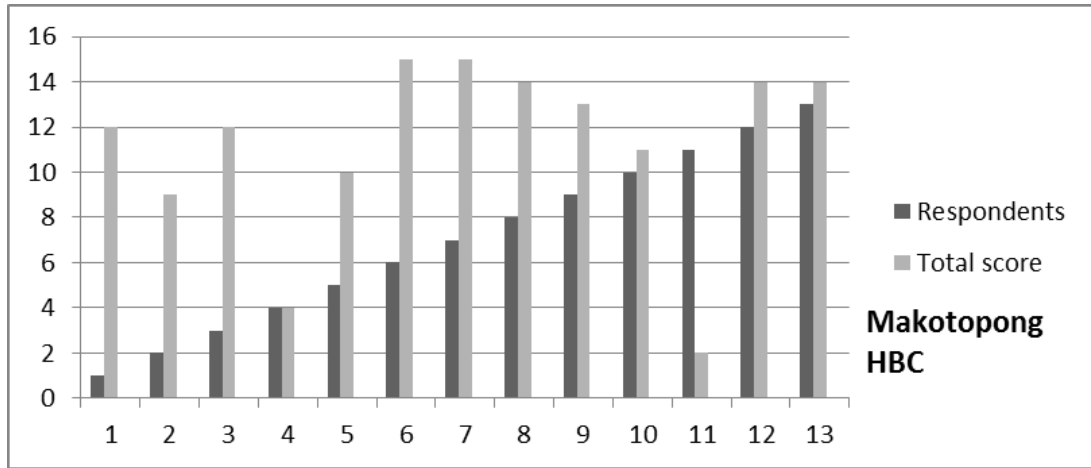
Figure 4.2: Perfomance of Makotopong HBCs

Figure 4.3 indicates the proficiency of HBCs at Seobi Dikgale which were assessed for using the FINDRISC tool. Ten (10) HBCs have been assessed and have performed moderately competent and scored 12 (twelve) points and the highest score was 15 (fifteen) points out of 17(seventeen) points. The average proficiency of Seobi Dikgale HBC is 14%.
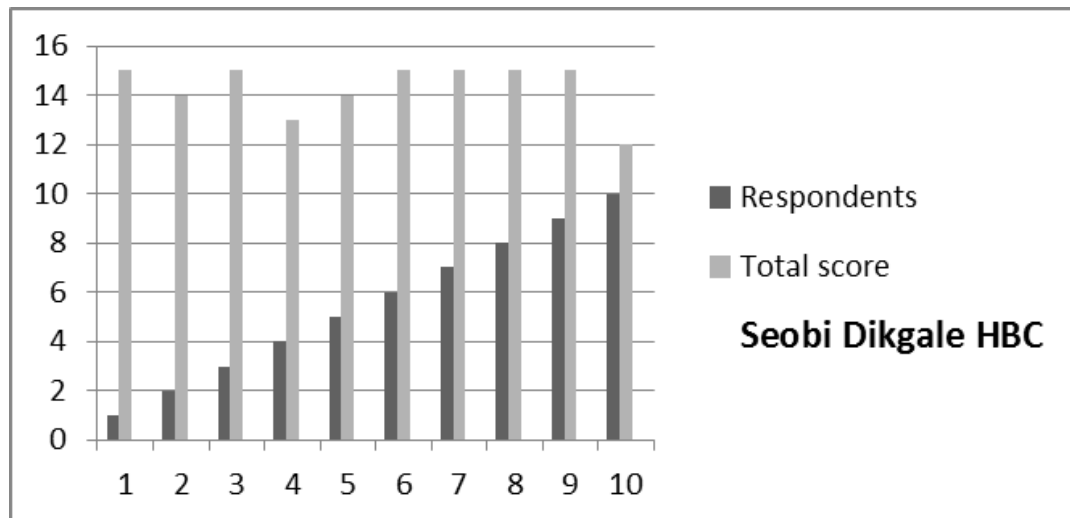
Figure 4.3: Performance of Seobi Dikgale HBCs

Figure 4.4 indicates the proficiency of HBCs at Sebayeng that have been assessed for using FINDRISC tool. Thirteen (13) HBCs have been assessed and have performed moderately competent and scored 12 (twelve) points and the highest score was 16 (sixteen) points out of 17 (seventeen) points. The average proficiency of Sebayeng HBC is 15%. Sebayeng HBCs have scored the highest average amongst the 4 (four) HBC groups.

4.4 Results of Assessing HBCs on the Use of the FINDRISC Tool

Table 4.11 presents the overall results of HBCs in all variables and questions asked. Table 4.11 indicates the overall results of HBCs in all variables and questions asked. Total number of 52 (fifty-two) HBCs have been assessed in all the clinics. The overall results indicate that 3 (three) HBCs which count to 5.8% were incompetent in this study. Forty-nine (49) which count to 94.2% are moderately competent. All 52 (fifty-two) HBCs were not fully competent which implied that they were unable to assess the patient to the extent that HBCs couldn't identify the patients at risk of diabetes. The TPB behaviour indicates that changes in attitude should lead to changes in intentions and the ultimate behaviour.
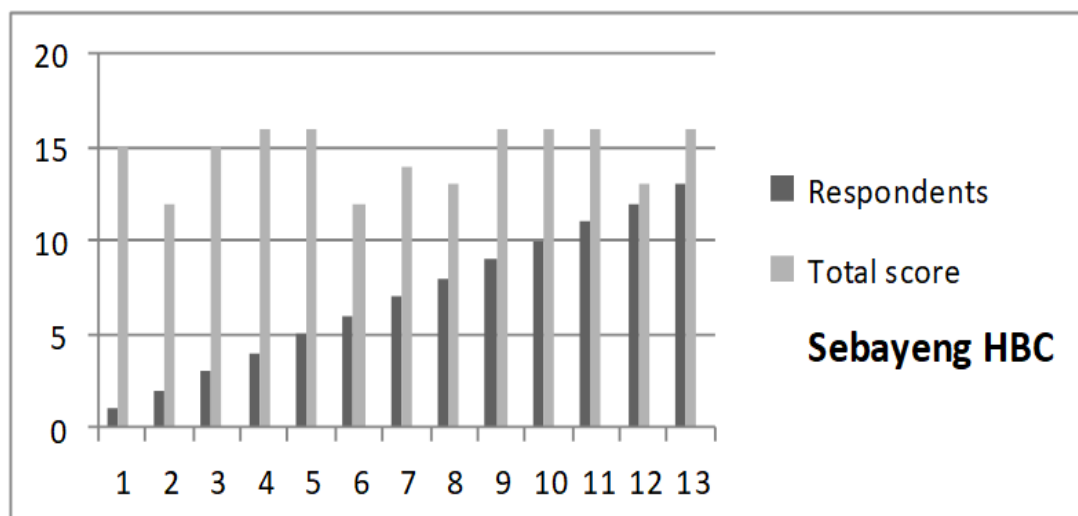
Figure 4.4: Performance of Sebayeng HBCs

