



FACTORS ASSOCIATED WITH SEXUAL DYSFUNCTION AMONG MEN WITH
TYPE 2 DIABETES MELLITUS IN BOTSWANA

GAOGAKWE RAMAOLGA

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR MASTER DEGREE OF NURSING SCIENCE
(INTERNATIONAL PROGRAM)
IN ADULT NURSING PATHWAY
FACULTY OF NURSING
BURAPHA UNIVERSITY

2025

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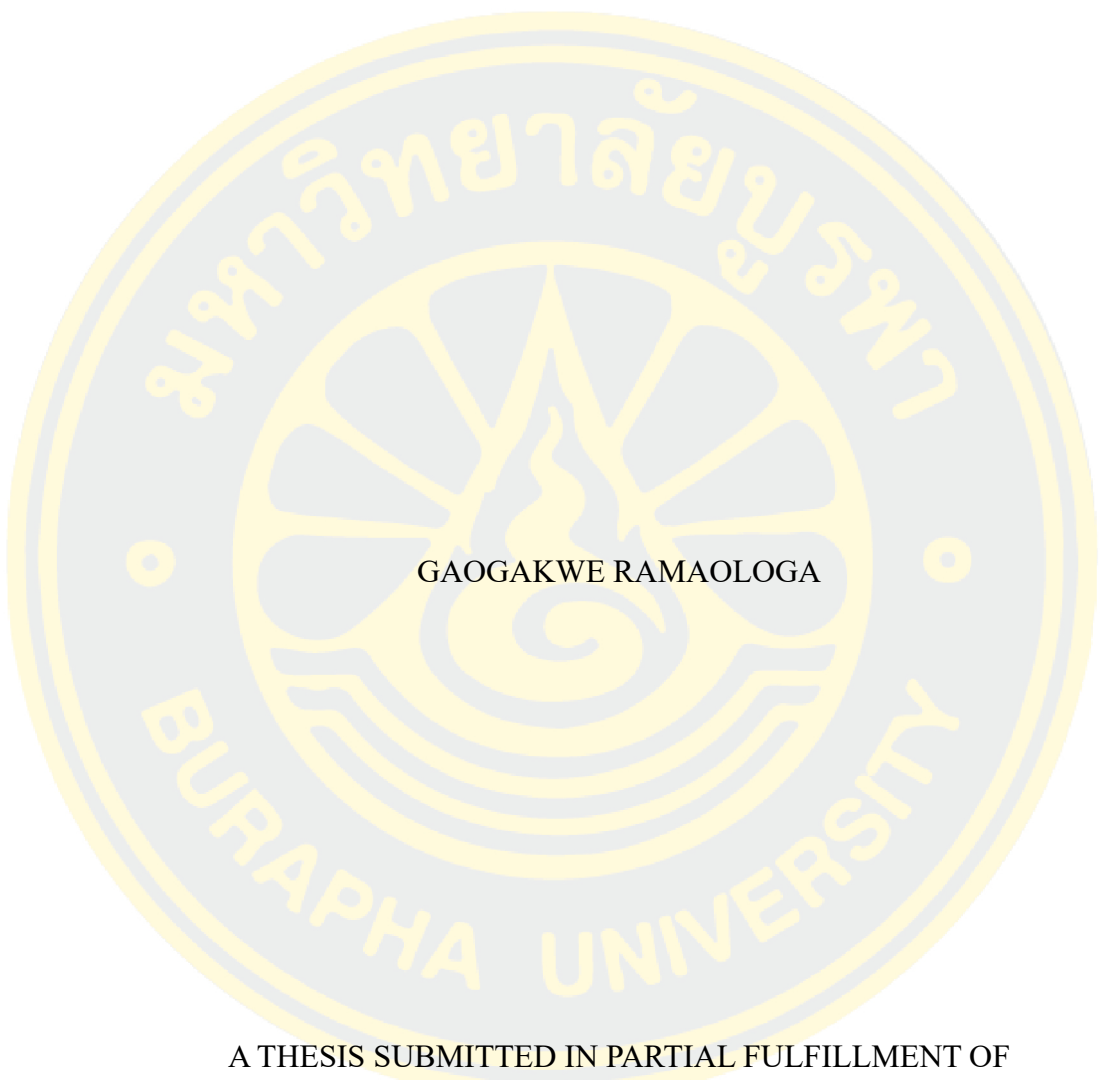
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FACTORS ASSOCIATED WITH SEXUAL DYSFUNCTION AMONG MEN WITH
TYPE 2 DIABETES MELLITUS IN BOTSWANA

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Sexual dysfunction (SD) is a common complication among men with type 2 diabetes mellitus (T2DM), significantly impacting their quality of life. Men with T2DM are at increased risk of developing SD prematurely. This descriptive correlational study aimed to examine the prevalence of SD and its associated factors including age, health status, diabetes duration, HbA1C and couple satisfaction among men with T2DM in Botswana. A simple random technique was employed to recruit 200 men with T2DM attending out-patient diabetes services at Block 6 clinic Gaborone, Botswana. Data were collected using the Demographic Information Questionnaire, the Short Form-12 (SF-12), the Couple Satisfaction Questionnaire (CSQ-4), and the Changes in Sexual Functioning Questionnaire (CSFQ- 14). Descriptive statistics and multiple regression analysis were used for data analysis.

The results indicated a high prevalence of SD (70%), with 89% experiencing desire disorders, 99% arousal disorders, and 100% orgasm disorders. Significant associations were found between SD and all examined variables: age, health status, HbA1C, diabetes duration, and couple satisfaction with SD. Regression analysis showed that these variables collectively accounted for 43.7% of the variance in SD. Among the predictors, age emerged as the strongest predictor ($\beta = .370, t = 5.959, p < .001$), followed by health status ($\beta = .285, t = 4.806, p < .001$), HbA1c levels ($\beta = .187, t = 3.448, p = .001$), diabetes duration ($\beta = .176, t = 3.057, p = .003$), and couple satisfaction ($\beta = .162, t = 2.942, p = .004$).

These findings underscore the multifactorial nature of SD in men with T2DM. Poorer glycemic control, prolonged diabetes duration, deteriorating health, lower couple satisfaction, and advancing age are all associated with increased

SD. Healthcare interventions should prioritize improving glycemic management, enhancing overall health, and offering couple-based counseling to support sexual health and well-being in this population.



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Gaogakwe Ramaologa

TABLE OF CONTENTS

	Page
ABSTRACT.....	D
ACKNOWLEDGEMENTS.....	F
TABLE OF CONTENTS.....	G
LIST OF TABLES	I
LIST OF FIGURES	J
CHAPTER 1 INTRODUCTION	1
Background and significance	1
Research Objectives.....	8
Research Hypothesis.....	9
Conceptual Framework.....	9
Scope of Study	12
Operational Definition of Terms	12
CHAPTER 2 LITERATURE REVIEW	14
Overview of Type 2 Diabetes Mellitus.....	14
Sexual dysfunction among men with type 2 diabetes mellitus in Botswana.....	18
Risk factors for sexual dysfunction in men with Type 2 diabetes mellitus	19
Biopsychosocial Model (BPS) and Sexual dysfunction.....	22
Factors associated to sexual dysfunction among men with Type 2 Diabetes Mellitus	24
Conclusion	30
CHAPTER 3 RESEARCH METHODOLOGY	31
Study Design.....	31
Study Setting.....	31
Population and sample	32
Research Instruments	34
Psychometric properties of instruments.....	36

Human Subjects Protection	37
Data Collection	37
Data Analysis	39
CHAPTER 4 RESULTS	41
Description of demographic characteristics and health information	41
Description of dependent (DV) and independent variables (IV)	46
Factors associated with sexual dysfunction among men with type 2 diabetes mellitus in Botswana.	47
CHAPTER 5 CONCLUSION AND DISCUSSIONS	50
Summary of findings	50
Discussion	51
Strengths and Limitations of the study	56
Implications of study findings	57
REFERENCES	60
APPENDIX	67
APPENDIX A	68
APPENDIX B	79
APPENDIX C	86
APPENDIX D	91
BIOGRAPHY	99

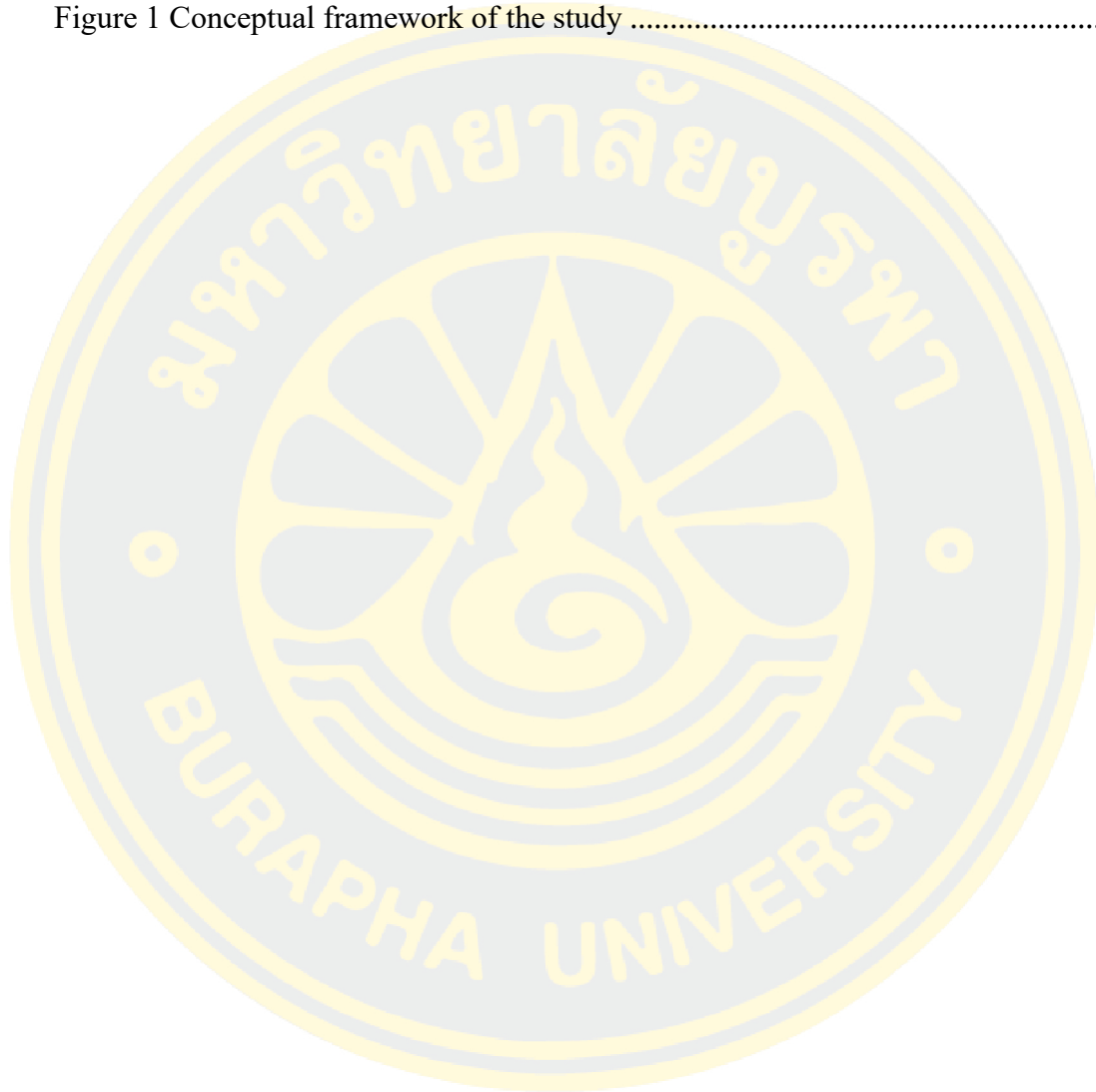
LIST OF TABLES

	Page
Table 1 Reliability test for instruments	37
Table 2 Demographic characteristics of participants (n =200)	42
Table 3 Frequency, percentage, mean, standard deviation of health information of participants (n=200)	44
Table 4 Range, mean and standard deviation of sexual dysfunction (n=200)	46
Table 5 Prevalence of sexual dysfunction in men with T2DM (n=200)	46
Table 6 Range, Mean and standard deviation of variables (n=200)	47
Table 7 Correlation matrix among study variables (n = 200)	48
Table 8 Summary of regression analysis for variables predicting sexual dysfunction among men with type 2 diabetes mellitus (n=200)	49

LIST OF FIGURES

Page

Figure 1 Conceptual framework of the study	12
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CHAPTER 1

INTRODUCTION

Background and significance

Diabetes mellitus (DM) is a public health concern, as the number of newly diagnosed people continues to rise. In 2021, 537 million cases of diabetes mellitus were recorded worldwide among adults aged 20 to 79 (International Diabetes Federation (IDF), 2022). The African continent's burden was at 24 million persons in 2021, with an expected 54 million cases by 2045 (IDF, 2022). According to de Ritter et al. (2020), 17.7 million more men than women have diabetes mellitus globally, however Kautzky-Willer et al. (2023) estimated that 8.4% of women and 9.1% of men have diabetes mellitus.

Diabetes mellitus is growing more common in Botswana, and according to the World Health Organisation [WHO] (2020), it is the country's sixth leading cause of death, trailing after infectious illnesses, cardiovascular diseases, accidents, and cancer. In 2021, the IDF reported an expected 78,100 cases of diabetes among those aged 20 to 79, with type 2 diabetes accounting for 5.2% (IDF, 2020). Furthermore, WHO reported that 1273 or 6.56% of DM fatalities occurred in Botswana in 2020. Diabetes mellitus is a severe health concern in Botswana, with the country's age-adjusted mortality rate ranking ninth in the world (WHO, 2020).

According to the facts presented above, Botswana a middle-income country, is expected to have diabetic issues in the next years. Additional factors contributing to the rise in T2DM prevalence in Botswana include urbanisation, unhealthy eating habits, smoking, and physical inactivity to mention a few. (Uloko et al., 2018).

In Botswana, more than 80% of diabetic patients have complications related to this disease, and these include cardiovascular disease, chronic renal disease and retinopathy (Rwegerera et al., 2018). This high prevalence of T2DM complications among diabetic patients in Botswana could mean that there is a high prevalence rate of SD as one of the complications, unfortunately no study has been undertaken to determine the prevalence of sexual dysfunction (SD) among men with T2DM.

Botswana's health system like other nations, is plagued by diabetes mellitus and Block 6 clinic among other specialist clinics nation-wide treat many diabetic patients referred particularly in the southern part of Botswana. In the year 2022, around 1,100 T2DM patients were treated monthly at Block 6 Clinic, of which 425 (38.6%) being were T2DM men every month. Around 20-21 T2DM men were treated daily and this number constituted both repeat and new cases. Men are less proactive in pursuing health compared to women; hence, they are more likely to present to health facilities already with T2DM complications such as sexual dysfunction (Das et al., 2018). Unfortunately, statistics on SD among men in Botswana is not available. The explanation might be that nurses and physicians do not screen for SD in these patients or that patients do not disclose or report it; therefore, this study aims to fill that gap.

According to WHO (2023), T2DM occurs when the pancreas fails to produce enough insulin or when the body is unable to effectively use the insulin it produces. The most common risk factors include obesity, genes and family DM history, genetic mutation, hormonal diseases, and pancreatic damage or removal. Prolong hyperglycaemia from DM has been linked to biochemical variations and other pathological changes in the body, thus, metabolic abnormalities which affect organs such as the eyes, cardiovascular and genitourinary systems (Banday et al., 2020). Elevated blood sugar levels can potentially cause significant disruptions in spermatogenesis, retrograde ejaculation or erectile dysfunction as well as a reduction in sexual appetite.

Sexuality is described as a person's physical, emotional, psychological and social well-being that is related with sexual urges rather than dysfunction (Heidari et al. 2019). Sexual expression refers to how a person experiences sexuality and conveys it to others which includes sexual behaviours, sexual communication, and sexual identity (de Jager et al., 2018). This is critical for establishing identity and self-esteem which are impacted by biological, psychological and social variables. As a result, lack of sexual expression may increase the risk of sexual dysfunction (de Jager et al., 2018). A proper sexual function is a multifaceted process influenced by psychogenetic, sex hormonal, neurogenetic, and hemodynamic variables. Any alteration in the parameters may lead to sexual dysfunction in men with T2DM (Chen et al., 2019).

Sexual dysfunction (SD) is a common consequence of DM and one of the most significant issues confronted or experienced by men with type 2 diabetes mellitus (Jumani and Patil, 2020). There are several definitions of SD in literature. SD is defined as the loss of desire, issues with arousal, long-term problems with ejaculation, erectile dysfunction and orgasm disorders (Gezgin- Yazici & Utas-Akhan, 2023). SD is also defined as a multi-factorial and heterogeneous set of illnesses that can take many forms and affect both sexes, with the main symptom being major clinical disruptions in one's capacity to respond sexually or enjoy sexual pleasure. SD can also be defined as an individual's inability to participate in sexual activity in the manner that they wish with symptoms including loss of sexual drive, lack of desire, sexual arousal and lack of satisfaction (WHO, 2022). Olivier (2017) defined SD based on sexual cycle response including arousal disorder (erectile dysfunction), hypoactive sexual desire, pain disorder and orgasm disorder (Olivier, 2017).