Table 4.11: Results of assessing HBCs on the use of FINDRISC tool

Competence level	Number of HBCs	Percentages
Incompetent	3/52	5.8
Moderately competent	49/52	94.2
Fully competent	0/52	0

In this study, the researcher has tested the competence of HBCs in assessing the patients who are at risk of T2D using the FINDRISC tool. The results indicate the predicted competence behaviour based on the basics of home-based health care skills acquired through PHC re-engineering programme. This indicates the overall competence on all variables and questions asked. A gap of 5.8% has been identified which can be attributed to lack of training and skills of Seobi Dikgale, Dikgale and Makotopong HBCs. HBCs of Sebayeng is the exception due to the fact that they attend some of the workshops in which they are taught some of the skills and these have been reflected in their results because they were the competent ones. TPB theory on its principle of intentions indicates that ordinary people which are within a health care team could be influenced on their ultimate behaviour. In this study, the HBCs were influenced to be part of the health care team. The overall proficiency of the HBCs in this study indicated that there is a feasibility that the HBCs can be utilised in assessing the people at risk to develop diabetes using the FINDRISC tool.

The study by Mcdermott, Schmidt, Preece, Owens, Taylor, Li and Esterman (2015) concurred with this study's findings as they indicated that a culturally safe community health care worker model is the effective care of DM care programme in the rural areas of Australia. This indicates the feasibility of utilising the HBCs in the dealing with problems posed by DM. Sebayeng and

Dikgale HBCs have indicated being skilled in health care aspects that are also contained in the FINDRISC tool. This is supported by the proficiency on the following variables:

- ‰ Weighing of patients using manual or electronic scales;

- ‰ Taking height measurements using a tape measure or a stadiometer;

- ‰ Measurement of waist circumference using a fabric tape measure; and

- ‰ Calculation of Body Mass Index using a BMI wheel, BMI chart or manual calculation of BMI.

The results revealed that Makotopong and Seobi Dikgale HBCs have not performed well and the gap of 5.4% identified is from these 2 (two) HBC groups. Thus, Maimela, Alberts, Modjadji, Choma, Dikotope, Ntuli, and Van Geertruyden (2016) have concluded in their study that with proper training, HBCs will be better able to deliver appropriate health care service in the management of NCDs, including T2D.

4.4.1 Comparison Between the Two Studies as contextualised with other studies

The results of this study are congruent with those of a study done on the assessment of the level of knowledge about DM in a PHC setting which revealed the following comparison (Table 4.12).

Table 4.12: Comparison between the two studies

Previous Study	This Study
An assessment of the level of knowledge of diabetic patients, in a primary health care setting, on DM	Home-based carers' use of the finish diabetes risk score tool to assess DM patients at Ga-Dikgale Village South Africa: a feasibility study
Section A	**Section A**
The patients were asked about patient history	Biographic data
Section B	**Section B**
The patients were asked about patient age, race, residence, number of years, and type of medication taken.	Body Mass Index
	Section C
	Waist Circumference
	Section D
	Physical Activity
	Section E
	Diet
	Section F
	Presence of other ilness
	Section G
	Any medication taken for hypetension and Diabetes
	Section H
	Previous Diagnosis of any member of the family with DM.
Used adapted version of Michigan Diabetes Research and Training Centers brief diabetes test	Used adapted version of FINDRISC tool

Moodley and Rambiritch (2007) havre indicated that a total of 121 of 181 patients passed the knowledge test (p<0.05). The variables that have been tested in Moodley and Rambiritch's study were similar to the variables and questions that have been shown in Table 4.13. It should be borne in mind that the patients are the members of the public who are basically exposed to health care literacy at laymen's level.

Paprott, Mühlenbruch, Mensink, Thiele, Schulze, Scheidt-Nave and Several - Heidemann (2016) indicated that international guidelines recommend a stepwise approach to identify persons at high risk for or with yet undiagnosed T2D among the general population. In this study, the participants have been identified from the community by the HBCs and field workers whereby they were assessed in the community using the FINDRISC tool. This included history taking and anthropometric measurements. Consent forms have been signed by the patients at the first contact before assessment by HBCs was done.

4.5 Conclusion

This chapter discussed the data analysis, interpretation and the results with reference to the literature review and theory of planned behaviour (TPB). The results were presented in frequency tables and figures in accordance with the 8 (eight) sections of the FINDRISC adapted tool.

CHAPTER 5

THEORETICAL FRAMEWORK

5.1 Introduction

A theoretical framework is the overall conceptual underpinnings of a study. Theory is a systematic, abstract explanation of some aspects of reality (Polit and Beck, 2012). Theory of Planned Behaviour (TPB) has been applied as a theoretical framework because the study is about assessing HBCs' use of the FINDRISC tool to assess DM patients at Ga-Dikgale, South Africa: A feasibility study. TPB was based on the prediction of intention by the researcher in assessing the HBCs' use of the FINDRISC tool to assess DM patients.

5.2 Theory of Planned Behaviour

The propositions in TPB are intentions, attitudes, perceived behavioural control, normative beliefs and perceived self-control beliefs (Figure 5.1). These propositions have been used in order to determine attitudes and subjective norms in proficiency of an activity in which HBCs use the FINDRISC tool when assessing diabetic risk status of people at Ga-Dikgale Village. Each proposition bears the direction to be followed for an activity to be achieved. All the propositions in TPB depend upon each other.

5.2.1 Intentions

Intentions means that an individual functions based on the 3 (three) determinants, namely, individual attitude towards behaviour, subjective norms

and perceived behavioural control (Ajzen, 1991).
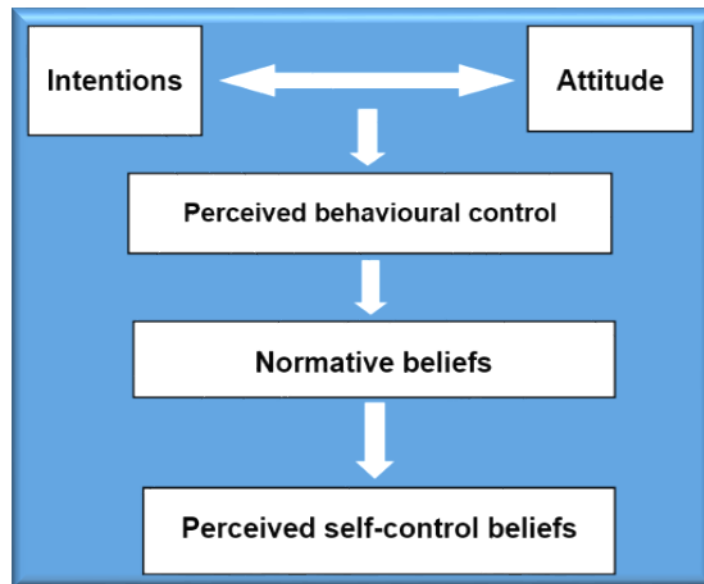
Adapted from Ajzen (1991)

Figure 5.1: Mind map for Theory of Planned Behaviour

Intentions also mean being ready to undertake a determined behaviour (Javadi, Kadkhodaee, Yaghoubi, Maroubi & Shams, 2013). In this study, the researcher had an intention to assess HBCs when using the FINDRISC tool to identify the risk status of diabetes. On the other hand, the HBCs had homogeneous characteristics that facilitated the intentions for them when using FINDRISC tool to determine the diabetic risk status of people at Ga-Dikgale. According to TPB, individuals are keen to be influenced by motivational factors through intention and results in exerting more effort in order to engage in a behaviour (Ajzen, 1991). In this study, HBCs have motivational factors such as monthly remuneration that resulted in exerting more effort in executing their activities.

Akulume and Kiwanuka (2016) in their study concurred with the description of TPB principles of intentions as a proposition for readiness to engage in a

task. This is also described as a major determinant of behaviour. In this study, feasibility of HBCs in using the FINDRISC tool has been assessed and knowledge gaps have been identified. Intentions by the researcher in assessing the HBCs have been carried out and recommendations on filling the knowledge gaps such as measuring of waist circumference, measurement of BMI and calibration of weighing scales have been made. Akulume and Kiwanuka (2016) echoed the findings of this study by indicating that according to TPB intentions of doing, an activity leads to proficiency. It is further stated that in TPB an individual behaviour is determined by how ready the person is when engaging in an activity which confirms his/her intensions. In this study, this has been supported by the overall results assessment of HBCs. Burns and Grove (2009) concurred with these findings by indicating that TPB has been used on the prediction of behaviour in order to achieve a specific behaviour as an outcome.

5.2.2 Attitude

Attitude means a state in which a person has positive or negative feelings towards the behaviour in a given situation. Attitude is defined in TPB as feelings favourable or unfavourable towards a behaviour and is dependent on intentions of an individual (Ajzen, 1991). In this study, the results indicated the feasibility of HBCs in using FINDRISC tool to assess risk status of diabetics which was either favourable or not because proficiency of HBCs were different. The observation that others performed better may be due to the favourable behaviour they portrayed towards the activity. It would be because some performed badly when performing the activity because their attitudes were negative towards the activity.

Kiwanuka and Akulume (2016) supported these findings because they have

indicated that teacher candidates possessed an attitude and subjective norms which, when combined with perceived behavioural control, resulted in strong intention and commitment to perform an activity. In this study, the HBCs have portrayed a positive attitude on the variables that had good proficiency such as biographic data where 100% competency have been acquired. On assessment of biographic data, it has been found that the HBCs have performed well as they were asking the patients questions related to age. On further assessment, gaps have been identified on other sections of the FINDRISC tool such as assessment on demonstration of BMI where the HBCs have poorly performed either due to unfavourable conditions as they were not taught and not because of their negative behaviour towards the skill. According to TPB, attitude also involves the degree of favourability in which perceived costs and benefits of engaging in an activity is addressed (Ajzen, 1991).

5.2.3 Perceived Behavioural Control

Perceived behavioural control means the individual perception in which the level of competency in proficiency of a task is determined as either the task is easy or difficult. The presence or absence of required resources and opportunities, past experiences and information influences an individual's perceived behavioural control (Ajzen, 1991). In this study, HBCs have been exposed to a PHC re-engineering programme and have been frequently trained on palliative care such as care of chronic conditions and health promotion. According to the results, variables that required anthropometric measurements such measurement of weight, HBCs performed well with a result of 42/52 which might be because this was easy to them.

The TPB indicates that attitudes and behaviour will result in either a positive

or negative outcome on evaluation of an activity based on the fact that the activity might be easy or difficult or either the environment enables an individual to perform (Burns & Grove, 2009). It was expected that the HBCs' behavioural beliefs may lead to competence in the aspects of health care according to the level of their expertise and decision-making in the PHC setting because some of the tasks were easy whilst others were difficult as outlined in TBP. Additionally, the proficiency was also based on availability of resources and training the HBCs attended. On assessment of HBCs, their behavioural beliefs such as expected positive outcome on proficiency of many aspects of the FINDRISC tool has been achieved through the TBP principle of perceived behavioural control. This has assisted in identification of the knowledge gaps which HBCs have.

Kiwanuka and Akulume (2016) are in agreement with this proposition as they argued that according to TPB the behaviour of an individual cannot be 100% voluntary and it is controlled by other aspects in life that can lead to perceived behavioural control which include training a person and/or difficult and easy tasks that are performed. The results of this study, guided by the principles of TPB, indicate that on the variables that require intense nursing knowledge such as demonstration measuring of waist circumference by HBCs, they performed poorly. This can be attributed to the fact that basic anatomy of the waist was required from the HBCs in measuring of waist circumference which they were not taught.

5.2.4 Normative Beliefs

Normative beliefs refer to the way in which an individual is perceived by others in society when performing an activity in a surrounded social environment. It also refers to the condition in which social pressure is

involved in performing an activity (Ajzen, 1991). The HBCs have been evaluated on using the FINDRISC tool to assess people at risk for developing diabetes in the social environment in which they operate on a daily basis is villages an the community.