Desire disorder is defined as a continuous or recurring absence of sexual desire or interest in sex which is usually accompanied by an avoidance of being touched on the penis (Olivier, 2017). *Arousal disorder* is the inability to get physically aroused, obtain and maintain an erection or feel stimulated during sexual engagement (Olivier, 2017). *Orgasm disorder* occurs when there is a delay or lack of orgasm (climax), which is connected to premature or insufficient ejaculation (Olivier, 2017). *Painful disorder* is defined as experiencing discomfort during sexual activity, which is typically coupled with a lack of desire and lubrication (Olivier, 2017). Erectile dysfunction is the most frequent kind of SD, accounting for 35-90% of cases in men with T2DM (Seid et al., 2017).

Shiferaw et al. (2020) noted in their study that various studies done throughout the world confirm T2DM as a substantial risk factor for men experiencing SD. Men with T2DM are three times more likely to acquire SD than men without the disease (Bahar et al., 2020). As a result, it is critical to note that half of all adults remain undiagnosed yet living with T2DM for long periods of time unaware of the cause of their condition. additionally, it is worth noting that T2DM complications like SD in male patients, might already be present in newly diagnosed T2DM patients (Defeudis et al., 2022).

The global ageing of the world population, along with increased rates of T2DM explains the-overall high prevalence of SD in men with T2DM worldwide, which has had a detrimental influence on their quality of life (Abedi et al., 2021). It has been found that men with diabetes mellitus have a threefold higher incidence of erectile dysfunction than those without diabetes (Shiferaw et al., 2020). A large cohort study of men followed by professionals every two years and answering SD questionnaires revealed a tenfold difference in diabetic men with risk factors compared to those with healthy lifestyles (Anderson et al., 2022). The most common T2DM complication is diabetic neuropathy with sexual dysfunction accounting for 10-90% (Jumani & Patil, 2020).

The global increase in SD in diabetic men is largest in East and Southeast Asia, where 31% of men aged 40 to 80 had sexual dysfunction (Mekonnen et al., 2021). Erectile dysfunction is estimated to affect 152 million men globally, with a prevalence of 52% in America, 35-75% of whom are men with diabetes (IDF, 2020). It is estimated that 12 million men in Africa suffer from erectile dysfunction, with Nigeria having more than three out of ten men with diabetes mellitus ranging from 51 to 85.5%.

The prevalence of SD in Ethiopia according to types is as follows: orgasm disorder leading at 99.5%, erectile disorder 99.3%, desire 91.8 %, pain disorder 42% and pleasure disorder 52.4 %, with almost half suffering from more than one forms. Botswana has had little or no published research on the prevalence of sexual dysfunction in men with T2DM, therefore this study is critical to filling that gap.

Chronic medical disorders such as T2DM lead to SD in men and frequently have a detrimental influence on other aspects of an individual's life, including not only physiological but also psychological well-being (Anderson et al., 2022). T2DM men with sexual dysfunction may be stressed, raising blood glucose levels through cortisol production which leads to ailments with hyperglycaemic symptoms (Elterman et al., 2021).

Prolonged hyperglycaemia impairs sperm quality during spermatogenesis, potentially affecting men's fertility/impotence which is a biological domain (Chen et al., 2019). SD-induced stress exacerbates blood glucose increase through cortisol production, resulting in additional illnesses, complications and rehospitalization

increasing the burden and expenses on the health system and daunting the country's economy (Cooper et al., 2018). When individuals are unable to procreate or engage in regular sexual activity, they get unhappy, withdraw and have poor self-esteem which can lead to disagreements with partners, feelings of insecurity, and inadequacy which thus impacting on the psychological domain (Thongtang and Seesawang, 2020). This may also have a social impact, like relationship disagreements that may eventually lead to divorce, whilst in the society they may be branded as infertile (Anderson et al., 2022).

Cooper et al. (2018) revealed that men living with T2DM are concerned about sexual difficulties, which extend beyond biological concerns of erectile dysfunction to complicated psychological and relationship repercussions. SD affects not just T2DM men and their spouses but also their families and the society, since they withdraw from social activities due to the psychological impacts of stress and sadness caused by SD (Cooper et al., 2018).

The influence of SD on the physiological, social and psychological dimensions in men with T2DM remains a concern since it impacts their QoL which may even extend to the national level, as these men become unproductive at work affecting the country's economy (Elterman et al., 2021).

There are several reasons for this challenge including the sensitivity of the topic, as generally men have poor health seeking behaviour compared to women. Additionally, some men do not want to be perceived as weak, hence their reluctance to seek help (Thongtang & Seesawang, 2020). Nurses should familiarise themselves with SD in men with T2DM and its implications to effectively manage them.

Nurses should be able to treat and manage SD in men with T2DM holistically by assessing, consulting, collaborating with other health care providers and referring appropriately for continuity of care. They should educate both men and their partners about SD, so that they are aware of it, refer them to available treatments (Thongtang and Seesawang, 2020).

Several risk factors influence T2DM men's sexual dysfunction including but not limited to the following classifications. Under the biological domain examples of risk factors are diseases like diabetes mellitus, hypertension and environmental variables like radiation exposure (Dilixiati et al., 2024). The risk factors under

psychological domain are depression, anxiety, eating disorders and lower sexual efficacy (Dilixiati et al., 2024). Other examples of risk factors for SD in men with T2DM under social domain can be lifestyle variables like smoking cigarette, alcohol drinking, illiteracy, low income, unable to access nutritious foods and couple unsatisfaction among others (Chen et al., 2019). The reported common risk factors for T2DM in Botswana are attributed to biological domains like the rise in metabolic syndrome, men and women having high risk factors like hypertension and hyperlipidaemia psychological domain like stress and sedentary lifestyle as social domain. (Tladi et al., 2021).

The pathogenesis of diabetic SD is complex, impacted by a variety of variables that affect the patient's quality of life. T2DM long-term consequences such as macroangiopathy, microangiopathy, and neuropathy can cause SD due to limited/reduced blood flow, nerve damage and damaged blood vessels (Defeudis et al., 2021). T2DM damages arterioles, causing changes in endothelium-dependent relaxation of penile smooth muscles, inhibiting adequate blood flow to the penis and hence inability to erect (Chen et al., 2019). Hyperglycaemia is the primary cause of diabetic vascular complications including sexual dysfunction (Chen, 2019).

According to literature review, variables linked with sexual dysfunction may be divided into three categories: biological, psychological and social (Yazdi et al., 2020). The Biopsychological model shares the key components of biological, psychological and social, emphasising that each domain alone is insufficient to assess and treat on patient's needs but a comprehensive strategy involving all domains is critical (Engel, 2012).

In this study, biological domain such as age, diabetes duration and HbA1C were investigated, whereas psychological domain included health status and couple satisfaction as the social domain. The variables were chosen based on the above-mentioned domains and the WHO's major objective for diabetes mellitus which is to control blood glucose and hence to have good HbA1C levels. The age factor can impact self-management and self-care of T2DM men. If not treated well can results in T2DM complications such as SD, hence it was picked to determine the prevalence of sexual dysfunction in men with type 2 diabetes mellitus in the context of Botswana.

Also, to determine overall health status of men with T2DM who have SD and to investigate their couple satisfaction while experiencing SD.

In men with T2DM, age is defined as the time from birth and study, expressed in solid years (United Nations, 2018). According to a literature review, SD is widespread in men with T2DM, particularly in older men (Defeudis et al., 2022). The reason for selecting this factor was that, while SD may be considered normal with the ageing process, sexuality remains a key aspect of masculinity and is part of how men define themselves, it exists independent of chronological age, and even as they age, they continue to enjoy sex life (Chung, 2019).

Diabetes duration is the period from the date of T2DM diagnosis by a physician with a high blood sugar level (126 mg/dl or above) and the study date (WHO, 2022). That is the number of months or years since the patient was diagnosed with T2DM. The longer you have DM, the more likely you are to develop microvascular and macrovascular issues that lead to diabetes-related (Hurisa & Negera, 2020).

HbA1C is a test that assesses the average blood glucose level in men with T2DM during the previous 2-3 months, indicating glycaemic control (Selvin, 2021). In this study, HbA1C was determined by the latest findings of HbA1C to assess long-term glycaemic control of men with T2DM, which was valid for a period of three months that was discovered in the patient's medical records (Wang, 2021). According to literature review, there is a link between uncontrolled blood sugar and the incidence of SD in men with T2DM and poor glycaemic control is a risk factor for SD which has been shown to deteriorate with increasing duration of T2DM (Hurisa and Negera, 2020).

Health status is apprehension of men with T2DM of their health in terms of a function/dysfunction continuum of everyday activities that may be judged as excellent or bad, both physically and mentally (NCHS, 2020). SD has a significant impact on the health status of men with T2DM because difficulty in intimacy causes men to lose self-esteem and self-efficacy (Thongtang and Seesawang, 2020). The emphasis is on patient-centered health care necessitating interventions aimed at both the physical and emotional health of men with T2DM.

Couple satisfaction is defined as genuine sentiments of joy, pleasure, and satisfaction experienced by men with T2DM in their relationships (Asadi et al., 2020). Sexual interactions are the most essential variables influencing personal happiness and couple's life and if the pair is dissatisfied, it leads to low psychological well-being, with men reporting emotions of failure, defeat and insecurity in a relationship (Heidari et al., 2019). Furthermore, poor self-esteem is associated with loss of masculinity in men and lower sexual and emotional closeness in couples which might lead to divorce in most cases (Cooper et al., 2018).

In conclusion, various studies on SD and T2DM have been undertaken worldwide with diverse results, but none have been conducted in Botswana. However, there has been one study done in Botswana on men sexual function, focused on voluntary medical male circumcision and perceived sexual functioning, satisfaction and risk behaviour (Ledikwe et al., 2020). This study did not address SD in men with T2DM, hence there was a need for the current study to be conducted.

The study setting was a center of excellence for diabetes in the country yet failed to screen T2DM men for SD, despite evidence from a literature review showing that SD is the most common neurologic complication of men with T2DM. SD has a significant detrimental influence on the quality of life of our people. Given the sensitivity of sexual dysfunction in T2DM men along with other issues like cultural attitudes, lack of information about the matter and an unwillingness to discuss SD highlight another gap that had to be addressed.

The study findings if accepted, are likely to bring value and information to the nursing profession as well as enable nursing interventions aimed at preventing and managing the psychological trauma and social problems posed by SD on men with T2DM. There are varying study results on this topic elsewhere in the world, so it was critical to have conducted this study in Botswana based on different genealogical, cultural beliefs, ethnicity, culinary, socioeconomic status, and many other factors that may influence SD among men with T2DM.

Research Objectives

1. To assess the prevalence of sexual dysfunction on men with T2DM in Block 6 clinic in Botswana.

2. To examine associations between selected factors including age, health status, diabetes duration, HbA1C, and couple satisfaction with sexual dysfunction among men with T2DM in Block 6 clinic in Botswana.

3. To examine whether factors including age, diabetes duration, HbA1C, health status and couple satisfaction could predict sexual dysfunction among men with T2DM in Block 6 clinic in Botswana.

Research Hypothesis

1. There were relationships between age, diabetes duration, HbA1C, health status and couple satisfaction with sexual dysfunction among men with T2DM2 in Botswana.

2. The selected variables including age, diabetes duration, HbA1C, health status and couple satisfaction together could predict sexual dysfunction among men with type 2 diabetes mellitus in Botswana.

Conceptual Framework

The Biopsychosocial Model (BPS) and literature review served as the framework for this investigation. George Engel developed the model, which was published in 1977 at Michigan State University in the United States (Lugg, 2022). George Engel believed that to understand patients, respond appropriately to their needs and give them a sense of being understood, a clinician needed to consider the biological, psychological and social dimensions of illness, therefore, proposed a holistic alternative to the then-prevailing biomedical model (Engel, 2012).

Taukeni (2019), defined the BPS model as an interdisciplinary paradigm that examines the biological, psychological and socio-environmental aspects. The BPS model provided insight into how men with T2DM perceived their symptoms such as sexual dysfunction and how they responded to this issue with their spouse. The focus of this concept is that each component is insufficient on its own to definitively create sickness or health; rather, it is the intricate interplay of the three components, biological, psychological and social that results in a certain outcome (Engel, 2012).

The biological aspect, according to the BPS model, is a term that is frequently connected with the connection between sickness and physical health and

addresses the biochemical reactions of the body to sickness (Engel, 2012). The biological part of the proposed study is T2DM, in which long-term high blood glucose levels damage neurons and blood vessels, resulting in inadequate blood supply to the penis and consequently erectile dysfunction (Chen, 2019). Age, diabetes duration and HbA1C were investigated in this study as biological domain variables.

In a review of the literature, age, particularly older age has been linked to sexual dysfunction. Individuals over 50 are 11.21 times more likely to have sexual dysfunction than those under 50 (odd ratio: 11.21, 95% confidence interval: 6.40-19.62) (Bahar et al., 2019). There is inconsistency in study results, hence age was included in the research to establish the context in Botswana. Diabetes duration has also been linked to sexual dysfunction, with longer T2DM diagnoses increasing the likelihood of uncontrolled blood sugar and SD. T2DM patients with more than 5 years of diabetes had a lower risk of SD (AOR: 3.5; 95% CI: 1.12, 11.70); $p < 0.001$) (Hurisa and Negera, 2020).

HbA1C evaluates glycaemic control, and poor glycaemic control has been linked to the development of diabetic complications including sexual dysfunction. T2DM men with HbA1C $< 7\%$ had a lower risk of developing ED compared to those with HbA1C $> 7\%$, although the difference was not statistically significant (OR: 0.93; 95% CI: 0.15-5.91) (Shiferaw et al., 2020).

Psychological is the aspect of mental and emotional well-being that also includes behaviours (Engel, 2012). The components of mental and emotional health influence behaviour, hence the BPS model promotes psychological support which creates strong self-esteem and provides social cognitive skills both of which improve patients' quality of life (John et al., 2020). In this study, health status which considers assess both physical and mental health of men with T2DM and was used to investigate the effects of behaviours that influence their self-esteem and cognitive skills, providing a picture of their perceived quality of life in relation to sexual dysfunction. Sexual dysfunction in men with T2DM has a psychological impact on them by bruising their masculinity ego, making them feel less of a man, and stressing them out, which worsens their blood glucose levels and affects their physical and mental health, thus resulting in a poor quality of life.

The social component considers interpersonal elements like social engagement and community activities and lack of social connection can result in feelings of loneliness and unbalanced lifestyle, both of which can have a detrimental effect on a person's capacity to socialize (Engel, 2012). A person's capacity to engage in meaningful social contact significantly influences how they maintain good connections with loved ones (Litt et al., 2020). As a result, in this study, couple satisfaction was chosen as a variable to investigate couple satisfaction among men with T2DM who also had sexual dysfunction.

The BPS model is multidimensional, and its key assumptions; therefore, provide a useful theory-oriented framework for understanding the various interactions of biopsychosocial processes that shape perceptions and experiences of sexual functioning and wellbeing in the context of diabetes mellitus (Cooper et al., 2018). It is therefore with the goal of investigating factors associated with sexual dysfunction in men with T2DM, the model is chosen to achieve a complex relationship among several biological (age, diabetes duration, HbA1C), psychological (health status), and social factors (couple satisfaction) that are associated with sexual dysfunction in men with T2DM, as shown in figure 1.