Javadi, Kadkhodaee, Yaghoubi, Maroubi and Shams (2013); Kiwanuka and Akulume, (2016) obtained similar results as they described that normative beliefs are expectations to conform through motivation to a specific norm in a given situation. The TPB indicates that normative beliefs as a proposition have a direct impact on a specific behaviour to be achieved which was used in this study to motivate the HBCs in the feasibility to use the FINDRISC tool in assessing people at risk to develop diabetes. The Limpopo Province Department of Health in South Africa, through their processes of support funding, had an influence on the individual proficiency of HBCs to continue providing services in communities.

The community has an expectation on the part HBCs in terms of conduct as they work within their vicinity and, on the other hand, support from the community as they are served by the HBCs. The overall proficiency of HBCs relates to their strength to work because they receive a stipend on monthly basis. Kiwanuka and Akulume (2016) in their study further concurred that in normative beliefs, the influence of an individual is based on other people's behaviour and or what they do to you within the social circle.

5.2.5 Perceived Self-Control Beliefs

Perceived self-control beliefs mean that an individual have personal feelings, ethical behaviour and moral obligations and/or responsibility to engage in an activity (Ajzen, 1991). In this study, HBCs demonstrated a combination of all aspects of perceived self-control beliefs through communication skills with the

patient during the use of the FINDRISC tool. HBCs have also exhibited ethical behaviour through explanation of the procedure to the patient, getting consent and maintenance of confidentiality during the study.

Javadi *et al.* (2013) agreed with this notion in their study by indicating that in perceived self-control beliefs there are factors that may facilitate or impede proficiency of an activity. In this study, the outcome of proficiency on assessment of HBCs were based on multifactorial propositions, including intentions, attitude, normative control, perceived behavioural control and perceived self-control beliefs. In this study, there were no impediments as HBCs have demonstrated the element of perceived self-control beliefs which were embedded in how they maintained ethical standards and the way they communicated with the participants as observed by the researcher. Polit and Beck (2010) indicated that knowledge, confidence and skills acquired by an individual will impact on the proficiency of an individual according to TPB. Polit and Beck (2010) further affirmed that TPB specifies the nature and the relationship amongst the concept related to health behaviour. In this study, the relationship between the knowledge and skills of the HBCs, using the FINDRISC tool, in assessing the patients at risk of diabetes has been assessed.

5.3 Conclusion

This chapter discussed TPB as applied throughout the study. The TPB supported the study results and literature was also presented to support the findings. TPB consisted of principle of intentions, attitudes, perceived behavioural control, normative beliefs and perceived self-control beliefs. The next chapter will provide a summary, recommendations and conclusions of the study.

CHAPTER 6

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

6.1 Introduction

The previous chapter has discussed the theoretical framework which was used to contextualise the results in the use of TPB. This chapter presents a summary, conclusions and recommendations of this study which focused on determining the feasibility of HBCs on the use of the FINDRISC tool to assess DM patients at Ga-Dikgale Village, South Africa.

6.2 Objectives of the Study

The objectives of the study were to:

- Describe knowledge and skills of HBCs at Ga-Dikgale Village, South Africa, regarding use of the different components of the FINDRISC tool to assess people with DM.

- Recommend training content and strategies for HBCs to use FINDRISC tool to assess the DM at Ga-Dikgale Village based on the study results.

6.3 Summary of the Results

The results in this study have been summarised according to the variables which were guided by the FINDRISC tool. A 100% competency level was required for HBCs to be competent in using the FINDRISC tool to assess the diabetic risk status of people at Ga-Dikgale Village.

This implies that the HBCs were required to be competent in all sections of the the FINDRISC tool in order to implement the tool in the South African context. The tool had proven to be valid to this context. Fifty-two (52) HBCs have been assessed on using the FINDRISC tool which consisted of 8 (eight) sections containing 17 (seventeen) variables and questions asked based on those variables.

6.3.1 Participant's Proficiency on Sections of the FINDRISC Tool

A total of 52 (fifty-two) participants have been assessed on all sections of the FINDRISC tool. Eight (8) sections of the FINDRISC tool consisted of 17 (seventeen) combinations of both variables and questions.

6.3.1.1 Section A: Biographic Data

The biographic data covered the expertise expected of the HBCs in asking the patient's age and verification thereof as the process of assessing people's risk of diabetes using the FINDRISC tool. Fifty-two (52) HBCs have been able to demonstrate the variable and were fully competent in all the 4 (four) clinics.

6.3.1.2 Section B: Body Mass Index

The results indicate that 39 (thirty-nine) HBCs are moderately competent and 13 (thirteen) are incompetent in this variable. HBCs were required to measure weight and height. Another variable assessed was the BMI. The HBCs have been assessed on whether they have the ability to demonstrate BMI of the patient using a BMI wheel or any other method they know for the purpose of calculation of BMI. Forty-two (42) HBCs were incompetent in this variable and 10 (ten) HBCs were competent.

6.3.1.3 Section C: Waist Circumference

The HBCs have been assessed on whether they have the ability to demonstrate measurement of waist circumference. Forty-nine (49) HBCs were incompetent in this variable and 3 (three) HBCs were competent.

6.3.1.4 Section D: Physical Activity

The HBCs have been assessed on the question "Did the HBCs ask the patient if they engage in physical activity?" Five (5) HBCs were incompetent and 47 (forty-seven) were moderately competent in this question. The HBCs have been assessed on the question "Did the HBCs ask the patient how does s/he exercise?" Four (4) HBCs were incompetent in that question and 48 (forty-eight) were moderately competent. The HBCs have been assessed on the question "Did the HBCs ask the patient how long or how often does she exercise?". The HBCs have been assessed on whether they have the ability to ask the patient whether they engage in physical activity by giving example of how the patient exercises. Five (5) HBCs were incompetent in that question and 47 (forty-seven) were moderately competent.

6.3.1.5 Section E: Diet

The HBCs have been assessed on the question "Did the HBC ask the patient what they include in their diet e.g. fruits, vegetable or berries?" Four (4) HBCs were incompetent in that question and 48 (forty-eight) were moderately competent. The HBCs have been assessed on the question "Did the HBC ask the patient how often they follow the diet?" The answer expected from the HBCs on this question was daily or sometimes from the patient. Six (6) HBCs were incompetent on this question and 46 (forty-six) were competent.

6.3.1.6 Section F: Presence of Other Illnesses

The HBCs have been assessed on the question "Did the HBC ask the client if having any illness diagnosed at present?" Eleven (11) HBCs were incompetent in that question and 41 (forty-one) were moderately competent. The HBCs have been assessed on the question "Did the HBC ask if the client has ever been found to have high blood glucose in illness or during pregnancy?" Ten (10) HBCs were incompetent in that question and 42 (forty-two) were moderately competent.