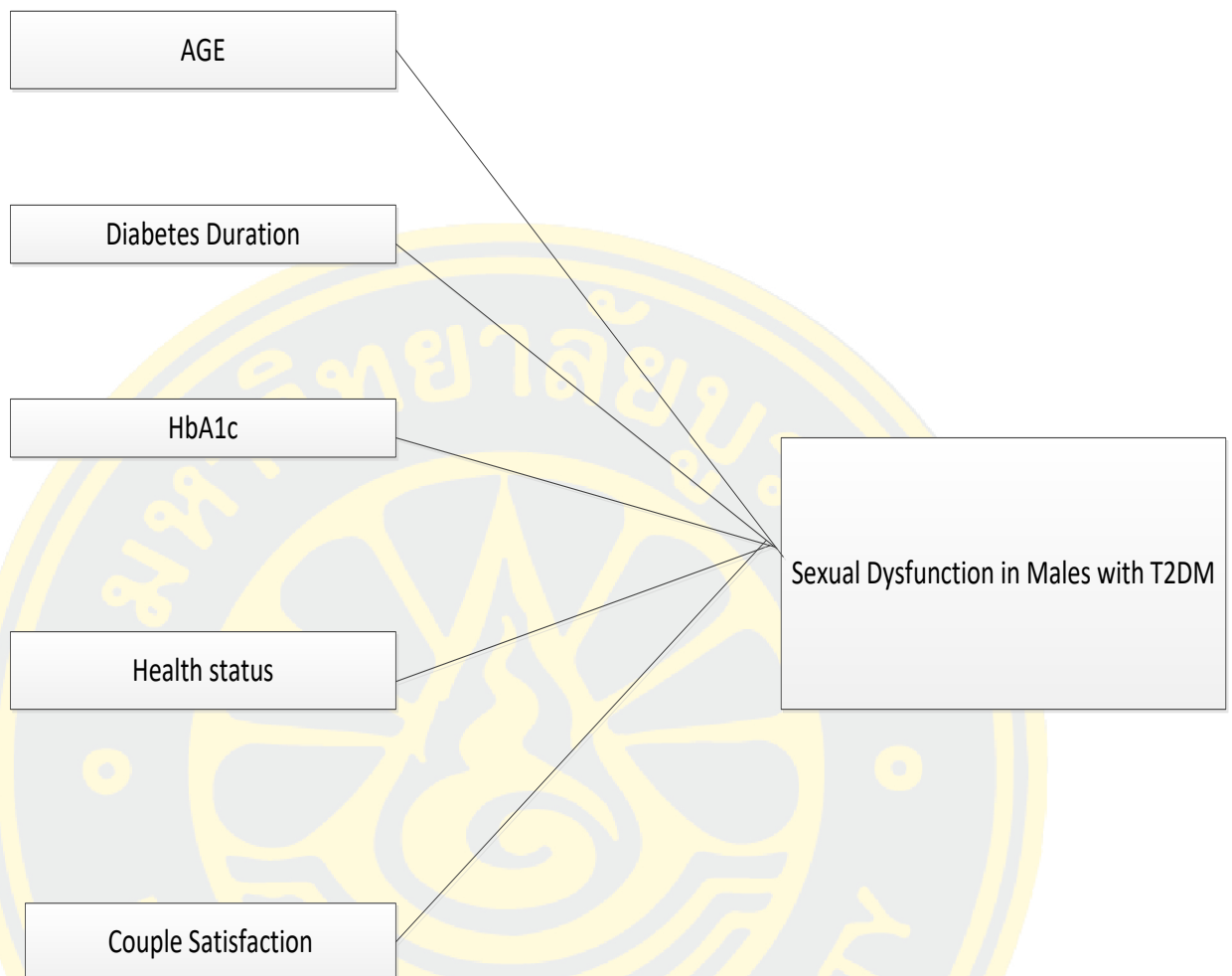


Figure 1 Conceptual framework of the study

Scope of Study

The study was conducted on men with type 2 diabetes mellitus attending out-patient clinic to determine prevalence of SD and contributing factors associated to sexual dysfunction at Block 6 clinic, Gaborone capital city of Botswana.

Operational Definition of Terms

Sexual dysfunction refers to inability of men with T2DM to respond sexually or experience sexual pleasure, classified into 3 categories including sexual desire, sexual arousal, and orgasm. It was measured by the Changes in Sexual Functioning Questioner-14 (CSFQ-14) (Clayton et al., 2002).

Age refers to the interval of time between date of birth and date of study expressed in complete years in men with T2DM (United Nations, 2018). In this study age was solid number of years for men with T2DM has lived, which was recorded in patient's medical records and identity cards.

Diabetes duration refers to the time men with T2DM diagnosed by physician following criteria of diagnosis from disease with a high level of blood sugar in the blood counted in years until study date which was found in patient's medical record.

HbA1C is a test that measures the average of blood glucose in men with T2DM for the past 2-3 months which shows results of glycemic control (Selvin, 2021). In this study HbA1C was defined by the recent results of HbA1C to assess long term glycemic control of men with T2DM which was valid within period of three months found in patient's medical records (Wang, 2021).

Health status is perception of men with T2DM regarding their health in terms of function/dysfunction continuum of daily activities performed which can be rated as good or bad both physical and mental (NCHS, 2020). It was defined operationally by the scores in the Short Form-12 (SF-12) developed by Ware, Kosinski and Keller (1996), which is a multi-purpose generic health status questionnaire on physical and mental health scale.

Couple satisfaction refers to a true feeling of joy, pleasure and satisfaction experienced by men with T2DM in their relationships with partners. It was measured by the Couple Satisfaction Index-4 (CSI-4) developed by Funk and Rogge (2007).

CHAPTER 2

LITERATURE REVIEW

This chapter is the literature review focuses on sexual dysfunction and its associated factors among men with type 2 diabetes mellitus (T2DM). The section is divided as follows:

1. Overview of type 2 diabetes mellitus
 - 1.1 Prevalence of type 2 diabetes mellitus
 - 1.2 Criteria for diagnosing diabetes mellitus
 - 1.3 Symptoms of type 2 diabetes mellitus
 - 1.4 Treatment for type 2 diabetes mellitus
 - 1.5 Complications of type 2 diabetes mellitus
2. Sexual dysfunction among men with type 2 diabetes mellitus in Botswana
 - 2.1 Definition
 - 2.2 Prevalence of sexual dysfunction
 - 2.3 Causes of sexual dysfunction
 - 2.4 Risk factors
 - 2.5 Pathophysiology of sexual dysfunction in type 2 diabetes mellitus
 - 2.6 Impacts of sexual dysfunction
3. Biopsychosocial model
4. Factors associated to sexual dysfunction among men with T2DM
5. Conclusion

Overview of Type 2 Diabetes Mellitus

Type 2 Diabetes Mellitus (T2DM) is one of the most common metabolic illnesses caused by a combination of two primary factors: inappropriate insulin production by pancreatic beta-cells and an inadequate response to insulin in insulin-sensitive tissues (Galicia-Garcia et al., 2020). Type 2 diabetes mellitus has increased substantially in nations of all income levels over the last three decades, resulting in a global public health problem (WHO, 2023). Diabetes mellitus is the fifth leading cause of death in Western societies and the fourth leading cause of doctor visits,

leading to complications such as heart attacks, kidney failures, retinopathy, neuropathy, reduced life expectancy, and sexual dysfunction (Bahar et al., 2020).

Prevalence of type 2 diabetes mellitus

Type 2 diabetes mellitus is the most common type of diabetes mellitus, accounting for 90-95% of all cases and it has been linked to SD in men with T2DM (Cooper et al., 2018). T2DM affects one out of every ten individuals worldwide, accounting for an estimated 537 million adults aged 20 to 79 (International Diabetes Federation (IDF), 2021). In the Sub-Saharan Africa area which includes Botswana, the anticipated prevalence of T2DM among adults is expected to skyrocket by 2045 to 40.7 million (Zimmermann et al., 2018).

According to statistics on T2DM in Botswana, there were 1,978 new instances of T2DM in 2019 and 41,661 T2DM patients who routinely visited health facilities in the capital city of Gaborone. Furthermore, in 2021, Block 6 Clinic the study setting, had 525 new T2DM cases, 39% of which were new men with T2DM, while 1662 or 42% were repeat cases of men with T2DM (Block 6 Clinic Statistics, 2022). In 2022, Block 6 Clinic had an average of 1100 T2DM patients each month with 425 (38.6%) of them being men. To get the above-mentioned prevalence of T2DM, the following accepted criteria for diagnosing patients with T2DM are used.

Criteria for diabetes diagnosis

The American Diabetes Association (ADA) has proposed the following criteria for diagnosing diabetes mellitus, with the test performed in a health care environment, such as by a doctor or a laboratory (ADA, 2022). There are various tests to diagnose and each test must generally be repeated the next day, although a doctor can assess a positive increased blood glucose level and show characteristic symptoms of high blood glucose and diagnose diabetes mellitus at the same time (ADA, 2022).

1. A1C test measures the average of blood glucose for the past 2-3 months. Results of A1C are categorized as: normal < 5.7%, prediabetes 5.7% to 6.4 % and diabetes > 6.5% (ADA, 2022).

2. Fasting Plasma Glucose (FPG) test measures glucose level after eating nothing except water at least 8 hours before the test usually in the morning (ADA, 2022). Results of FPG are classified as normal < 100mg/dl, prediabetes

100-125mg/dl and diabetes is diagnosed at fasting blood glucose of $>126\text{mg/dl}$ (ADA, 2022).

3. Oral Glucose Tolerance Test (OGTT) measures glucose level before and two hours after taking a sweet drink to show how body process sugar. The results are classified as: normal $< 140\text{ mg /dl}$, prediabetes $140 - 199\text{ mg/dl}$ and diabetes is diagnosed at 2-hour blood glucose 200 mg/dl (ADA, 2022).

4. Random/ Casual Plasma Glucose Test is done at any time of the day to measure glucose on a person presenting severe symptoms of diabetes and usually the test is repeated the same day for conformity. The blood glucose result of 200 mg/dl or more diagnose diabetes (ADA, 2022).

In T2DM the above criteria of diagnoses by physicians is very important as the symptoms may take long time to show/asymptomatic, but it is important to know and monitor symptoms of T2DM (Defeudis et al., 2022).

Symptoms of type 2 diabetes mellitus

Type 2 diabetes mellitus symptoms might be comparable to type 1 diabetes mellitus, even though T2DM is less visible and typically silent (IDF, 2020). It is important to remember that T2DM may go undiscovered in half of these people for a long period, with the possibility of problems such as SD occurring during this time (Defeudis et al., 2022). The common symptoms include frequent urination, feeling excessively hungry and thirsty even after eating, intense weariness, fuzzy eyesight, injuries that take a long time to heal and numbness, pain, or tingling in the hands or feet (IDF, 2020). Therefore, if a diagnosis is made, the patient should start therapy right away, as explained below.

Treatment of type 2 diabetes mellitus

According to WHO, (2020) guidelines, the main objectives of treatment in T2DM are to keep blood sugar levels within goal range ($\text{HbA1C} < 7\%/53\text{ mmol/mol}$) and treat other medical conditions that go along with diabetes like high blood pressure and advise patients to stop smoking if they smoke.

These measures reduce the risk of T2DM complications like SD (WHO 2020). Throughout the treatment process, pharmacological treatments and lifestyle modifications are often utilised to manage T2DM (WHO, 2020). Monotherapy can be initiated when lifestyle modifications alone fail to reduce blood glucose levels

to target levels. If there are no contraindications, metformin is the first medicine of choice for T2DM and should be continued as part of the T2DM treatment plan (ADA, 2020). Patients who cannot take metformin may use insulin secretagogues or glucosidase inhibitors.

If metformin by itself is unable to control blood sugar levels, dual therapy may include insulin secretagogues, glucosidase inhibitors, dipeptidyl peptidase IV (DPP4) inhibitors or thiazolidinediones (TZDs), sodium glucose cotransporter 2 (SGLT2) inhibitors, insulin, or glucagon-like peptide-1 (GLP-1) receptor agonists (Jia et al., 2019).

When dual treatment fails to regulate blood glucose levels, a combination of three drugs may be used. After undergoing triple treatment, individuals with uncontrolled blood sugar levels should continue to receive multiple daily insulin injections (basal + prandial insulin or multiple daily premixed insulin injections), as needed. Insulin secretagogues should not be utilised to provide multiple doses of insulin (Jia et al., 2019).

T2DM is primarily treated with western medicine in Botswana however, the government of Botswana has a policy to promote collaboration and cooperation between traditional healers and the formal health sector, so the country fortunately avoids excessive stigmatisation of traditional medicine by Western health practitioners (Chipfakacha 1997). Most DM patients, particularly those residing in Botswana's eastern region, widely employ water extracts of plants that have been shown to be effective as anti-diabetic medications (Motlhanka & Mathaka 2012). Effective blood glucose management in T2DM is critical, and failure to do so will result in consequences (WHO, 2020). These measures reduce risk of T2DM complications like SD (WHO, 2020).

Complications of type 2 diabetes mellitus

Traditional complications of T2DM include microvascular conditions such as coronary heart disease, stroke, and peripheral arterial disease, as well as macrovascular conditions such as diabetic kidney disease, retinopathy, and peripheral neuropathy, which cause damage to blood vessels and nerves, including sexual dysfunction (Tomic et al., 2022). Diabetic neuropathies inhibit correct nerve

conduction, thus even when stimulated impulses do not reach the penis, leading to reduction in smooth muscle delivery in the corpus cavernosum (Chen et al., 2019). Damaged arterioles alter endothelium-dependent relaxation of penile smooth muscles, limiting appropriate blood flow to the penis and as a result, preventing penile erections (Chen et al., 2019). Cardiovascular diseases, chronic kidney illnesses, and retinopathy are a few examples of the diabetic complications that are reported in over 80% of diabetic patients in Botswana (Rwegerera et al., 2018).

Diabetes mellitus especially T2DM is a leading cause of cardiovascular diseases, blindness, kidney failure and lower limb amputation in many different income countries (WHO, 2020). Complications like SD among men with T2DM can be delayed or prevented by controlling blood sugar, blood pressure, and cholesterol levels (WHO, 2020). Therefore, it is crucial to control blood glucose and regularly monitor complication symptoms because if not, many above mentioned complications will result in SD inclusive (IDF, 2020).

Sexual dysfunction among men with type 2 diabetes mellitus in Botswana

Sexual dysfunction (SD) is multi-factorial and heterogeneous group of disorders which can take different forms affecting both sexes and mainly characterized as a significant clinical disturbance in one's ability to respond sexually or experience sexual pleasure (Olivier, 2017). SD is classified according to sexual cycle response which are arousal disorder (erectile dysfunction), hypoactive sexual desire, pain disorder and orgasm disorder (Olivier, 2017).

Desire disorder is a lack of sexual desire or interest in sex which is persistent or recurrent and normally associated with avoidance to be touched on penis (Olivier, 2017). *Arousal disorder* is the inability to become physically aroused/ attain and maintain erection or excited during sexual activity (Olivier, 2017). *Orgasm disorder* is whereby there is delay/absence of orgasm (climax) which is associated with premature ejaculation or little ejaculation (Olivier, 2017). While Pain disorder is feeling pain during sexual activity which is normally associated with lack of desire and lubrication during sexual activity (Olivier, 2017).

SD is caused by complications of T2DM also known as adult-onset diabetes mellitus (Defeudis et al., 2022). About half of adults remain undiagnosed for long

periods unaware of their condition and as such diabetes complications may already be present by the time of diagnosis and these are inclusive of sexual dysfunction (Defeudis et al., 2022). SD is one of the most common T2DM complications in diabetic neuropathy which occurs at 10- 90% (Jumani and Patil, 2020).

The type 2 diabetic neuropathies in men prevent correct nerve conduction even where there is stimulation, the impulses do not pass to the penis causing a decrease in the delivery of smooth muscles of the corpus cavernosum resulting in failure of penile erection (Chen et al., 2019). In Botswana there are over 80% of diabetic patients with diabetic complications documented of both macroangiopathy and microangiopathy (Rwegerera et al., 2018), but lack of information regarding SD prevalence among men with T2DM hence needed to be established. SD prevalence is evident and is a real problem among men with T2DM as shown below.

Risk factors for sexual dysfunction in men with Type 2 diabetes mellitus

There are many risk factors for sexual dysfunction among men with type 2 diabetes mellitus and the few are mentioned below under three domains being biological, psychological and social domain. Some of the risk factors under the biological domain linked to SD in T2DM men are dyslipidemia and hypertension. Dyslipidemia is highly related to risk of SD, with each mmol/L rise in blood cholesterol leading to a 32% rise in erectile dysfunction (Al-kuraishy et al., 2020). The association of dyslipidemia and SD is due to the fact that it causes endothelial dysfunction by impairing nitric oxide (NO) generation and release which is responsible for erection of penis (Al-kuraishy et al., 2020). Another risk factor is hypertension whereby there is elevated blood pressure that inhibits the arteries that carry blood to the penis from dilating properly. It also hinders the smooth muscle in the penis ability to relax. Consequently, insufficient blood goes into the penis to make it erect (Mollaioli et al., 2020).

Physical inactivity is one of many risk variables that fall within the psychological domain that is linked to SD in men with T2DM. According to studies, it increases the likelihood of developing erectile dysfunction by decreasing endothelial NO production and increasing oxidative stress, which has a negative impact on mental health and self-esteem and a major influence on psychological illnesses associated with SD (Mollaioli et al., 2020).

Smoking cigarette and drinking alcohol are some of other risk factors that has been associated with SD under social domain among men with T2DM. Cigarette smoking causes blood arteries to constrict, drastically lowering blood flow throughout the body, including the penis. It also enhances risk of acquiring health issues that can lead to erectile dysfunction (Alrumaihi et al., 2024). Alcohol is a central nervous system depressor that reduces brain function, respiration and blood flow. Alcohol intake especially in alcohol-dependent individuals, leads to the development of SD, particularly ED in men (Mollaioli et al., 2020).

Prevalence of sexual dysfunction in Botswana

Sexual dysfunction is a major concern among men with T2DM worldwide, with a global estimate of 152 million, the highest prevalence in East and Southeast Asia at 31% of men aged 40-80 years, and in America at 52%, with 35-75% of men with diabetes (Mekonnen et al., 2021). In African nations particularly in Ethiopia, prevalence of SD according to types are orgasm disorder leading at 99.5%, erectile disorder 99.3%, desire 91.8 %, pain disorder 42% and pleasure disorder 52.4 %, over half suffering from more than one type (Mekonnen et al., 2021). Botswana has little to no information on SD since no research have been undertaken on SD among men with T2DM. However, SD has a detrimental influence on men with T2DM, thus this study was necessary addressing the gap.