6.3.1.7 Section G: Any Medication Taken for Hypertension and Diabetes

The HBCs have been assessed on the question "Did the HBCs ask the patient if s/he has taken medication for high blood pressure and diabetes?" Two (2) HBCs were incompetent in that variable and 50 (fifty) were moderately competent. The HBCs have been assessed on the question "Did the HBC ask if the patient adhere to medication if taken?" Six (6) HBCs were incompetent in that question and 46 (forty-six) were moderately competent.

6.3.1.8 Section H: Previous Diagnosis of Any Member of the Family with Diabetes Mellitus

The proficiency were HBCs have been assessed on whether they have the ability to ask the patient's history of diabetes in the family or relatives (not own parent, brother, sister or child. Seven (7) HBCs were incompetent in that variable and 45 (forty-five) were competent. The HBCs have been assessed on the question "Did the HBC ask if the patient's has history of diabetes in the family or relatives (own parent, brother, sister or child?" Seven (7) HBCs were incompetent in that variable and 45 (forty-five) were competent.

6.3.2 Findings of the Study

6.3.2.1 Assessment of HBCs in Using the FINDRISC Tool

Not all 52 (fifty-two) HBCs were fully competent, which implies that they were unable to assess the patient to the extent that they can identify the patients at risk of diabetes. It has been found that HBC groups differ in terms of resources such as accommodation, funding, and in-service training attended. The findings is that Makotopong had 3 (three) HBCs who has been rated incompetent in almost all variables with the scores of 2 (two) points, 7 (seven) points and 8 (eight) points. Thirteen (13) HBCs have been assessed at Makotopong with an average of 11.2%. Dikgale, Seobi Dikgale and Sebayeng HBCs have performed moderately competent with the following average.Dikgale 14.3%, Seobi Dikgale14% and Sebayeng 15%. Sebayeng has performed well because it is well-structured and have resources from the funders and Department of Health. Sebayeng has also adopted Dikgale HBCs and this is indicated by the average as the second best performer.

Sixteen (16) HBCs in the Dikgale HBC group have been assessed and all were moderately competent and they scored 13 points and the biggest score was 16 points out of 17 (seventeen). Thirteen (13) HBCs at Makotopong have been assessed and performed as moderately competent and scored 12 (twelve) points and the highest score was 16 (twelve) points out of 17 (seventeen). Ten (10) HBCs at Seobi Dikgale have been assessed and performed as moderately competent and scored 12 (twelve) points and the highest score was 15 (fifteen) points out of 17 (seventeen). Thirteen (13) HBCs at Sebayeng have been assessed and performed moderately competent and scored 12 (twelve) points and the highest score was 16 (sixteen) points out of 17 (seventeen).

6.3.2.2 Skills acquired by HBCs in this study

The following skills has been acquired by HBCs in this study

- ❧ **Combining** daily palliative care with additional activity of assessment of participants on using the FINDRISC tool to assess their risk status of diabetes.

- ❧ **Measuring** of anthropometric variables, including BMI, weight and waist circumference as part of the assessment using the FINDRISC tool.

- ❧ **Scoring** the participants in accordance with FINDRISC tool in order to determine the risk status of participants.

- ❧ **Communicating** with the participants about DM and getting informed consent from the participants.

6.4 Recommended Training Content and Strategies to Fill the Gaps Identified in this Study

Strategies to enhance HBCs to use the FINDRISC tool to assess the DM at Ga-Dikgale Village are based on the study results.

6.4.1 Biographic Data

On variable such as age, the nature and demonstration of this variable requires continous training to enhance the knowledge of HBCs in an effort to strengthen proficiency in the procedure.

6.4.2 Body Mass Index

HBCs' Calculation of Body Mass Index (BMI) by applying different methods should be included in the curriculum of HBCs. BMI is measured by commercially prepared BMI wheels and can also be measured as follows: BMI is calculated by dividing individual's weight in kilograms by his/her height in metres, then dividing the answer by his/her height again for example the following formula have been provided:

BMI (kg/m^2) = Body weight (kg) / Height $(m)^2$ For instance: BMI = 66 kg / $(1.69 \ m^2)$ = 66 / 2.86 = 23.08 kg/m^2 (Kolimechkov, 2014)

6.4.3 Waist Circumference

Training on demonstration of measuring of waist circumference using a measuring tape. Waist circumference is usually measured at the level of the navel, and interpretation of measurement thereof in men and women for the purpose of scoring the risk of T2D of the patient.This variable is recommended to be included in the curriculum of the HBCs.

6.4.4 Weight and Height

Continuous training to enhance the knowledge of HBCs in an effort to strengthen quality of performing the procedure. Measurement of weight is a skill that has been used by the HBCs in palliative care. The focus on measurement of weight should be calibration of a manual weighing scale to zero kilogram in order to maintain accuracy of weight taken.

6.4.5 Other Variables

Questions on the FINDRISC tool listed below require continuous training to enhance the knowledge of HBCs in an effort to strengthen quality of doing the

procedure:

- ❧ Physical Activity

- ❧ Diet

- ❧ Any Medication Taken for Hypertension and Diabetes

- ❧ Previous Diagnosis of Any Member of the Family with Diabetes

6.5 Recommendations

The recommendations are presented based on the variables tested and the questions asked.

Based on the findings of the study, the following are recommended:

- ❧ HBCs should be incorporated into PHC re-engineering programmes.

- ❧ The government should facilitate and regularise funding so that HBCs can be retained in the PHC re-engineering programme.

- ❧ HBC groups should be encouraged to participate in team building events in order to motivate them.

- ❧ HBCs should be involved in skills development training more frequently to upgrade their abilities and to motivate them in accomplishing their operations. Government can provide this training to improve their skills as this will motivate them to work harder and be more committed to their work. Structured training programmes should be offered with planned periods to cover all HBC groups in all the districts.

ℾ The management of HBCs in HBC groups should monitor their key proficiency areas on a quarterly basis to recommend individualised refresher courses based on the gaps identified per HBC. This will assist in identifying how the HBCs cope with their daily activities.

ℾ A special task office should be setup to deal with problems HBCs face every day as part of a pilot study. Coordinators and managers of HBCs can report frequently to this office on the problems that they encounter.

ℾ As HBCs are ancillary members of the health care team, debriefing sessions are recommended to be offered on a semester or yearly basis.

6.6 Limitations of the Study

The expected number of the sample of HBCs was not reached and this has led to the reduced sample size. Some of the HBCs were on leave and they were not assessed while others were in management positions of HBC groups. This has led to a sample size of 52 (fifty-two). Therefore, this study can only be generalised within the HBC setting in the Capricorn District. Grove *et al.* (2015), on the other hand, stated that descriptive studies tend to use small samples as groups are not compared and problems related to sampling error and generalisation have little relevance for such studies in quantitative research.

6.7 Further Research

Based on the findings of this study, it is recommended that further research be conducted to investigate the following:

❧ Assessing task shifting production efficiency of HBCs on using the FINDRISC tool to assess patients at risk of T2D.

❧ Perceptions of professional nurses in incorporating the HBCs in the PHC re-engineering programme.

❧ Designing, validation and implementation of Sub-Saharan African diabetes risk assessment tool.

6.8 Conclusions

This study has found that HBCs can play an important role in the assessment of patients at risk of developing diabetes in the communities. The knowledge and skills of the HBCs that have been acquired throughout the years can be supplemented by strengthening the PHC re-engineering programme and in-service training that can be tailored for proper functioning of the HBCs within the health care team.

The study has highlighted a few problems that the HBCs are experiencing with regard to aid in the provision of home-based palliative care where they have been allocated. Amongst other problems experienced are matters related to funding so that they receive their stipend on monthly basis. This will boost their morale as they are mainly working as volunteers. The problem of funding impacts negatively on their ability to assist in rendering clinical functions such as directly observe treatment support of patients taking tuberculosis treatment, antiretroviral drugs and palliative care of the patients at their homes.

The highlighted problem is consistent with the argument done in a study by Maimela, Alberts, Van Geertruyden, Meulemans and Modjadji (2016) that the low and inconsistent remuneration received by the HBCs was prevalent

which seems to have been documented in other studies conducted in South Africa. These problems were tabled in the recommendations and will be brought to the attention of Limpopo Provincial Department of Health through the research report. The study could contribute towards effective screening and management of chronic conditions such as T2D by increasing the scope of HBCs.

The study will contribute to risk assessment of the population in relation to diabetes. The HBCs have been most effective when they facilitate change of the community level while being respected by government, public service workers and communities they serve. It is further stated that the HBCs serve limited number of households and their communities know them very well to the extent that their interaction with the local health workers at the clinics serve as a link between the community and health facilities. Therefore, acquired skills mentioned will boost such interaction (Dennil & Rendall-Mkosi, 2012).

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APPENDIX A

TURFLOOP RESEARCH ETHICS COMMITTEE CLEARANCE CERTIFICATE

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 2212, Fax: (015) 268 2306, Email: noko.monene@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE CLEARANCE CERTIFICATE

MEETING: 05 July 2016

PROJECT NUMBER: TREC/78/2016: PG

PROJECT:

Title: Home-based care's use of the finish diabetes risk score tool to access diabetes mellitus patients at Ga-Dikgale Village in Limpopo Province, South Africa: A feasibility study.

Researcher: TT Molepo
Supervisor: Prof Mothiba
Co-Supervisors: Prof H Bastiaens
                Prof J Wens
School: Health Care Sciences

Degree: Masters in Nursing

PROF TAB MASHEGO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:
i)   Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.
ii)   The budget for the research will be considered separately from the protocol.
        PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

APPENDIX B

REQUEST TO LIMPOPO PROVINCE DEPARTMENT OF HEALTH TO CONDUCT THE STUDY

University of Limpopo
Turfloop Campus
School of Health Sciences
Nursing Department
Private Bag x 1106
Sovenga
0727

The Deputy Manager Primary Health Care
Dikgale Local Area

RE: REQUEST TO UNDERTAKE A RESEARCH STUDY AT GA-DIKGALE VILLAGE

I hereby applying for permission to undertake a research study about Home-Based Carers' use of the Finnish Diabetes Risk Score tool to assess Diabetes Mellitus patients at Ga-Dikgale Village, South Africa: A feasibility study. Processes and procedures shall be adhered to in relation to undertaking of the research study.

Yours faithfully

Thanana Thomas Molepo

Cell Number: 082 567 4571 / 0606663889
e-mail: 201625147@keyaka.ul.ac.za
        molepothanana@gmail.com

APPENDIX C

PERMISSION FROM THE LIMPOPO PROVINCE DEPARTMENT OF HEALTH TO CONDUCT THE STUDY

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

Enquiries: Latif Shamila (015 293 6650)   Ref:4/2/2

Molepo TT
University of Limpopo
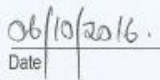Private Bag X1106
Sovenga
0727

Greetings,

RE: Home based cares' use of the finish diabetes risk score tool to assess diabetes mellitus patients at Ga-Dikgale Village in Limpopo Province, South Africa: A feasibility Study

The above matter refers.

1. Permission to conduct the above mentioned study is hereby granted.
2. Kindly be informed that:-

   - Research must be loaded on the NHRD site (http://nhrd.hst.org.za) by the researcher.
   - Further arrangement should be made with the targeted institutions, after consultation with the District Executive Manager.
   - In the course of your study there should be no action that disrupts the services.
   - After completion of the study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   - The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   - The above approval is valid for a 3 year period.
   - If the proposal has been amended, a new approval should be sought from the Department of Health.
   - Kindly note, that the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated.

_____   06/10/2016.
Head of Department   Date

18 College Street, Polokwane, 0700, Private Bag x9302, POLOLKWANE, 0700
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APPENDIX D

INFORMATION FOR PARTICIPANTS

PROJECT TITLE	Home-Based Carers' Use of the Finnish Diabetes Risk Score Tool to Identify Diabetes Mellitus Patients at Ga-Dikgale Village Village, South Africa: A Feasibility Study
PROJECT LEADER/ SUPERVISORS	Professor T.M. Mothiba
	Professor H. Bastiaens
	Professor J Wens

You are invited to participate in the following research project:

Home-Based Carers' Use of the Finnish Diabetes Risk Score Tool to Identify Diabetes Mellitus Patients at Ga-Dikgale Village Village, South Africa: A Feasibility Study

Participation in the project is voluntary and you are free to withdraw from the project (without providing any reasons) at any time. It is possible that you will not personally experience any advantages during the project, although the knowledge that may be accumulated through the project might prove advantageous to others. You are encouraged to ask any questions that you might have in connection with this project at any stage. The project leader and her/his staff will gladly answer your question. They will also discuss the project with you in details.