Pathophysiology of sexual dysfunction in type 2 diabetes mellitus men

Hyperglycemia in T2DM can lead to number of complications including macroangiopathy, microangiopathy and neuropathy which can collectively contribute to development of SD (Defeudis et al., 2021). The diabetic neuropathies prevent correct nerve conduction although there can be stimulation, the impulses do not pass to the penis causing a decrease in delivery of smooth muscles of corpus cavernosum (Chen et al., 2019). Damaged arterioles lead to alterations in endothelium- dependent relaxation of penile smooth muscles preventing optimal blood flow to penis and hence failure to penis erection (Chen et al., 2019). The poor glycemic control is found to be culprit to all complications of T2DM including sexual dysfunction among men with type 2 diabetes mellitus hence this need to be managed with a multidisciplinary and evidenced based approach like theory (IDF, 2020).

Impact of sexual dysfunction

On the biological aspect T2DM complications causes SD on individuals which may trigger stress releasing hormones of which causes further elevation of blood glucose levels among men with T2DM (Sharma et al., 2022). Men in general has issues of masculinity and do not want to be regarded weak, when they fail to maintain their sexual intimacy, they are affected psychologically, feeling less of a man, frustrated and even depressed end up withdrawing from their partners which can even results in divorce (Thongtang and Seesawang, 2020).

This negative impact goes beyond biological and psychological on men with T2DM but also affect their relationships which is social domain, whereby within the family and community they withdraw from social activities and feeling inadequate of a man (Cooper et al., 2018). The negative impact may extent even to national level because it impedes on general health status of these men, having uncontrolled blood glucose cause ailments, rehospitalization which is a burden and costly to health system of the country's economy (Phrommintikul et al., 2022).

Most of health care workers are not conversant with the SD among men with T2DM and cultural beliefs of both patients and health care workers pose limit on this topic (Thongtang and Seesawang, 2020). T2DM cost a substantial financial burden from its complications hence there is need for effective management with multi-disciplinary efforts from government and health care workers (Phrommintikul et al., 2022). Hence this is a concern that nurses need to acclimatize themselves on SD among men with T2DM and its impact.

Nurses will be able to holistically approach and manage SD among men with T2DM using their roles to assess, consult, collaborate with other health care workers and refer appropriately for continuity of care (International council of Nurses (ICN), 2007). Nurses need to health educate both T2DM men and their partners about SD so as to have good understanding and refer for multidisciplinary management (ICN,2007. This prevents prolonged elevation of blood glucose level in T2DM which causes negative impact on biological, psychological and social well-being of men with T2DM and ultimately affecting their health status and quality of life as demonstrated by the SD mechanism in T2DM above.

Biopsychosocial Model (BPS) and Sexual dysfunction

The Biopsychosocial model (BPS) was first pioneered at Michigan State University in the USA (Lugg, 2022). The main reason for development of this model was in contrast to conventional biomedical models of clinical medicine which was the most prevailing model by then placing a greater emphasis on pathophysiology and other biological approaches to disease, rather than to emphasize the necessity of comprehending human health and illness in all of its interconnectedness (Engel, 2012).

Dr. George Engel believed that in order to comprehend health, illness and the provision of healthcare, the biopsychosocial approach diligently considers biological, psychological and social aspects as well as the complex relationships among them (Engel, 2012). Therefore, this model was employed to show interrelation of biopsychosocial elements in SD among men with T2DM.

Sexuality is an essential aspect of human existence that may be expressed and experienced in a variety of ways, including the interaction of biology, psychology and social factors that influence sexuality. Global ageing and T2DM in men contribute to a significant prevalence of SD, thereby impacting their quality of life (Abedi et al., 2021). Because this is a complex phenomenon, sexual dysfunction should be addressed through multidisciplinary efforts using a biopsychosocial framework that incorporates important relationships between biological, psychological and social elements to provide a holistic approach to SD in men with T2DM (Tripodi et al., 2022).

Biological

According to the BPS model this element, which is frequently connected between sickness and bodily health, encompasses the biological reactions of the body to illness (Engel, 2012). The biological factor of the proposed study is T2DM, in which long-term high blood glucose damages neurons and blood vessels, resulting in inadequate blood supply to the penis and consequently cause sexual dysfunction (Defeudis et al., 2021). There are many variables associated with SD among men with T2DM like dyslipidemia, metabolic syndrome, hypertension and cardiovascular disease but for this study only age, diabetes duration and HbA1C were investigated under biological domain. Sexual dysfunction has a detrimental biological impact on

men with T2DM because it interferes with their normal sexual function, disrupting the integration process that is influenced by psychogenetic, sex hormonal levels, neurogenetic, and hemodynamic variables (Chen et al., 2019).

Psychological

This is the aspect of mental and emotional wellness that also relates to behaviors (Engel, 2012). The components of mental and emotional health have an effect on behavior and therefore the BPS model fosters psychological support, which builds strong self-esteem and offers social cognitive skills, both of which eventually enhance good quality of life to patients (John et al., 2020). Many factors, including anxiety, depression and eating disorders have been linked to SD in men with type 2 diabetes. However, in this study health status was selected as a factor that evaluates the physical and mental health of men with T2DM while accounting for both biological and psychological aspects.

Health status was employed to explore the effects of behaviors of men with T2DM that influences their self-esteem and cognitive skills which gave a picture to their perceived quality of life in relation to sexual dysfunction (John et al., 2020). Sexual dysfunction in men with T2DM affect them psychologically by brucing their masculinity, feeling less of a man and stressed thus even worsen elevation of blood glucose affects their health status physical and mentally and ultimately poor quality of life (Thongtang & Seesawang, 2020).

Social

The social aspect highlights interpersonal parameters such as interaction with others and community activities and the absence of such interactions with others leads in an overwhelming feeling of seclusion and an imbalanced lifestyle, whether deliberate or not and has an enormous effect on one's ability to socialize (Engel, 2012). A person's ability for meaningful social interaction has a significant impact on how they maintain healthy relationships with loved ones (Litt et al., 2020). Though there are many factors which fall under social domain such as low individual income, illiteracy and lack of access to nutritious food linked to SD in men with type 2 diabetes, couple satisfaction is selected variable in this study to be investigated.

Sexual dysfunction may affect men with T2DM negatively in their relationship satisfaction as they may feel frustrated not intimate with their partners

cause conflicts in the relationships, accusing their partners to be unfaithful and can even lead to divorce (Cooper et al., 2018). This negative impact can even move from couples to affecting family and community relationships as men with T2DM may be isolated and not participate in social activities (Thongtang & Seesawang, 2020).

In summary the BPS model is multi-dimensional, and its key assumptions that provides a useful theory-oriented framework for understanding the various interaction of biopsychosocial processes that shape perception and experiences of sexual functioning and sexual wellbeing within the context of diabetes mellitus (Cooper et al., 2018). It is therefore with the objective to examine factors associated with sexual dysfunction among men with T2DM, the model was chosen to attain a complex relationship among several biological, psychological and social factors that are associated with sexual dysfunction among men with T2DM as elaborated clearly in chosen factors below.

Factors associated to sexual dysfunction among men with Type 2 Diabetes Mellitus

In the literature review all studies have included personal characteristics on sexual dysfunction among men with T2DM and the association has varied and inconsistent showing a relationship between personal characteristics and SD among T2DM men hence included in my study to describe study variables found in Botswana context. According to Biopsychosocial model and literature review, many factors are associated with SD in men with T2DM and they are mainly categorized into biological, psychological and social elements (Copper et al., 2018; Yazdi et al., 2020).

Based on theory, factors related to T2DM were chosen for exploration in this study under the biological domain included age, diabetes duration and HbA1C, under psychological domain factors included health status and finally under social domain is couple satisfaction. The association of these factors among themselves and their interplay association based on their categories is explained as follows.

Age

In the proposed study, age is defined as the period between the date of birth of men with T2DM and the date of study, as measured in solid years using the

patient's medical records or identity card (United Nations, 2018). Age is a significant predictor of SD and epidemiological studies have found a substantial link between SD and rising age (Jumani and Patil, 2020). The age component may be intrinsically related to other factors such as diabetes duration in the biological domain, as well as interconnected to other factors in the psychological or social domain (Bolton and Gillett, 2019).

For example, an elderly man with T2DM having SD associated with long diabetes duration of uncontrolled blood sugar which in turn can affect him psychologically resulting in depression and withdrawal (psychological) hence his partner became sexually dissatisfied (social) (Frankel et al., 2003).

Advanced age has been associated with SD showing T2DM men aged 50-59 years have 3.6 times risk of developing SD as compared to those aged 18-29 years and the risk is even higher 6-7 times among men aged older than 70 years old (Jumani & Patil, 2020). This is related to age-hormonal, metabolic and inflammatory as well as increased prevalence of other risk factors in the older population (Jumani & Patil, 2020).

Age is often associated negatively with SD among men in many studies considering it normal to have SD with the aging process (Chung, 2019). Men with T2DM above 50 years old have an association of 77 % to SD with probability of T2DM men having SD aged above 50 is 11.21 times as higher than men without T2DM under 50 years (odd ratio:11.21, 95% confidence interval: 6.40-19.62) (Bahar et al., 2019). However, in another study older age was not associated with SD in a qualitative study done by Thongtaeng et al. (2022), in northern Thailand whereby 66.7 % of men with SD aged between 40-49 years while those above 50 years was 13.34%.

Therefore, inconsistent results may be due to many factors like different study designs and even sample size hence this could be attributed to the difference in their findings. Studies that found an association of age and sexual dysfunction were quantitative cross-sectional studies and the one that did not find any significant association was qualitative phase of large mixed method study. Therefore, it was important to find clarity of how age is associated with SD in the case of Botswana population since there is varying evidence in different settings.

Diabetic duration

It refers to the time men with T2DM diagnosed by physician following criteria of diagnosis from disease with a high level of blood sugar in the blood counted in years until study date which was found in patient's medical record (WHO, 2022). The longer the duration of T2DM, the higher the risks for more complications of microvascular and macrovascular occur giving a rise to diabetes related SD mostly neurogenic and vasculogenic etiology which is negative relationship (Hurisa & Negera, 2020). There is connection of this variable within biological domain and other domains like psychological and social.

The longer diabetes duration may happen in men with T2DM having uncontrolled blood glucose ($HbA1C > 7\%$) which may result in T2DM men having SD. The interconnection of diabetes duration under biological domain to psychological domain is that patient may have psychological problem like anxiety during sexual activity which can affect their penile erectile and ultimately have couple relationship dissatisfaction which is the social domain (Frankel et al., 2003). In the review study they reported prevalence of SD is three times higher in men with T2DM and within ten years of diagnosis (long diabetes duration), at least half of diabetic patients are thought to be affected by SD (Faselis et al., 2020).

Another study has reported that T2DM men with more than five years of diabetes duration has shown to be three times more likely to experience SD than diabetic men having less than five years' diabetes duration showing statistical significance increased occurrence of SD with each added year of diabetes duration (AOR: 3.5; 95 % CI; $p < .001$) (Hurisa & Negera, 2020).

Despite the previous studies association of SD with diabetes duration among men with T2DM, it was still imperative to explore this association in men with T2DM in Botswana because of many influencing factors like different context, cultural practices and beliefs.

HbA1C

This is a test that measures the average blood glucose in men with T2DM for the past 2-3 months which shows results of glycemic control (Selvin, 2021). In this study HbA1C was defined by the recent results of HbA1C to assess long term glycemic control of men with T2DM which were valid within period of three months

found in patient's medical records (Wang, 2021). The long term of uncontrolled blood glucose is more than 7%. HbA1c is the main culprit of causing SD among men with T2DM which demonstrates negative impact in their health.

The African population has high prevalence of SD due to inadequate /poor control of diabetes hence serious and multifactorial approach is much needed in that continent to manage T2DM-related SD (Shiferaw et al., 2020). The study results have shown T2DM men with HbA1C less than 7 % were less likely to develop ED compared to men with T2DM with HbA1C more than 7 %, although this was not statistically significant (OR:0.93; 95% CI: 0.15-5.91) (Shiferaw et al., 2020).

Another study conducted in South-east of Ethiopia agrees with other previous study reports showing association of 55% uncontrolled blood sugar to prevalence of SD and further stated that poor glycemic control is a risk factor which has shown to worsen with increasing duration of diabetes mellitus (Hurisa & Negera, 2020). However, in Botswana there was a dearth of data about this association and hence it was important to conduct this study and share results to influence policymakers with evidence based to enhance good management of SD in men with T2DM.

Health status

On the psychological domain is health status, which is defined as the perception of men with T2DM regarding their health in terms of function/dysfunction continuum of daily activities performed which can be rated as good or bad both physical and mental (NCHS, 2020). There are very few studies which are done to show the effects of SD among men with T2DM on their health status yet SD negatively affects the quality of life because of difficulty in intimacy causing T2DM men to lose their self-esteem and self-efficacy (Thongtang & Seesawang). SD has a negative effect on the health status of men with T2DM that affect their psychosocial well-being negatively (Thongtang & Seesawang).

SD has been shown to have an interplay impact on the dimensions of physical and social relationships in men with T2DM, leading to feelings of insecurity, lack of freedom, dissatisfaction with the health system (Thongtang & Seesawang, 2020). The emphasis is on patient-centered health care because mental health is a

major problem, necessitating interventions that address both physical and mental health in men with T2DM (Nowakowska et al., 2019).

SD among diabetic population severely impairs their QoL resulting in worse metabolic control and poor therapeutic compliance (Corona et al., 2020). This may negatively affect men with T2DM psychologically by being depressed/stressed and socially isolated from partner, family and even in the community social events resulting in poor QoL (Shiferaw et al., 2020). However, there is a gap in Botswana as there is no published research on how men with T2DM with SD are affected by the condition psychologically hence this study had to be conducted to provide such information.

Physical status

Most men still have a need for intimacy and sexuality of which is directly tied to establishing social relationships, especially with partners and if this is not done, it can lead to isolation leading to emotional depression and eventually affect them psychologically (Gobbens et al., 2019). In their systematic quantitative review, the results of three studies showed a significant association of SD to physical health of men with T2DM (Thongtang & Seesawang, 2020).

The results encountered decline in QoL in overall physical domain posing limitation resulting in stigmatization which ultimately affect patients psychologically (Thongtang & Seesawang, 2020). This is a gap in the context of Botswana as there is limited to non-information regarding effects of physical health on the psychological aspect on men with T2DM having SD hence conducted this study to close the gap.

Mental status

The association of SD and mental health as self-esteem, self-efficacy, anxiety and depression among men with T2DM is undeniable as it has been shown by Thongtang & Seesawang (2020), in their systematic review of many studies. On the psychological domain, men with T2DM related SD scored lower than men with common SD ($p < .002$). The decrease in physical and mental health was associated with severity of T2DM related SD, severe clinical conditions of SD, older age and complications of macro and microvascular (Thongtang & Seesawang, 2020).

The effects of SD on men with T2DM on their mental health has been demonstrated in the study conducted in China that more than three men with diabetes

who also experienced SD had a statistically significant increased risk of mental health issues, such as depression at 64.9%, with an $R^2 = 0.169$ (Xiao et al., 2023).

These results demonstrated a need to conduct a study in Botswana to add more value of knowledge on the subject so that men with T2DM may get appropriate help they long await in silence as the topic is hardly discussed yet they suffer in silence psychologically. There are no published studies done in Botswana on effects of SD among men with T2DM on the mental health/ psychological domain hence it was important to conduct this study.

Couple satisfaction

Couple satisfaction is defined as a true feeling of joy, pleasure and satisfaction experienced by men with T2DM in their relationships (Asadi et al., 2020). T2DM men value emotional and social support provided by their partners to help them cope with the condition as it was expressed by T2DM men in the study conducted in South Africa and Malawi (Cooper et al., 2018). In their study, many T2DM men provided narratives on how their female partners provided support by preparing diabetic meals, encouraging them to exercise and to timely take their medication regularly (Cooper et al., 2018).

The couple's dissatisfaction has a negative impact on the psychological well-being of individuals and that might reduce sexual desire as the link between SD and couple satisfaction is interplayed to put it simply results in poor sexual desire and performance (Mekonnen et al., 2021). Their results showed couples satisfaction with their partners (AOR= 0.15, 95% CI, 0.03-0.704) which means they are less likely to have SD than those unsatisfied with their partners (Mekonnen et al., 2021).

Consequently, it is essential for T2DM men to have a fulfilling relationship in order to enhance their sexual relationships as well as to preserve their mental, emotional and physical health (Mekonnen et al., 2021). In a systematic review, Kurpisz et al. (2017), found that partners' attitudes towards sexual activity were satisfying when $p < 0.05$, as was the quality of their relationship. In order to empower stakeholders and enable healthcare practitioners manage SD in men with T2DM appropriately, it was necessary to conduct research to add more evidence-based practices to the nursing and research fields. There was a need to investigate couple

satisfaction among men with T2DM who have SD because the available data is limited to nonexistent in Botswana.

Conclusion

According to literature review, men with T2DM who experience SD frequently have negative psychological effects and poor health status as their sexual performance declines, as well as relational mistrust, general despair, and fear of losing their partner's support (Shiferaw et al., 2020). However, some of these negative effects can be mitigated with good illness management. For example, different studies have suggested that lifestyle modifications, such as diet, exercise and weight loss, quitting smoking, couple counselling and proper glycaemic control through nutrition can improve sexual function in roughly one-third of T2DM men with SD (Shiferaw et al., 2020).