An adapted (tool) questionnaire (Appendix F) of modified FINDRISC tool will be used to collect data and will be completed by HBC in assessing their knowledge. The researcher will score the HBCs on the adopted FINDRISC tool (Appendix G) after HBCs have demonstrated all sections of the risk

assessment tool. An emotional trauma may be experienced by the HBCs on the process of being assessed on the usage of FINDRISC tool. By demonstrating all sections of the risk assessment tool, an emotional trauma may be experienced by the HBCs on the process of being assessed on the usage of the FINDRISC tool.

Should you at any stage feel unhappy, uncomfortable or is concerned about the research, please contact **Mr Thanana Thomas Molepo at 082 567 4571**.

APPENDIX E

CONSENT FORM

PROJECT TITLE	Home-Based Carers' Use of the Finnish Diabetes Risk Score Tool to Identify Diabetes Mellitus Patients at Ga-Dikgale Village Village, South Africa: A Feasibility Study
PROJECT LEADER/ SUPERVISORS	Professor T.M. Mothiba
	Professor H. Bastiaens Professor J Wens

I, _____ , hereby voluntarily consent to participate in the following project:

Home-Based Carers' Use of the Finnish Diabetes Risk Score Tool to Identify Diabetes Mellitus Patients at Ga-Dikgale Village, South Africa: A Feasibility Study

I realise that the study deals with Home-Based Carers' use of the Finnish Diabetes Risk Score tool to identify Diabetes Mellitus patients at Ga-Dikgale Village, South Africa: A feasibility study. The HBCs may experience emotional trauma during the process of the study and to the patients there may be pain on the puncture site and allergy to the latex rubber may be experienced.The procedure or treatment envisaged may hold some risk for me that cannot be foreseen at this stage.

The Ethics Committee has approved that individuals may be approached to participate in the study. The research project, i.e. the extent, aims and methods of the research, has been explained to me. The project sets out the

risks that can be reasonably expected as well as possible discomfort for persons participating in the research, an explanation of the anticipated advantage for myself or others that are reasonably expected from the research and alternative procedures that may be to my advantage.

I will be informed of any new information that may become available during the research that may influence my willingness to continue my participation. Access to the records that pertain to my participation in the study will be restricted to persons directly involved in the research. Any questions that I may have regarding the research, or related matters, will be answered by the researchers/s. If I have any questions about, or problems regarding the study, or experience any undesirable effects, I may contact a member of the research team or Mr Thanana Thomas Molepo

Participation in this research is voluntary and can withdraw my participation at any stage. If any medical problem is identified at any stage during the research, or when I am vetted for participation, such condition will be discussed with me in confidence by a qualified person and /or I will be referred to my doctor.

I indemnify the University of Limpopo and all persons involved with the above project from any liability that may arise from my participation in the above project or that may be related to it, for whatever reasons, including negligence on the part of the mentioned persons.

Signature of researched person: …………………………………

Signature of witness: ………………………………….

Signature of person that informed: …………………………………

Signature of parent/guardian of the researched person: ………………

Signed at ……………… this …………… day of …………………20…

APPENDIX F

DATA COLLECTION TOOL

Finish Diabetes Risk Assessment Tool to be used by Home-based carers

Section A: Biographic Data

1. HBCs ask the following related to age.

   - How old are you?
   - What is the date, month and year of your birth?

     *HBCs demonstrate calculation of the exact years of the patient in accordance with the given answers.

Section B: Body Mass Index

2. Demonstration of weighing of patient how HBCs measures body mass index of the patient using body mass index chart provided.

Lower than 25 kg/m^2
25-30 kg/m^2
Higher than 30 kg/m^2

Section C: Waist Circumference

3. Demonstrate how HBCs measures waist circumference of the patient using the tape measure provided. (usually at the level of the navel)

Men	Women
Less than 90 cm	Less than 80 cm

90-100 cm	80-90 cm
More than 100 cm	More than 90 cm

Section D: Physical Activity

4. HBCs ask the patient the following questions.

   - Do you engage yourself in physical activity? Yes or No.
   - How do you exercise for example (walking briskly, cycling or swimming)
   - How often or How long? for example daily for 30 minutes.

Section E: Diet

5. HBCs ask the patient the following questions.

   - Do you include fruits, vegetables or berries in your diet? Yes or No.
   - How often? Daily or sometimes?

Section F: Presence of Other Illnesses

6. HBCs ask the patient the following questions.

   - Do you presently have any illness diagnosed?
   - Have you ever been found to have high blood glucose (Sugar) in illness or during pregnancy?

Section G: Any Medication Taken for Hypertension and Diabetes Mellitus.

7. HBCs ask the patient the following questions.

   - Do you take medication for high blood pressure?
   - Do you adhere to your treatment by taking your medication regularly?
   - At what time do you take your medication?

Section H: Previous Diagnosis of Any Member of the Family with Diabetes Mellitus.

8. HBCs ask the patient the following questions.
   - In your family or relatives (not own parent, brother, sister or child) is there any member who has been diagnosed with diabetes?
   - Have either of your parents, or any of your brothers or sisters or own child been diagnosed with Diabetes Mellitus?

Adapted from test designed by Professor Jaako Tuomilehto, Department of Public Health, University of Helsinki, and Jaana Lindstrom, MFS, National Public institute.

APPENDIX G

ASSESSMENT TOOL

To be used by the Researcher for the assessment of HBCs in using of FINDRISC tool to assess Diabetes Mellitus patients

	0	1
Section A: Biographic Data HBCs ask the following related to age.		
• How old are you?		
• What is the date, month and year of your birth?		
*HBCs demonstrate calculation of the exact years of the patient in accordance with the responses.		
Section B: Body Mass Index Demonstration of: • Weighing of patient		
• How HBCs measures body mass index of the patient using body mass index chart provided. Lower than 25 kg/m^2 25-30 kg/m^2 Higher than 30 kg/m^2		
Section C: Waist Circumference Demonstrated how HBCs measures waist circumference of the patient using the tape measure provided (usually at the level of the navel). **Men** — **Women** Less than 90 cm — Less than 80 cm		

90-100 cm	80-90 cm			
More than 100 cm	More than 90 cm			

Section D: Physical Activity HBCs ask the patient the following questions.		
• Do you engage yourself in physical activity? Yes or No.		
• How do you exercise for example (walking briskly, cycling or swimming)		
• How often or how long? for example daily for 30 minutes.		
Section E: Diet HBCs ask the patient the following questions.		
• Do you include fruits, vegetables or berries in your diet? Yes or No.		
• How often? Daily or sometimes?		
Section F: Presence of Other Illnesses HBCs ask the patient the following questions.		
• Do you presently have any illness diagnosed?		
• Have you ever been found to have high blood glucose (Sugar) in illness or during pregnancy?		
Section G:Any Medication Taken for Hypertension and Diabetes Mellitus HBCs ask the patient the following questions.		
• Do you take medication for high blood pressure?		
• Do you adhere to your treatment by taking your medication regularly?		
• At what time do you take your medication?		
Section H: Previous Diagnosis of Any Member of the Family with Diabetes Mellitus HBCs ask the patient the following questions.		
• In your family or relatives (not own parent, brother, sister or child) is there any member who has been diagnosed with		

diabetes? 114		
• Have either of your parents, or any of your brothers or sisters or own child been diagnosed with Diabetes Mellitus?		