In their study Shiferaw et al. (2020), it pointed out that numerous primary research conducted in Africa demonstrate the severity of SD, notably erectile dysfunction, as a public health concern in the continent. Additionally, recognizing these factors may assist healthcare professionals in managing T2DM men with SD throughout the course of their treatment (Thongtang & Seesawang, 2020). However, there were differences between this research. Drawing from the entire review of literature, it was essential to examine factors associated with SD among men with T2DM in the context of Botswana due to cultural and socioeconomic disparities.

Even though few studies have been done in places like Botswana, more than 90% of those studies have focused on erectile dysfunction, which has been verified to predominantly impact men with T2DM. This current study therefore focused on the prevalence of all types of SD among men with T2DM in Botswana, rather than only the prevalence of ED as it is just type of SD. Studies on the prevalence of SD and factors associated with SD among men with T2DM have not been done before in Botswana, as a result there was scarcity of empirical data on this subject. This study has filled in this informational gap and determined the need for further research to explore and combine the pertinent variables linked to SD among men with T2DM in Botswana.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter presents the methodology of the study including study design, study setting, population, sample, sample size, sample recruitment, instruments, quality of instruments, human subject protection, data collection procedure and data analysis.

Study Design

A descriptive correlational design was used in this study to investigate factors associated with sexual dysfunction among men with T2DM at Block 6 clinic, Gaborone, Botswana.

Study Setting

The study was done in Block 6 clinic, which is in an area known as Block 6, Bonington South on the outskirts of greater Gaborone, Botswana's capital city on one of the key roads that connects the A7 route to the country's northwest. According to the Central Statistics Office of Botswana (2022), preliminary census data suggest that the population in the capital city of Gaborone is 244,107 individuals, which is the highest and most diversified population by district. Gaborone has 16 outpatient clinics, 11 of which are open eight hours a day and five of which are open twenty-four hours.

In addition, Gaborone has a diabetes specialised clinic in Block 6, which serves the bulk of diabetic patients. The study location Block 6 clinic was purposefully chosen by the researcher because it is the epicentre of excellence for diabetes, where men with T2DM were easily accessible. The clinic employs health professionals who are experienced and trained in diabetes mellitus and can give diabetes care to patients with both Type 1 and Type 2 diabetes. The clinic offers physician consultation, health education such as dietary counselling, diabetes self-management, eye and foot screening, laboratory testing and medication adherence counselling and issuance (Rwegerera et al., 2021).

The clinic's team consists of two physicians, two medical officers, a head nurse, six registered nurses, one ophthalmic nurse, two laboratory technicians, three pharmacy technicians and three lay counsellors who oversee providing diabetes management treatment to patients. The Ministry of Health has designated this clinic as a diabetes specialist facility. The clinic is in one of Gaborone's suburban neighbourhoods, Block 6 in Bonington South on one of the key routes connecting to the A7 route in the country's northwest.

In 2022 an average 1,100 T2DM patients were seen at Block 6 Clinic, of these 425 (38.6%) were men with T2DM per month. In a day about 20-21 men who are diagnosed with T2DM comprised of both repeat and new cases among them were attended to at the clinic (Block 6 clinic statistics, 2020). However, the statistics on sexual dysfunction (SD) of these men was unavailable. The reason could be that nurses and physicians do not assess for SD in these patients or that patients do not share or report it, therefore this presents a gap which this study filled.

Population and sample

Population

The target population of the proposed study was men with T2DM in Gaborone, Botswana who sought care at Block 6 clinic during the period of the study. Additionally, in 2022 an average of 425 (38.6%) men with T2DM were attended to at Block 6 Clinic monthly, with 20-21 men being seen daily which was a mixture of both new and repeat cases (Block 6 Clinic Statistics, 2022).

Sample

The sample was composed of men with T2DM who come to Block 6 clinic for diabetes services and met the following criteria:

Inclusion criteria:

1. Age 35 years of age to 75 years
2. T2DM diagnosis identified on patient's medical record before the recruitment date in the past 5 years.
3. Was sexually active in the last 3 months
4. No mental illness (which was documented on patient medical cards)
5. No disabilities such as blindness or hearing loss, paralysis or weakness

6. If there were co-morbidities, it was in stable condition

7. Be able to understand, read and write in Setswana (official language of Botswana)

Sample size

The sample size was determined using G*Power set at Pearson r correlation effect size (small) = 0.20, power 0.80, tail=2 tailed, alpha = 0.05 and yielded sample size of 193. The sample size was increased by 10 participants catering for possible outliers of which 3 outliers identified during analysis and were deleted then settled for a sample size of 200 which was good in analysis of normal distribution.

Participant recruitment

The simple random technique (no repeated sample participants) was used to recruit the sample, make more representative, unbiased and generalization of the findings of the population.

1. The Block 6 clinic nurse reviewed the register of bookings every day at Block 6 clinic and picked up the men who would be attended to that day and then gave the list to the researcher after having asked for permission from patients to take part in the study.

2. To avoid using the participants' names each participant was assigned a unique study identification number which was used to code the questionnaires for confidentiality purposes.

3. Only the primary investigator accessed the coding sheet that corresponds with the participants' names. The participants were provided with questionnaires that bear their unique identification number.

4. Researcher wrote those numbers on small pieces of paper, folded them, and put them in a bowl.

5. She then randomly selects, using the replacement method of those participating in the study for fair equal chance.

6. The potential participants were then approached individually, where the researcher and research assistant introduced themselves.

7. Information about the study was then shared by the researcher and research assistant with the potential participants, using the recruitment script about the main purpose of the study, that participation is voluntary.

8. The potential participants were given enough time to think through after information shared to make informed decisions and be comfortable to partake in study.

9. The potential participants were informed that they could only participate after signing off the consent form.

10. They were informed that the decision is voluntary and that there was no remuneration for taking part in the study, they can quit anytime they want but that decision would not affect services they came for.

11. They were assured that their line for the service they came for was secured to allay anxiety on their time that they took for study. All those that met the inclusion criteria took part in the study until the sample size was met.

Research Instruments

There were four instruments which were used in this study including the demographic information questionnaire, Short Form-12 (SF-12), Couple Satisfaction Questionnaire (CSQ-4) and Changes in Sexual Functioning Questionnaire (CSFQ-14). The researcher got permission to use all instruments from the developers.

The demographic information questionnaire

Demographic questionnaire is a self-report developed by the researcher aimed to describe the study sample regarding personal characteristics it includes:

1) General information: age, marital status, level of education, smoking cigarette, drinking alcohol and socio-economic status. Self-reporting was used to measure these characteristics.

2) Health information: this includes diabetes duration, glycemic control (HbA1C), BMI, comorbidities, diabetic medications and any traditional medicine, T2DM complications. This information was derived from patient's medical records.

The Short Form-12 v2 (SF-12 vs 2)

Health status was assessed using the Short Form-12 (SF-12) as a revised version of the original SF-36 which was developed by Ware, Kosinski and Keller (1996), for health outcomes from the patient's perspective. It is a multi-purpose generic health status questionnaire, consisting of 12 items that measure 8 health

domains under 2 subscales being physical and mental health. The questionnaire was validated across a variety of chronic diseases/conditions.

The 4 domains under physical health are general health, physical functioning, role physical and body pain. Mental health domain has vitality, social functioning, role emotional and mental health. To calculate the scores of the scale it was by summing up total scores from both subscales of which each has total score of 50, total is 100 hence scores range from 0 to 100. The higher the score indicates better physical and mental health functioning, that is score of 42 or less on the mental health domain may be indicative of depression while a score of 50 or less on the physical health domain has been recommended as a cut-off to determine a physical condition (Soh et al., 2021).

SF-12 items scores could be reversed if they have low scores in order for the higher item value to indicate better health. The 4 items which can be reversed are item 1, item 8, item 9 and item 10. Reliability of physical health domain is at Cronbach alpha 0.79, mental health domain is at Cronbach alpha 0.85 (Ibrahim et al., 2020) while the validity under physical domain is Cronbach alpha 0.74, mental health domain is Cronbach alpha 0.70 (Haddad et al., 2021).

The Couple Satisfaction Index - (CSI-4)

Couple relationship satisfaction was assessed by using The Couple Satisfaction Index - 4 (CSI-4), a self-reporting instrument which has 4 items derived from original version (CSI-32). Funk and Rogge (2007) created this instrument to improve the accuracy of measuring relationship satisfaction using the Couples Satisfaction Index CSI-4. The scale uses the 6 Likert scale with scores ranging from 0-5 on items 2, 3 and 4 while a 7-Likert scale with scores ranging from 0-6 is on item 1.

The scoring of the CSI-4, the responses to all 4 items were simply added up together to determine the CSI-4 total score, the scores range from zero (0) to twenty-one (21) point totals for every response to each question (Funk and Rogge, 2007). The higher score indicates a higher level of relationship satisfaction. The scores falling below 13.5 suggested notable relationship dissatisfaction (Funk and Rogge, 2007). The psychometric properties of the CSI-4 are at Cronbach alpha coefficient 0.85 (Omani- Samani et al., 2018).

The Changes in Sexual Function Questionnaire M-C (CSFQ-14)

Sexual dysfunction was assessed using Changes in Sexual Function Questionnaire (CSFQ-14) which was developed by Clayton et al. (2002). The CSFQ-14 is a revised short form version of the original CSFQ-36. The tool was initially created in response to patient reports of sexual dysfunction and sexual adverse effects of psychiatric drugs with the goal of helping patients receiving therapy at an outpatient psychiatric clinic identify and treat sexual dysfunction (Clayton et al., 2002).

The tool has 14 items which yields the scores for 3 scales corresponding to phases of sexual response cycle being sexual desire (item 2, 3, 4, 5 & 6), arousal (item 7, 8 & 9) and orgasm (item 11, 12 & 13). The tool uses 5-point Likert scales. To calculate the scores of the CSFQ you add up all the values of responses for 14 items and for calculating subscales scores, add up responses only in each subscale. If the male patient has a total CSFQ score of 47 or below stated cut off points in any of the following subscales, it is an indication of sexual dysfunction (Clayton et al., 2002).

The total CSFQ score range from 14-70 and cut off point is 47. Sexual desire ranges from 5-25, cut off point is 19 arousal/excitement range from 3-15, cut off point is 13 and sexual orgasm/completion range from 3-15, cut off point is 13 (Clayton et al., 2002). The scale has demonstrated good internal consistency in male version of Cronbach's alpha of .89 which is good reliable psychometric property which was used in proposed study (Clayton et al., 2002).

Psychometric properties of instruments

All instruments used in this study got permission from the developers. They were tested and validated by the experts in some previous studies, which meant all instruments had good validities. Before the actual data collection, the internal consistency reliability was carried out to test the reliability of the instruments. The Cronbach's alpha was used to determine the reliability of each instrument with 30 men with T2DM, who had the same characteristics as the sample of the study. The Cronbach's alpha (the tryout) of each instrument was accepted (more than .80), therefore, no revision was performed for each instrument. Table 1 presents reliabilities of all instruments of the tryout and the main study.

Table 1 Reliability test for instruments

Instruments	Try out (n = 30)	Main study (n =200)
SF 12	.96	.95
CSI-4	.85	.89
CSFQ-14	.82	.90

Human Subjects Protection

Ethical approval was sought from the Burapha University Review Board (BUU IRB) (G-HS 100/2566) and from Botswana Ministry of Health (HPRD:6/14/1). The researcher explained the study objectives, study procedure, safety and benefits of the study to the participants before getting their consent. The participants were assured of their right to refuse participation in the study or withdraw at any time from the study, and they were assured that despite their irrespective decision they were still going to receive the health care services they came for. Confidentiality, privacy and anonymity was assured regarding participants' personal information. The data was kept in a secured place and was only used for purposes of this study, no names were disclosed, and the results of the study were reported as group data instead of individualized.

Data Collection

Since this study focused on a private and sensitive topic related to sexual health problems and to control errors or threat to study validity, the researcher trained a male research assistant to collect data. The male research assistant is an associate degree, well experienced and familiar to research system, has worked with so many researchers at university of Botswana, other African and American researchers and is still doing that. The researcher trained him, briefed him on objectives of the study, issues of informed consent, confidentiality and detail of all instruments used. Had a return demonstration practical after training to ensure that he understood the importance of closely following the procedures and had the knowledge and skills necessary for research. Also ensured proper understanding to training, the researcher ran a trial out with the research assistant to make sure no errors or differences

occurred between the researcher and research assistant in data collection procedure for accurate results. Data collection procedure of the study was done by the researcher and research assistant as follows:

1. Submission of proposal to Burapha University IRB approval Faculty of Nursing by researcher.
2. The researcher got approval permission from BUU IRB faculty of Nursing to collect data at Block 6 clinic, Gaborone Botswana.
3. The approval from BUU IRB was taken to Human Research and Development Committee (HRDC) in the Ministry of Health to seek permission to conduct the study in Botswana.
4. Permission to conduct the study was granted by MOH and Princess Marina Hospital permission to carry out the study at Block 6 clinic which is in their jurisdiction.
5. The researcher and research assistant met with the nurse-in charge of Block 6 clinic, explained the purpose of the study, the data collection procedure and was then permitted audience with clinic staff for the purpose of explaining the study to everyone thus facilitating data collection procedures.
6. The researcher and research assistant went to the clinic for data collection every Monday to Friday from 07:30 am to 16:30 pm.
7. Using the simple random selection, participants who met inclusion criteria were recruited at the registration point with the help of Block 6 clinic nurse every morning as they awaited consultation.
8. The researcher and research assistant invited the participants to an allocated private room to introduce themselves, shed details on the purpose of the study, explained human rights protection, safety, confidentiality and the right to withdraw or participation.
9. The researcher obtained informed consent from participants before data collection. The assurance to keep in line for consultation was granted to minimize anxiety and potentially miss line.
10. The researcher received data from participants through self-reported questionnaires in the private room allocated. Reading glasses were provided for those

who had challenged sight. It took an estimated time of 20-30 minutes to complete all questions in the questionnaires.

11. An envelope was provided to participants to place filled questionnaires then sealed off to ensure confidentiality of their information.

12. Validation of completeness of questionnaires was ensured by thorough explanation of how to complete questionnaires.

13. The researcher then entered the data into a computer spreadsheet for data analysis.

14. Data was collected for a period of six weeks and had 100% participation.

Data Analysis

Data was fed into the Statistical Package of Social Sciences-26, the alpha level was set at .05.

1. Descriptive statistics such as the measures of central tendency (mean, mode, median) dispersion (standard deviation), frequencies and percentages were used to describe demographic variables, age, diabetes duration, HbA1C, health status, couple satisfaction, and sexual dysfunction.

2. Pearson *r* correlation were used to examine associations between the selected variables-age, diabetes duration, HbA1C, health status and couple satisfaction- with sexual dysfunction

3. Multiple regression analysis was performed to examine whether factors including age, diabetes duration, HbA1C, health status and couple satisfaction together could predict sexual dysfunction among men with T2DM in Gaborone, Botswana.

Before conducting the multiple regression analysis, the assumptions testing for multiple regression was performed. According to Fan et al. (2021), testing for assumptions of multiple regression were as follows:

1. Data was from a random representative sample
2. Sample size large enough ($n = 200$)
3. Univariate and multivariate and had no outliers
4. Data normally distributed, linear
5. No autocorrelation and no multicollinearity

6. Both variables were on interval or ratio



CHAPTER 4

RESULTS

This chapter presents data analysis results. The purposes of this study were to assess the prevalence of SD and to examine associations between selected factors including age, health status, diabetes duration, HbA1C and couple satisfaction with SD among men with T2DM in Botswana. The results of the study are presented as follows:

1. Description of the demographic characteristics and health information.
2. Description of dependent and independent variables.
3. Factors associated with SD among men with T2DM in Botswana.

Description of demographic characteristics and health information

Demographic characteristics

The study had a total of 200 men with T2DM coming for their scheduled appointments for diabetes in Block 6 clinic Gaborone, Botswana recruited for this study. The age of participants ranges from 35 years old to 70 years old with a mean age of 54 years and SD = 9.39. Most of the age fall in Late adult (50-60 years) at 38%, followed by middle adult (35-49 years) at 32 % and lastly elderly (61-70 years) at 30%. A larger proportion of marriage status falls under married at 60% followed by single at 34%. Level of education: 33 % have done tertiary education, followed by 21 % who did junior school education, 20.5 % did primary education while 15% have done senior school education and lastly no education at 10.5%. For individual income the majority of 35 % have no income followed by 28.5% earning 11000 pula or more being high income, 20.5% middle income earning 5,000-11,000 pula and lastly the minimum wage at 16 % earning 1,500 pula. 18% of participants drink alcohol, another 18 % are former alcohol drinkers and 5.5 % smoke cigarettes currently while 13.5 % are former cigarette smokers, smoking duration maxim 30 years and no smoking duration 5-10 years. Table 2 shows more detailed demographic characteristics.

Table 2 Demographic characteristics of participants (n =200)

Characteristics	Frequency	Percentage
Age (M= 54.01, SD =9.391, Min =35, Max= 70)		
Middle adult (35-49 years)	64	32.0
Late adult (50-60 years)	76	38.0
Elderly (61-70 years)	60	30.0
Marital status		
Single	68	34.0
Married	120	60.0
Divorce	7	3.5
Widowed	5	2.5
Education level		
None	21	10.5
Primary	41	20.5
Secondary	42	21.0
High school	30	15.0
Higher education	66	33.0
Individual income (1pula = 0.07 \$ US)		
None	70	35.0
< 1,500 pula	32	16.0
5,000-11,0000 pula	41	20.5
> 11,000 pula	57	28.5
Drink Alcohol		
Currently alcohol drinker	36	18.0
Former alcohol drinker	36	18.0
No history of alcohol	128	64.0
Alcohol duration (Min = 1, Max= 30, M =2.86, SD= 5.99)		
Never	128	64.0
1-5 years	53	26.5
6-10 years	3	1.5
>10 years	16	8.0

Table 2 (Continued)

Characteristics	Frequency	Percent
Smoke Cigarette		
Currently smoker	11	5.5
Former smoker	27	13.5
No history of smoking	162	81.0
Smoking duration (Min=1, Max=30, M=1.00, SD=4.17)		
Never	161	80.5
1-5 years	32	16.0
> 10 years	7	3.5

Health information

A larger portion of 66.5% have diabetes mellitus for duration periods of 5-10 years and only 6% have 20 or more years with T2DM. The mean score of DM duration is (M =10.29, SD =5.30) with actual score ranging from 5-23 years. The glycemic control status by HbA1c within 3 months of test showed 64.5% of the participants has HbA1c of equal to more than 8% indication of high or uncontrolled blood glucose. 28 % of participants have moderate blood glucose control of 7-7.9% while only 7.5 % of them have controlled blood glucose. HbA1c results show the mean score of (M =10.20, SD = 3.09) and the actual scores ranging from 5.5 % -19.2 %. A total of 59.5 % have never been admitted to hospital due to T2DM while 17 % of them have been admitted due to T2DM in the past 2-3 years and only 6.5 % of them have been admitted within a period of 1 year. A total high percentage of 91% of participants have comorbidities and only 9 % of participants have no comorbidity. Hypertension is leading in comorbidities at 52.8 %, followed by other comorbidities (gout, arthritis, hypothyroidism, HIV) at 28.6 %, 16.4 % had heart disease and lastly renal disease at 2.2 %. Participants who had diabetes-related complications are at 64.5% and 35.5 % of them do not have diabetes-related complications. Diabetic neuropathy leading at 46.5 %, followed by those who have both neuropathy and retinopathy at 31 %, followed by retinopathy only at 20.2 % and nephropathy at 2.3 %. Participants taking oral medication only was 54%, insulin only was 10 % and

those on combined therapy was 36 %. The health information was presented in table 3.

Table 3 Frequency, percentage, mean, standard deviation of health information of participants (n=200)

Characteristics	Frequency	Percentage
Last admission		
Never	119	59.5
<1 year	13	6.5
2-3 years	34	17.0
4-5 years	10	5.0
> 5 years	24	12.0
DM duration in years (M=10.29, SD=5.295, Min=5, Max=23)		
5-10 years	133	66.5
11-15 years	31	15.5
16-20 years	24	12.0
>20 years	12	6.0
HbA1c (M= 10.204, SD=3.089, MIN=5.5, MAX=19.2)		
<7	15	7.5
7-7.9	56	28.0
> 8	129	64.5

Table 3 (Continued)

Characteristics	Frequency	Percentage
Comorbidities		
No	18	9
Yes	182	91
Hypertension	96	52.8
Renal disease	4	2.2
Heart disease	30	16.4
Others (gout, arthritis, HIV)	52	28.6
Diabetes-related complications		
No	71	35.5
Yes	129	64.5
Neuropathy	60	46.5
Retinopathy	26	20.2
Neuropathy + Retinopathy	40	31.0
Nephropathy	3	2.3
Diabetic medication		
Oral medication	108	54.0
Insulin	20	10.0
Both oral medication and insulin	72	36.0

Description of dependent (DV) and independent variables (IV)

The study variables were sexual dysfunction, age, diabetes duration, HbA1c, health status and couple satisfaction. Sexual dysfunction, being dependent variable, was measured by CSFQ-14 which has three subscales being desire, arousal and orgasm. Sexual dysfunction cut-off point is 47, for the subscales, desire cut-off point is 19, both arousal and orgasm the cut-off points is 13. Scores of sexual dysfunctions and its subscales were presented in Table 4 and the prevalence of sexual dysfunction was illustrated in Table 5.

Table 4 shows the total score of CSFQ-14, results ranges from 21-59 out of 70 and the mean score is (M= 42.34, SD=8.49). For the subscales being the desire has mean (M =14.86, SD =3.12), the arousal have mean score of (M= 9.18, SD = 2.58) and the mean score for orgasm is (M= 9.27, SD =2.38).

Table 4 Range, mean and standard deviation of sexual dysfunction (n=200)

Sexual dysfunction & subscales	Range		M	SD
	Possible scores	Actual scores		
Total SD	14-70	21-59	42.34	8.49
Desire	5-25	7-22	14.86	3.12
Arousal	3-15	3-14	9.18	2.58
Orgasm	3-15	3-13	9.27	2.38

Table 5 Prevalence of sexual dysfunction in men with T2DM (n=200)

Sexual dysfunction	Yes	No
	n (%)	n (%)
Overall SD	140 (70)	60 (30)
Desire	178 (89)	22 (11)
Arousal	198 (99)	2 (1)
Orgasm	200 (100)	-

Table 5 shows total prevalence of SD at 70 % and prevalence of SD according to subscales are: desire disorder at 89 %, arousal disorder at 99 % and orgasm disorder at 100%.

Table 6 showed the scores of couple satisfaction and health status among men with T2DM. The results showed that the mean score of couple satisfaction was 13.50 (SD = 3.02). While the mean score of overall health status was 38.78 (SD = 3.52). Considering subscales of the health status, the mean score of physical health was 18.82, (SD = 2.14) and the mean score of mental health was 19.80 (SD = 2.14). In addition, the overall scores of health status and its subscales reflected that the participants had low health status.

Table 6 Range, Mean and standard deviation of variables (n=200)

Variables	Ranges		M	SD
	Possible score	Actual score		
Couple satisfaction	0-21	7-19	13.50	3.02
Health status	0-100	30-46	38.78	3.52
Physical health	0-50	14-23	18.82	2.14
Mental health	0-50	12-24	19.80	2.14

Factors associated with sexual dysfunction among men with type 2 diabetes mellitus in Botswana.

The preliminary analysis was performed to test multiple Regression assumptions which are normality of variables, outliers, linear relationship, multicollinearity and homoscedasticity. The normal distribution was tested through the histogram showing 0 curve, skewness and kurtosis of which at least one variable met those tests. All the variables were tested for outliers using the Boxplot and the results showed no outliers in all variables. The assumption of linearity and homoscedasticity was tested and the scatter plot residuals showed that it was met. The study variables have shown a linear relationship between the dependent variable and independent variables. Table 6 showed the degree of relationships among independent

variables and the dependent variable which had relationships less than .8, which meant there was no multicollinearity. In conclusion, all assumptions were met.

Table 7 illustrates the correlation of variables. There was a strong positive statistically significant correlation between SD and age ($r = .547, p < .001$). There was moderate positive statistically significant correlation between SD and diabetic duration ($r = .375, p < .001$). There was positive correlation between SD and couple satisfaction statistically significant ($r = .189, p .007$). There is no statistically significant correlation between SD and HbA1c ($r = .067, p > .05$) There is a negative correlation between SD and health status statistically significant ($r = -.235, p < .001$).

Table 7 Correlation matrix among study variables (n = 200)

	SD	AG	DD	HB	CS	HS
SD	1					
AG	.547**	1				
DD	.375**	.374**	1			
HbA1c	.067	-.066	0.022	1		
CS	.189**	.009	.031	.090	1	
HS	-.235**	-.303**	-.121	-.089	-.071	1

Note: Correlation is significant at the 0.01 level (2-tailed).

Abbreviations: Sexual dysfunction = SD, Age = AG, Diabetic duration = DD, HbA1c =HB, Couple satisfaction = CS, Health status = HS

Table 8 Summary of regression analysis for variables predicting sexual dysfunction among men with type 2 diabetes mellitus (n=200)

Predicting variables	B	SE	β	T	p-value
DM duration	.262	.086	.176	3.057	.003
HbA1c	2.425	.703	.187	3.448	.001
Health Status	.256	.053	.285	4.806	<.001
Couple satisfaction	1.672	.568	.162	2.942	.004
Age	3.144	.528	.370	5.959	<.001
Constant = 12.234, $R^2 = .451$, Adjusted $R^2 = .437$, $F = 31.690$, $p < .001$					

Table 8 illustrates results from multiple regression analysis on predicting sexual dysfunction among men with Type 2 Diabetes Mellitus. A multiple linear regression analysis was conducted to examine the extent to which selected variables—duration of diabetes mellitus (DM), HbA1c levels, health status, couple satisfaction, and age—predict sexual dysfunction in men diagnosed with type 2 diabetes mellitus (n = 200).

The overall model was statistically significant, $F(5, 194) = 31.690$, $p < .001$, and explained approximately 43.7% of the variance in sexual dysfunction ($R^2 = .451$, Adjusted $R^2 = .437$). Among the predictors, age emerged as the strongest predictor ($\beta = .370$, $t = 5.959$, $p < .001$), followed by health status ($\beta = .285$, $t = 4.806$, $p < .001$), HbA1c levels ($\beta = .187$, $t = 3.448$, $p = .001$), duration of DM ($\beta = .176$, $t = 3.057$, $p = .003$), and couple satisfaction ($\beta = .162$, $t = 2.942$, $p = .004$). All variables were statistically significant predictors of sexual dysfunction.

These findings indicate that poorer glycemic control, longer duration of diabetes, declining health status, lower couple satisfaction, and increased age are associated with higher levels of sexual dysfunction among men with type 2 diabetes.

CHAPTER 5

CONCLUSION AND DISCUSSIONS

This chapter presents the summary and discussion of the study findings. The implications of the findings, recommendations for future research and conclusion are also presented in this chapter.

Summary of findings

This study was carried out to assess the prevalence of SD and to examine associations between selected factors including age, health status, diabetes duration, HbA1C and couple satisfaction with SD among men with T2DM in Botswana. The study was guided by the Biopsychosocial Model (BPS) which was first conceptualized by George Engel in 1977 and literature review on SD among men with T2DM. A total of 200 men with T2DM were recruited by simple random sampling method while coming for their scheduled review of DM at Block 6 clinic Gaborone, Botswana. Data was collected using self-report questionnaires including the demographic and health data questionnaire, the Short Form-12 (SF-12) (Ware, Kosinski and Keller, 1996), the Couple satisfaction Index (CSI-4) (Funk and Rogge, 2007) and the Changes in Sexual Function Questionnaire (CSFQ-14) (Clayton et al., 2002). The Cronbach alpha of SF-12, CSI-4 and CSFQ-14 were .95, .854 and .823 respectively.

The mean age of participants was 54 years, and a dominating age group fell in late adult (50-60 years) at 38%, followed by middle adult (35-49 years) at 32 % and lastly elderly (61-70 years) at 30%. Results showed that 35 % of participants had no income and low income. The study findings indicated alcohol consumption, including present and past, was 36%, with a maximum duration of 30 years and 91 % of participants had comorbidities. The most common comorbidity was hypertension at 52.8 % followed by other conditions (gout, arthritis, thyroid, HIV) at 28.6%. Furthermore, the study's findings revealed complications of T2DM at 64.5% of which some participants had more than one complication, neuropathy leading at 46.5 %.

The results indicated a high prevalence of SD (70%) and SD according to the subscales are: desire disorder at 89 %, arousal disorder at 99 % and orgasm disorder at 100 %.

Results from multiple regression analysis demonstrated that age, diabetic duration, HbA1c, health status and couple satisfaction are all statistically significant predict of SD in men with T2DM. All variables together explained 43.7 % of the variance in SD. Among the predictors, age was the strongest predictor ($\beta = .370$, $t = 5.959$, $p < .001$), followed by health status ($\beta = .285$, $t = 4.806$, $p < .001$), HbA1c levels ($\beta = .187$, $t = 3.448$, $p = .001$), duration of DM ($\beta = .176$, $t = 3.057$, $p = .003$), and couple satisfaction ($\beta = .162$, $t = 2.942$, $p = .004$).

Discussion

Sexual dysfunction among men with type 2 diabetes mellitus in

Botswana

Sexual dysfunction is a great concern globally among men with T2DM, this study aimed to assess the prevalence and factors associated sexual dysfunction among men with T2DM. The results could be discussed as follows:

The findings illustrated a high prevalence of SD at 70 % and prevalence of SD according to subscales showed desire disorder at 89 %, arousal disorder at 99 % and orgasm disorder at 100%. This means that participants had high desire disorder that is lack of sexual thoughts which results in inability to get aroused to engage in sexual activity and ultimately having delay or no orgasm during sexual activity.

The findings of no income and low-income among participants was at 35 % which is a predisposing factor to non-affordability and non-adherence of diabetic diet which is a bit expensive in Botswana thus may results in SD due to complication of uncontrolled blood glucose. Study results showed current and history of alcohol intake at 36 % with maximum duration of 30 years that is a high risk for SD because it reduces blood flow to penis and testosterone production (Alrumaihi et al., 2024). The study results indicated 91 % of participants had comorbidities, the highest prevalent comorbidity being hypertension at 52.8 % which is a risk factor of atherosclerosis which might affect penile arteries (Al-kuraishy et al., 2020). Results of this study also revealed complications of T2DM at 64.5% of which some participants

had more than one, neuropathy leading at 46.5 % a culprit causing SD among men with T2DM, followed by those who have both neuropathy and retinopathy at 31%.

The findings of this study are in congruence with the Biopsychosocial model in the biological domain since it considers the body's biological responses to illness, which are linked to the relationship between illness (T2DM) and physical health (Engel, 2012). The biological component of the study under consideration is T2DM, a condition in which chronically elevated blood glucose destroys neurons and blood arteries, leading to insufficient blood flow to the penis and ultimately causes SD (Defeudis et al., 2021). The high prevalence of SD in this study was also supported by demographic characteristics that fall under the biological domain. This showed negative biological impact on men with T2DM because it interferes with their normal sexual function and disrupts the integration process, which is influenced by psychogenetic, sex hormone levels, neurogenetic and hemodynamic factors.

The results are consistent with the findings of previous study which was conducted in Africa-Ethiopia of which the total prevalence of SD is 69.5% while this study is at 70 % even though they did not have some same characteristics. The prevalence of SD in Ethiopia according to types has been reported as: orgasm disorder leading at 99.5%, erectile disorder 99.3%, desire 91.8 %, pain disorder 42% and pleasure disorder 52.4 % and close to half suffered more than one type of SD (Mekonnen et al., 2021). In the study conducted in Ethiopia the instrument employed was the same used in this study being changes in sexual function questionnaire (CSFQ-14) which was developed to assess medication and illnesses related to SD.

Factors associated with sexual dysfunction among men with type 2 diabetes mellitus in Botswana.

The study findings showed that age, diabetic duration, HbA1c, health status and couple satisfaction are all statistically significant predictors of SD in men with T2DM. All variables together could explain 43.7 % of variance in SD among men with T2DM. The discussion of the study findings is as follows.

Age

Age factor has a mean score of 54.01 (SD = 9.39). A statistically significant positive chance ($B = 3.144$, $P < 0.05$) has been found between SD and age. Meaning that in one-year increase the chance of SD for every one-year rise in age at 3.144. Age

is the biggest contributing factor for the eventuality of SD in this study at .370 according to standardized Coefficient measurements that are helpful for ranking the predictor variables, regardless of sign, depending on how much they contribute to the outcome variable's explanation.

Age is often associated negatively with SD among men in many studies considering it normal to have SD with aging process (Chung, 2019). Age which was examined in the biological domain under the direction of the Biopsychosocial model, the results support the theory that age is strongly associated with SD. This suggests that as men with T2DM age, their natural decline in testosterone production in the biological domain occurs, leading to SD (Barone et al., 2022). Skeletal muscle mass and strength decline with age and bone mineral density, cardiovascular risk rises and the glucometabolic profile changes resulting in restricted amount of blood supply to sexual organs, consequently, lack of sensation and SD occur (Barone et al., 2022).

The current study results also corroborate with previous studies which showed high prevalence of SD among advancing age, in Ethiopia the highest prevalence of SD in their study was found in ages above 50 years at 43% (Mekonnen et al., 2021). In northern Iran men with T2DM above 50 years old have an association of 77 % to SD (Bahar et al., 2019). Advanced age has also been associated with SD showing T2DM men aged 50- 59 years have 3.6 times risk of developing sexual dysfunction as compared to those aged 18-29 years (Jumani & Patil, 2020).

Diabetic duration

The study findings showed DM duration mean score at 10.29, (SD = 5.30) and indicated positive statistical significance between diabetes duration and SD ($B = .262$, $P < 0.05$). This means that in one year increase diabetes duration have an effect increasing SD by .262. Diabetes duration is the fourth significant predictor of SD in this study at (.176) according to standardized Coefficient measurements, which are helpful in ranking predictor variables, regardless of sign, based on how much they contribute to the outcome variable's explanation.