Adapted from test designed by Professor Jaako Tuomilehto Department of Public Health, University of Helsinki and Jaana Lindstrom,MFS,National Public Institute.

Key: Total 17 points

Fully Competent	17 points
Moderately competent	10 points and above
Not competent	0–9 points

APPENDIX H

TYPE 2 DIABETES RISK ASSESSMENT FORM

Circle the right alternative and add up the points.

1. Age	
0 Point	Under 45 years.
2 Point	45-54 years
3 Point	55-64 years
4 Point	Over 64 years
2. Body Mass Index	
0 Point	Lower than 25 kg/m^2
1 Point	25-30 kg/m^2
3 Point	Higher than 30 kg/m^2

3. Waist circumference measured below the ribs (usually on the level of the navel.		
	Men	**Women**
0 Point	Less than 94 cm	Less than 80 cm
3 Point	94-102 cm	80-88 cm
4 Point	More than 102 cm	More than 88 cm

4. Do you usually have daily at least 30 minutes of physical activity at work and/or during leisure time (including normal daily activity)?	
0 Point	Yes

2 Point	No
5. How often do you need vegetables, fruit or berries?	
0 Point	Everyday
1 Point	Not every day

6. Have you ever taken medication for high blood pressure on a regular basis?	
0 Point	Yes
2 Point	No
7. Have you ever been found to have high blood pressure (in a health examination, during an illness or during pregnancy?	
0 Point	No
5 Point	Yes
8. Have any of the members of your immediate family or other relatives been diagnosed with diabetes(Type 1 or Type 2)?	
0 Point	No
3 Point	Yes: grandparent,aunt, uncle or first cousin (but no own parent, brother, sister or child)
5 Point	Yes: parent, brother, sister or own child
Total Risk Score	
The risk of developing type 2 diabetes within 10 years is:	
Lower than 7	**Low:** estimated 1in 100 will develop disease.
7-11	**Slightly elevated:** estimated in 1 in 25 will develop disease

12-14	**Moderate:** estimated 1 in 6 will develop disease.
15-20	**High:** estimated 1 in 3 will develop disease.
Higher than 20	**Very high:** estimated 1 in 2 will develop disease.

Test designed by Professor Jaako Tuomilehto Department of Public Health, University of Helsinki and Jaana Lindstrom, MFS, National Public Institute.

APPENDIX I

RESEARCH JOURNEY

Introduction to Study at the University of Limpopo

I am Molepo Thanana Thomas, a nurse educator (Lecturer) at the Limpopo college of Nursing stationed at Sovenga Campus holding Honours degree in Nursing from the University of South Africa in 2013.

Registration and Preparation of the Proposal

After registering with the University for Masters Degree, the marathon of preparing the proposal started. I was lacking academic writing skills so Professor Mothiba started teaching me from the bottom. Studying masters is a task that requires extensive skills, so Professor Mothiba took me from tabula rasa in research. The other difficult activity that I was exposed to was to present the document to the senior degrees committee of the university. A lot of defence is required from students and supervisor in order to convince the panel. Defending a proposal need some expertise in the field that a person is researching. At this committee, I was expected to convince the panel on what the proposal entails. At that time, I was not yet clear on the expected outcome of the topic I wanted to study. Through the guidance of Professor Mothiba, Professor Bastiaens and extensive literature review, I gained momentum on the topic until the proposal went through all the stages. I finally got the approval from the university and ethical clearance was issued. I also received the provincial Department of Health permission to access health facilities so I could start with data collection.

Data Collection from the Home-Based Carers

Using the modified tool to assess the HBCs I have managed to collect data on separate days. HBCs are based at Seobi Dikgale Clinic, Sebayeng Clinic, Dikgale Clinic and Sebayeng Clinic. All were assessed for the use of FINDRISC tool in assessing the patient to determine the risk status of Diabetes Mellitus. At the end data was collected and ready for analysis. The university statistician has offered lessons during the year to do introduction to SPSS .The in-service classes assisted me in data analysis as I was finally able to enter data in excel sheet and in SPSS for analysis.

Visit to Belgium and Stay at University of Antwerp for Support

As the study unfold Professor Mothiba and Professor Bastiaens realised that the study can yield more than one article and decided to invite me to the University of Antwerp in Belgium so that I could continue with data analysis and preparation of the protocol for validation of FINDRISC tool.

Life and Academic Experience in Belgium

Professor J.P.Van geertruyden from University of Antwerp indicated the importance of learning through internet, more especially statistical issues in research. During my stay at Antwerp, I found other 2 colleagues from the University of Limpopo that was Mrs Cate Bopape and Mrs Edna Sechabe who already has attended classes related to statistics. I was provided with websites that will assist me in dealing with statistical problems that I will encounter in data analysis. During my stay at Antwerp I met Professor Wens who opened my eyes with matters related to Diabetes Mellitus and gave inputs for the study. The few hours meeting with him was very much productive. I have also had contact with Professor Bastiaens to deal with the matters related to the protocol related to validation of FINDRISC tool.

APPENDIX J

CONFIRMATION BY LANGUAGE EDITOR

CONFIRMATION BY LANGUAGE EDITOR

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16 January 2018

To Whom it May Concern

This serves to confirm that I have edited the language, spelling, grammar and style of the MCur thesis by Home-Based Carers' Use of the Finnish Diabetes Risk Score Tool to Assess Diabetes Mellitus Patients at Ga-Dikgale Village in Limpopo Province, South Africa: A Feasibility Study." The manuscript was also professionally typeset by me.

Sincerely Yours

Cert. Freelance Journalism, Dip. Creative Writing, MSc (Medicine), PhD