Under guidance of the biopsychosocial model, the diabetes duration factor was investigated within the biological domain. The results of the study aligned with the model which indicates that a longer diabetes duration is associated with incidence of microvascular and macrovascular complications

which in turn leads to diabetes-related SD, primarily of neurogenic and vasculogenic etiology (Hurisa & Negera, 2020). The study results are also consistent with a study conducted in Ethiopia that T2DM men with more than five years of diabetes duration has shown to be three times more likely to experience SD than diabetic men having less than five years diabetes duration (Hurisa & Negera, 2020). A review study conducted by Faselis et al. (2020), reported prevalence of SD to be three times higher in men with T2DM and within ten years of diagnosis (long diabetes duration) at least half of diabetic patients are thought to be affected by sexual dysfunction.

HbA1c

The HbA1c results of this study indicate the mean score being 10.20, (SD = 3.09) of which the results are indicative of poor glycaemic control. There was a positive statistical significance between SD and HbA1c at ($B = 2.425$, $P < 0.05$). This suggests that every unit increase in HbA1c predicts a 2.425 rise of SD in men with T2DM. The HbA1c is the third important predictor of SD in this study at (.187) utilizing standardized Coefficient measures on how much they contribute to the outcome variable's explanation.

HbA1c was examined under the biological domain of this study guided by the Biopsychosocial model. The study's findings are consistent with the model which suggests that a high HbA1c is associated with high prevalence of SD because long-term hyperglycemia lowers sperm quality during spermatogenesis which may lead to SD (Chen, 2019). A study conducted in South-east of Ethiopia showing association of 55% uncontrolled blood sugar to prevalence of SD (Hurisa & Negera, 2020). Another study which was a review by Shiferaw et al. (2020), has highlighted the African population having high prevalence of SD due to inadequate or poor control of diabetes, results have shown T2DM men with $HbA1C < 7\%$ were less likely to develop ED compared to men with T2DM with $HbA1C \geq 7\%$.

Health status

The results of this study indicated that health status has a mean value of 38.78 (SD = 3.52). For the subscales of health status being physical health results are ($M=18.82$, $SD=2.14$) and mental health ($M=19.80$, $SD=2.14$) of which the results are suggestive of overall poor health status. The model predicts that men

with T2DM who have poor health status have a greater possibility of SD by ($B = .256, P < 0.05$). Notwithstanding their sign, standardized coefficients are useful for rating the predictor variables based on their relative contribution to the explanation of the outcome variable. Health status is the study's second contributing factor at .285 to SD among men with T2DM.

In this study, health status was assessed within the psychological domain relating to thoughts, feelings, and behaviors under the direction of the biopsychosocial model. The outcomes complement the concept of the model since it highlights social cognitive skills and psychological support for patients to develop high self-esteem, both of which eventually improve their quality of life. The study which highlighted similar results that SD among diabetic population severely impairs their quality of life resulting in worse metabolic control and poor therapeutic compliance was conducted by Corona et al. (2020). A review study done in Thailand also revealed that high-quality studies reported diabetic erectile dysfunction had a negative impact on QoL on T2DM men with increased severity of ED correlating with a lower QoL. The results encountered decline in quality of life in overall health status posing limitation resulting in stigmatization which ultimately affects patients psychologically (Thongtang & Seesawang, 2020).

Couple satisfaction

The results of the study showed the mean for couple satisfaction was 13.50, ($SD = 3.02$) of which is below cut off point of 13.5 at 52% suggestive of couple dissatisfaction. The results showed positive statistical significance between men with T2DM who have couple dissatisfaction are more probable to experience SD at ($B = 1.672, P < 0.05$).

This study used the biopsychosocial model to investigate couple satisfaction in the social domain which encompasses personal interactions with others, cultural influences and economic factors that may impact an individual's health (Engel, 2012). Couple dissatisfaction triggers stress and the release of stress hormone (cortisol) which exacerbates elevation of blood glucose levels of which long-term hyperglycemia lowers sperm quality during spermatogenesis and also in the vascular system there is restricted amount of blood supply to sexual organs, consequently, lack of sensation and SD occur (Chen, 2019). It is evident that an individual's ability to

engage in meaningful social interactions significantly affects their ability to maintain healthy relationships with their loved ones (Engel, 2012).

Consequently, the study results support the notion that couple dissatisfaction is related to SD, aligning with the principles of the Biopsychosocial model. The results of this study also are in corroborate with the study done by Mekonnen et al. (2021) at Ethiopia revealing that couple dissatisfaction has a negative impact on the psychological well-being of individuals and that might reduce sexual desire as the link between SD and relationship satisfaction is interplayed to put it simply results in poor sexual desire and performance.

In summary, the results of this study showed a significant association between selected factors and SD also in congruence with the BPS model which is multi-dimensional and has key assumptions that provide a useful theory-oriented framework for understanding the various interactions of biopsychosocial (Engel, 2012). These processes shape perceptions and experiences of sexual functioning and sexual wellbeing within the context of T2DM. It is significant to highlight the study results that men with T2DM in Botswana experiencing SD have negative psychological effects from poor mental health status when their sexual performance declines, which ultimately results in couple dissatisfaction, which indicates an interplay of factors amongst them. However, some of these detrimental effects can be minimized with good illness management, such as diet, exercise, weight loss, quitting smoking, counselling, and proper glycemic control through nutrition, and this can enhance sexual function in T2DM men with SD.

Strengths and Limitations of the study

The aims of this study were to assess the prevalence and factors associated with SD among men with T2DM. The study was conducted in the diabetes Centre of excellence Block 6 clinic ensuring reliable data and good sample size. Given the sensitivity of the topic, a private room was assigned to the clinic, and participants were given self-administered questionnaires that complemented their independence and confidentiality. The study ensured valid data collection through the use of standardized instruments and potential methods to remove bias from the recruiting process. The methodological choices were limited because there was no documented

research on this topic conducted in Botswana, despite the fact that the technique employed was unable to effectively represent the real-world experiences of SD in men with T2DM. For this reason, a methodology must be selected and used to lay the groundwork (quantitative method and cross-sectional).

Implications of study findings

According to this study findings, SD prevalence is 70% among men with T2DM in Botswana which is a concern as SD has negative impact in the lives of men with T2DM. The SD was significantly associated with age, diabetes duration, health status and couple satisfaction while it was not significant with HbA1c yet positive. Undeniably the experience of sexual difficulties is a central concern of men living with DM and these difficulties go beyond biomedical issues of SD, comprising complex psychological and relational effects (Cooper et al., 2018). The impact of SD on the biopsychosocial domains in men with T2DM is a challenge as it affects their QoL of which may even go to national level whereby these patients became unproductive at work effecting economy of the country (Elterman et al., 2021). The stress caused by SD exacerbates elevation of blood glucose level though cortisol production leading to more ailments, complications, more rehospitalization thus more burden and costly to health system affecting the country's economy (Cooper et al., 2018).

Therefore, the concerning results call for improving care in Botswana recommend nursing practice to actively have encouraging conversations on behavioral and personal changes. Health care providers in Block 6 clinic advocate for proper management of SD and for them to have an institution health policy and standard of operation procedures (SOP) on management of SD since they are diabetes mellitus Center of excellence who are expected to better manage DM and its complications wholistically. Block 6 clinic management have to advocate for their own health personnel in the field of psychiatry/psychology and social worker who will be oriented fully to DM and its complications like SD, the impact they have to men with T2DM so that they can manage them accordingly.

Nurses should actively encourage involvement of patient's partners/family (support system) in good glycemic control which is crucial and

other healthy behaviors to avoid and minimize various diabetic complications by involving them in continuous health educations and update on progress of diabetes management. Health care providers must properly refer for couple counseling to psychiatric/psychologist as it is important to lessen couple dissatisfaction and stresses which is experienced by men with T2DM. It is plausible to conclude that sustaining strong relationships is critical for an individual's mental, emotional and physical well-being, as well as improving their reproductive health.

Nursing practice

The study results showed a high prevalence of SD by 70% and indicated that SD was significantly associated with age, diabetes duration, health status and couple satisfaction while it was not significant with HbA1c yet positive. The results should enable nurses in Block 6 clinic to collaborate with other health care workers to make institutional policy to better manage SD among men with T2DM. They should also have glycemic control interventions, manage the psychological trauma and social factors posed by SD among men with T2DM thus referrals for counselling either to psychiatrists/psychologists or social workers who are acquainted with SD. Nurses should also health educate/counsel T2DM men regarding the associated factors like age, HbA1c, DM duration, health status and couple satisfaction to SD to help them understand and enjoy life within their limitations imposed by SD to improve their health status and eventually their QoL will be improved.

Nursing research

This study is a pioneer on this research top in Botswana; it has set a foundation of knowing prevalence of SD and factors associated to SD among men with T2DM in Botswana. For further studies the same research can be done in other areas of Botswana to endorse findings which will improve generalization of SD among men with T2DM in Botswana. Also, further studies can be done including other factors associated with SD and include another diabetes population being women with T2DM in Botswana. Other studies can be done by nurses with other health care workers in Block 6 like doctors and pharmacist to carry out intervention studies on treatment of SD among men with T2DM so as to have evidenced based information as regard to having own institution policy on

management of SD among men with T2DM. This study methodology did not depict experiences lived by T2DM men with SD hence a need to explore the experiences using qualitative method. A furthermore study can be conducted to examine the cause and effect of SD among men with T2DM after the intervention research is done.



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APPENDIX



APPENDIX A

Questionnaires in English version

1.The Demographic Questionnaire

Direction: Please carefully read the questions in part 1 and give honest answer. Part 2 answers will be collected from medical record by researcher. Please tick “√” in the box of answer or write in provided space.

Part 1: Personal Profile (To be completed by participant)

1. Age: _____
2. Marital Status:

☐ Single	☐ Married
☐ Divorce	☐ Widowed
3. Level of Education:

☐ None	☐ Primary	☐ Junior school
☐ Senior school	☐ Tertiary	
4. Individual income:

☐ None	☐ <1500
☐ P5000-11 000	☐ >P11 000
5. Do you drink alcohol

☐ Currently alcohol drinker, duration.....years
☐ Former alcohol drinker, duration.....years
☐ No history of drinking alcohol
6. Do you smoke cigarette

☐ Currently smoker, duration.....years
☐ Former smoker, duration.....years
☐ No history of smoking

Part 2: Health Information (to be collected from patient's records by researcher)

1. Diabetes duration: years
2. Glycemic control (HbA1C).....%, (date:)
3. Last admission due to T2DM (if applicable):
4. Comorbidities:

☐ None	☐ Hypertension	☐ Heart disease
☐ Renal diseases	☐ Others (specify).....	
5. T2DM complications:

☐ None	☐ Neuropathy
☐ Nephropathy	☐ Retinopathy
☐ Others.....please specify	
6. Diabetic medications:
 - i) ☐ Oral medications

☐ Metformin fequency/day).....
☐ Glibenclamide (dose and frequency/day)
☐ Other (specify) (dose and frequency/day).....
 - ii) ☐ Insulin
Specify(dose and frequency/day)

2. Short Form Survey (Sf-12)

Direction: The following topic is to gather understanding on your perception regarding your health in terms of the function/dysfunction continuum, based on your daily life activity performance. Please choose the answer that best describe your best perception when answering questions. Tick “√” in the answer box provided.

1. In general, would you say

☐

Excellent

Very Good

Good

☐

Fair

Poor

The following two questions are about activities you might do during a typical day.

Does your health now limit you in these activities? if so, how much

2. Moderate activities,

.....

	Yes, Limited a lot	Yes, Limited a Little	No, Not Limited at all
a) Moderate activities such as			
b) Climbing several			

3. During the past week, how much of the time have you had any of the following problems with your work or other regular activities as a result of your physical health?

	All the time	Most of the time	Some of the time	A little of the time	None of the time
Accomplished less than					
Were limited in the kind					

4. During the past week, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	All the time	Most of the time	Some of the time	A little of the time	None of the time
Accomplished less than					
Did work or other activities					

5. During the past week, how much did pain interfere

- ☐ Not At All
 ☐ A Little Bit
 ☐ Moderately
☐ Quite A Bit
 ☐ Extremely

6. The questions are about how you feel and how things have been with you during the past week. For each question, please give the one answer that comes closest to the way you have been feeling. how much of the time during the past week...

	All the time	Most of the time	Some of the time	A little of the time	None of the time
Have you felt					
Did you					
Have you felt					

7. During the past week, how much of the time has

.....

- ☐ All of the time
 ☐ Most of the time
☐ Some of the time
 ☐ A Little of the time
☐ None of the time

3. Couple satisfaction Index-4 (CSI-4)

Direction: The following topic seeks to understand your true feelings of joy, pleasure and satisfaction you experience in your relationship. Please answer the questions with honesty by tick “√” in the correspondence box provided which best describe your true feelings.

1. Please indicate

Extremely unhappy	Fairly unhappy	A little unhappy	happy	Very happy	Extremely happy
0	1	2	3	4	5

2. I have a warm

Not at all true	A little true	Somewhat true	Mostly true	Almost completely true	Completely
0	1	2	3	4	5

3. How rewarding

Not at all true	A little true	Somewhat true	Mostly true	Almost completely true	Completely
0	1	2	3	4	5

4. In general, how

Not at all true	A little true	Somewhat true	Mostly true	Almost completely true	Completely
0	1	2	3	4	5

4. Changes in Sexual Function Questionnaire-14 (CSFQ-14)

Direction: The following statements ask to assess existence/presence of sexual dysfunction you might experience. Please answer the questions in an honest way that best describes your experience by “√” tick in the answer box provided

1. Compared with the most enjoyable it has ever.....

- | | | |
|--------------------------|-----------------------------|------------------------------|
| ☐ | No enjoyment or pleasure | Little enjoyment or pleasure |
| ☐ | Some enjoyment | Much enjoyment or pleasure |
| ☐ | Great enjoyment or pleasure | |

	Never	Rarely (≤ 1month	Sometimes(≥ 1-2 month)	Often (> 2 a week)	Everyday
2.How frequently do you					
3.How often do you					
4. How frequently					
5. Do you enjoy					

6. How much pleasure or enjoyment do

.....

☐ No enjoyment or pleasure Little enjoyment or pleasure

☐ Some enjoyment or pleas Much enjoyment or pleasure

☐ Great enjoyment or pleasure

7. How often do you have.....

☐ Never Rarely (once a month or less)

☐ Sometimes (more than once a month, up to twice a week)

☐ Often (more than twice a week) Everyday

	Never	Rarely (<halftim e)	Sometim es (halftime)	Often (<halftim e)	Alwa ys
8.Do you get					
9.Are you able to					
10.how often do you					
11.How often do					
12.Are you able to					

13. How much pleasure

- | | |
|--|------------------------------|
| ☐ No enjoyment or pleasure | Little enjoyment or pleasure |
| ☐ Some enjoyment or pleasure | Much enjoyment or pleasure |
| ☐ Great enjoyment or pleasure | |

14. How often do you

- | | |
|---|--------------------------------|
| ☐ Never | Rarely (once a month or less). |
| ☐ Sometimes (more than once a month, up to twice a week) | |
| ☐ Often (more than twice a week) | Every day |



APPENDIX B

Permission letters



NON-COMMERCIAL LICENSE AGREEMENT

Office of Grants and Scholarly Research (OGSR)

License Number: QUO-03175-W0H2K0

Licensee Name: Gaagakwe Ramaologa c/o Burapha University

Licensee Address: 169 Long Had Bangsaen Rd, Chon Buri District, Bangkok 20131, TH

Approved Purpose:

Purpose: Academic Publication Submission

Study Name: Factors associated with sexual dysfunction among males with type 2 diabetes mellitus

Study Type: Academic Research with no commercial funding

Survey Admin Method: Self Reported Paper CRF

Data Collection Workflow: Captured using QualityMetric Desktop Software

Therapeutic Area: Reproduction and Sexual Health

Indication: Impotence

Royalty Fee: None, because this License is granted in support of the non-commercial Approved

License Term: 9/7/2023 and ending on 4/30/2024

A. Effective Date: This Non-Commercial License Agreement (the "Agreement") from the Office of Grants and Scholarly Research (OGSR) is made by and between QualityMetric Incorporated, LLC, a Delaware limited liability company, with offices at 1301 Atwood Avenue, Suite 216E, Johnston, RI 02919 dba QualityMetric ("QualityMetric") and Licensee. This Agreement is entered into as of the date of last signature below and is effective for the Study Term set forth on page one of this agreement.

B. Appendices: Capitalized terms used in this Agreement shall have the meanings assigned to them in Appendix A, Appendix B and Appendix D. Licensee agrees the study information completed on Appendix D – Project details form (Questionnaire) is for non-commercial use. The appendices attached hereto are incorporated into and made a part of this Agreement for all purposes.

C. Grant of License: Subject to the terms of this Agreement, QualityMetric Incorporated, LLC grants to Licensee a non-exclusive, non-transferable, non-sublicensable worldwide license to use, solely for the Approved Purpose and during the Study Term. The Licensed Surveys, Software, SMS Scoring Solution, and all intellectual property rights related thereto ("Survey Materials"), in the authorized Data Collection Method, Modes of Administration, and Approved Languages indicated on Appendix B; and to administer the Licensed Surveys only up to the total number of Administrations (and to make up to such number of exact reproductions of the Licensed Surveys necessary to support such Administrations) in any combination of the specific Licensed Surveys and Approved Languages, Data Collection Method, and Modes of Administration.

D. Electronic Signature: The parties agree that execution of this Agreement by e-Signatures (as defined below) shall have the same legal force and effect as the exchange of original signatures.

Pursuant to this Agreement, e-Signatures shall mean a signature that consists of one or more letters, characters, numbers or other symbols in digital form incorporated in, attached to or associated with the electronic document, that (a) is unique to the person making the signature; (b) the technology or process used to make the signature is under the sole control of the person making the signature; (c) the technology or process can be used to identify the person using the technology or process; and (d) the electronic signature can be linked with an electronic document in such a way that it can be used to determine whether the electronic document has been changed since the electronic signature was incorporated in, attached to or associated with the electronic document.

Filename: Burapha University-Gaagakwe Ramaologa-SLA QUO-03175-W0H2K0

Page 1 of 13

Template: MLA – 18Aug20



EXECUTED by the duly authorized representatives as set forth below.

QualityMetric Incorporated, LLC

Signature: *Gus Gardner*
Electronically signed by: Gus Gardner
Reason: I have reviewed this document and
to the best of my knowledge, it is complete
and accurate.
Date: Sep 26, 2023 10:57:02Z
Name: Gus Gardner
Title: CEO
Date: 26-Sep-2023

**Gaogakwe Ramaologa c/o Burapha University
Burapha University**

Signature: *Burapha*
Name: Gaogakwe Ramaologa
Title: Student Master of Nursing Science
Date: 21 September 2023

QualityMetric Incorporated, LLC Reviewer

Signature: *Maria Williams*
Electronically signed by: Maria Williams
Reason: I have reviewed this document
and, to the best of my knowledge, it is
complete and accurate.
Date: Sep 26, 2023 09:11:00Z
Name: Maria Williams
Title: Client Success Representative
Date: 26-Sep-2023

COPYRIGHT LICENSE

This license agreement (hereinafter "Agreement") is made by and between Anita H. Clayton, M.D. ("Licensor") residing in Gordonsville, Virginia and Gaogakwe Ramaologa ("Licensee"), a _Burapha University student [corporation][limited liability company], with its principle place of business at Thailand .

WHEREAS Licensor is the owner of all right, title and interest in and to the specific work known to the parties as the "Changes in Sexual Functioning Questionnaire", attached hereto as Appendix A ("Work"), including all rights under copyright law in the United States, and desires to grant Licensee the right to exploit the Work subject to the terms and conditions of this Agreement; and

WHEREAS Licensee desires to receive said license under the terms and conditions set forth in this Agreement.

For the mutual promises exchanged herein, it is therefore agreed:

1. Definition of Terms

1.1 For the purposes of this Agreement the "Changes in Sexual Functioning Questionnaire- male clinical version" and the "Changes in Sexual Functioning Questionnaire- female clinical version", both short and long forms, and all accompanying instructions and documentation for completing and scoring shall be collectively referred to as the "Work".

2. Fees

2.1 In consideration for the rights and license granted to Licensee hereunder, Licensee shall pay to Licensor a discounted one-time fee of Fifty Dollars (50 USD) ("License Fee") upon execution of this Agreement. The License Fee must be paid prior to any use or exploitation of the Work; failure to make said royalty payment (i) within ninety (90) days of the Effective Date of this Agreement or (ii) prior to any use, reproduction, or exploitation of the Work, whichever comes first, shall be considered a material breach of this Agreement. Licensee shall not be entitled to any credit or return of the License Fee even if the Work is not used by Licensee in said Clinical Trial regardless of the reason for such non-use.

3. License and Rights Granted

3.1 Licensor hereby grants to Licensee a non-exclusive, non-transferable, worldwide license to use the Work in accordance with this Section 3 during the term specified herein.

3.2 Licensor grants the Licensee the right to use and exploit the Work in order to conduct the clinical study No.1 entitled: **_Factors associated with sexual dysfunction among men with type 2 diabetes mellitus** (hereinafter "Clinical Trial"), including the right to reproduce the Work in

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4. Term

4.1 The term of this Agreement ("Term") shall be for the duration of said Clinical Trial plus such time as is necessary in order to compile any necessary data from said Clinical Trial, with such license extending until the "lockdown", as that term is generally understood in the research community, of the Clinical Trial database; however, in no event shall the Term extend beyond 30 May 2024.

4.2 In addition to any other rights and remedies provided by law or under this Agreement, Licensor may terminate this Agreement by providing written notice to Licensee if Licensee fails to comply with any material provision of this Agreement.

5. Ownership and Credit

5.1 Licensee acknowledges and agrees that the Work is the property of Licensor and that this Agreement grants Licensee no title or right of ownership in the Work.

5.2 Licensee will acknowledge Licensor's ownership of the Work on all reproductions, publications, and displays of the Work, including all electronic versions, with the following credit line: "Reproduced with permission of Anita H. Clayton, M.D."

6. Miscellaneous

6.1 EXCEPT AS EXPRESSLY PROVIDED IN THIS AGREEMENT, LICENSOR MAKES NO WARRANTIES, EXPRESS OR IMPLIED, REGARDING THE WORK OR ANY OF THE CONTENT THEREIN, INCLUDING, BUT NOT LIMITED TO, THE RESPECTIVE QUALITY, PERFORMANCE, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OF THE WORK AND ALL SUCH WARRANTIES ARE HEREBY DISCLAIMED. FURTHER, LICENSEE ASSUMES ALL LIABILITY AND RESPONSIBILITY FOR, AND RELEASES AND DISCHARGES LICENSOR FROM, ANY AND ALL CLAIMS, ACTIONS, CAUSES OF ACTION, SUITS, AND DAMAGES, FROM ALL PARTIES, INCLUDING THIRD PARTIES, THAT ARISE FROM OR INVOLVE THE USE OF THE WORK AS A DIAGNOSTIC OR EVALUATIVE TOOL OR AID IN THE CLINICAL TRIAL.

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____ (Licensor) _ (Licensee)

AHC  G.R.

6.2 Neither party to this Agreement shall have the right to assign the Agreement without the prior written consent of the other party.

6.3 This is the complete Agreement regarding this subject matter; no amendments shall be made except in writing signed or otherwise accepted by both parties. Whenever possible, each provision of this Agreement shall be interpreted so that it is effective and valid under applicable law. All provisions in this Agreement are severable and if any provision or provisions of this Agreement or any application thereof shall be held to be invalid or unenforceable for any reason, the validity and enforceability of the other provisions shall in no way be affected thereby.

6.4 Interpretation and enforcement of this Agreement shall be governed by the laws of the Commonwealth of Virginia, without regard to its choice of law provisions. Any and all disputes or actions arising out of this Agreement or involving the License or the Work (collectively "Actions") shall be brought and litigated in the Circuit Court for the City of Charlottesville and/or the U.S. District Court for the Western District of Virginia (both collectively "Courts") and the Courts shall have exclusive jurisdiction over such Actions. All parties consent to personal jurisdiction in the Courts and waive all objection(s) to personal jurisdiction and venue for Actions in the Courts.

6.5 This Agreement shall take effect ("Effective Date") at such time that Licensor receives a signed and executed copy of said Agreement from Licensee and Licensor countersigns and executes the Agreement.

IN WITNESS WHEREOF, the parties hereto agree to the above terms:

Gaogakwe Ramaologa (Licensee) Date 22/09/2023

AH Clayton, MD

Anita H. Clayton,
M.D. (Licensor) Date

By: _____ Title: student

PLEASE BE CERTAIN TO INITIAL EACH PAGE

3

(Licensor) (Licensee)

September 26, 2023

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APPENDIX C

Participants information sheet and consent form



Participant Information Sheet

Research protocol code: G-HS 100/2566

Research Title: Factors associated with sexual dysfunction among men with type 2 diabetes mellitus in Botswana

Dear participants

I am Mrs. Gaogakwe Ramaologa, a graduate student from the Faculty of Nursing at Burapha University, Thailand. My research title is “Factors associated with sexual dysfunction among men with type 2 diabetes mellitus in Botswana”. The purpose of this study is to assess the prevalence of sexual dysfunction and its associated factors in men with Type 2 Diabetes mellitus (T2DM) in Botswana.

This study is conducted on a voluntary basis and upon agreement to take part, participants will be required to answer questionnaires which will approximately take 20 to 30 minutes. No direct benefits/ no monetary or compensations will be derived from this study participation, however, the data collected from this study may be useful in the development of policy and interventions that can assist health facilities and healthcare professionals in providing advanced and quality care to men with Type 2 Diabetes mellitus. No physical risks anticipated for participants, and no harm or risks to society will be incurred during this study.

The potential minor social and psychological risks like discomfort to talk about sexual dysfunction will be curbed by presence of male research assistant to answer private questions. Data collection will be done in an allocated private room within the clinic for privacy. . Participants who are not coping well, depressed and anxious will be referred for interventions through the existing channels of the clinic. For example, they can be referred to social worker in the clinic for counselling. Participants will also be assured that their line for the service they came for will be secured to allay anxiety on their time that they will take for study. No direct benefits/ no monetary or compensations will be derived from this study participation. There will be no expenses incurred by participants since they will be recruited while coming for their usual routine check-ups for their diabetes mellitus.

Participation in this study can be terminated at any given time without being required to notify the researcher. The quality of services provided by the Block 6 clinic is unaffected by the decision taken by participants. All data collected from the study, including the participant's identity, shall be kept private and confidential and a

code number shall be assigned to the participant. Your name shall not be used in the presentation of findings from the study. Any personal information of participants shall not be made public. All data shall be accessible solely to the researcher, who shall destroy the data one year after the completion of the study after publication.

Upon completion of the study, further details regarding its nature will be communicated to you. Also after completion of the study, you may request a more detailed explanation of the subject matter you are free to do so. The study will be conducted by Mrs. Gaogakwe Ramaologa, under the guidance of major advisor Assistant Professor Dr. Khemadee Masingboon. Should you have any queries, please do not hesitate to contact me by telephone at +267 72206361, or via email wmmandu@gmail.com. You may also contact Burapha University Institutional Review Board Office, Burapha University (Division of Research and Innovation), Tel. +66 38-102620 email buuethics@buu.ac.th. You will be given a copy of this consent form to keep.

Gaogakwe Ramaologa





Consent Form

Research Code: G-HS 100/2566.....

(Given by the Research Ethics Committee at Research and Innovation Administration Division, Burapha University)

Research Title: FACTORS ASSOCIATED WITH SEXUAL DYSFUNCTION AMONG MEN WITH TYPE 2 DIABETES MELLITUS IN BOTSWANA

Date 11 Month October Year 2023

Before signing the consent form for this research participation, I was provided the information about the purposes and the processes of the research in the participant information sheet, which the researcher has given to me. I have fully understood the preceding explanation and the researcher has undertaken to answer my questions willingly and without concealment to my satisfaction.

I voluntarily agree to participate in this research project. I understand I can withdraw from the research project at any time without giving a reason, without it affecting any benefits that I am entitled to.

I have been given the explicit guarantees that my information and identity will be kept confidential and will be shared only in the summary of research results. Disclosure of my information to the relevant authorities requires my permission.

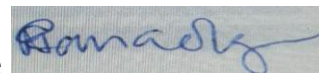
I have read and fully understood the above statements in all respects and have signed this consent document willingly.

In the case that I cannot read or write, the researcher has read the statement in the consent form to me until I fully understand it well. Therefore, I willingly signed or stamped my thumb on this consent form.

Participant's signature

(.....)

Researcher's signature



(Gaogakwe Ramaologa)

Note: If the participant gave thumbprint as their consent, witness signature will be needed.





APPENDIX D

Ethical approval



บันทึกข้อความ

ส่วนงาน กองบริหารการวิจัยและนวัตกรรม งานมาตรฐานและจริยธรรมในงานวิจัย โทร. ๒๖๒๐

ที่ อว ๘๑๐๐/๐๐๓๔๕

วันที่ ๘ กุมภาพันธ์ พ.ศ. ๒๕๖๗

เรื่อง ขอส่งเอกสารรับรองผลการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา

เรียน คณะบดีคณะพยาบาลศาสตร์

ตามที่นิสิตระดับบัณฑิตศึกษาในหน่วยงานของท่าน ได้ยื่นเอกสารคำร้องเพื่อขอรับการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา สำหรับโครงการวิจัย ระดับบัณฑิตศึกษา ชุดที่ ๓ (กลุ่มคลินิก/ วิทยาศาสตร์สุขภาพ/ วิทยาศาสตร์และเทคโนโลยี) รหัสโครงการวิจัย G-HS 100/2566 โครงการวิจัย เรื่อง FACTORS ASSOCIATED WITH SEXUAL DYSFUNCTION AMONG MEN WITH TYPE 2 DIABETES MELLITUS IN BOTSWANA โดยมี MRS.GAOGAKWE RAMAOLOGA เป็นหัวหน้าโครงการวิจัย นั้น

บัดนี้ โครงการวิจัยดังกล่าว ได้ผ่านการพิจารณาจากคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา สำหรับโครงการวิจัย ระดับบัณฑิตศึกษา ชุดที่ ๓ (กลุ่มคลินิก/ วิทยาศาสตร์สุขภาพ/ วิทยาศาสตร์และเทคโนโลยี) เป็นที่เรียบร้อยแล้ว กองบริหารการวิจัยและนวัตกรรม ในฐานะผู้ประสานงาน จึงขอส่งเอกสารรับรองผลการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา จำนวน ๑ ฉบับ (หมายเลขใบรับรองที่ IRB3-008/2567) มายังท่าน เพื่อแจ้งนิสิตระดับบัณฑิตศึกษาที่มีรายชื่อข้างต้น ดำเนินการโครงการวิจัยต่อไป โดยห้ามมิให้ เบี่ยงเบนรายละเอียดต่าง ๆ ของโครงการวิจัยที่ยื่นมาขอรับการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา และเมื่อมีนิตินิติดำเนินการวิจัยเสร็จเรียบร้อยแล้ว ขอให้แจ้งปิดโครงการวิจัย (Final Report) มายังคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา ด้วย

จึงเรียนมาเพื่อโปรดแจ้งให้นิตินิติ ทราบ จะขอบคุณยิ่ง

เรียน คณะบดี

๑. เพื่อโปรดทราบ

๒. เชิญสรรหากรรมการจริยธรรม (คุณณณิธร) ทราบ

เพื่อดำเนินการส่วนที่เกี่ยวข้องต่อไป

สุภาวิณี ๑๒ ก.พ. ๖๗

(ผู้ช่วยศาสตราจารย์ แพทย์หญิงมร. แยมประทุม)

ประธานคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา

สำหรับโครงการวิจัยระดับบัณฑิตศึกษา

ชุดที่ ๓ (กลุ่มคลินิก/ วิทยาศาสตร์สุขภาพ/ วิทยาศาสตร์และเทคโนโลยี)

หมายเหตุ : ผู้วิจัยสามารถดาวน์โหลดเอกสารชี้แจงเข้าร่วมโครงการวิจัย เอกสารแสดงความยินยอมของผู้เข้าร่วมโครงการวิจัย และเอกสารเครื่องมือที่ใช้ในการวิจัยต่างๆ ซึ่งผ่านการประทับตรารับรองเรียบร้อยแล้ว ได้ที่ระบบการขอรับพิจารณาจริยธรรมการวิจัยแบบออนไลน์ (BUU Ethics Submission Online) เพื่อนำไปใช้ในการเก็บข้อมูลจริงจากผู้เข้าร่วมโครงการวิจัยต่อไป



Certificate Number IRB3-008/2567

Certificate of Human Research Approval
Burapha University

BUU Ethics Committee for Human Research has considered the following research protocol:

Protocol Code: G-HS 100/2566

Protocol Title: FACTORS ASSOCIATED WITH SEXUAL DYSFUNCTION AMONG MEN WITH TYPE 2 DIABETES MELLITUS IN BOTSWANA

Principal Investigator: MRS.GAOGAKWE RAMAOLGA

Affiliation: Faculty of Nursing

Principal Advisor (Independent Study, Thesis, Dissertation):

Assistant Professor Dr. Khemaradee Masingboon **Affiliation:** Faculty of Nursing

Principal Co-advisor (Independent Study, Thesis, Dissertation):

Associate Professor Dr. Niphawan Samartkit **Affiliation:** Faculty of Nursing

Review Method: ☐ Exemption ☐ Expedited ☒ Full board

BUU Ethics Committee for Human Research has considered the following research protocol according to the ethical principles of human research in which the researchers respect human's right and honor, do not violate right and safety, and do no harms to the research participants.

Therefore, the research protocol is approved (See attached)

1. Form of Human Research Protocol Submission	Version 2: 5 January 2024
2. Research Protocol	Version 1: 19 October 2023
3. Participant Information Sheet	Version 2: 29 December 2023
4. Informed Consent Form	Version 2: 18 December 2023
5. Research Instruments	Version 1: 19 October 2023
6. Others (if any)	Version -: -

Approval Date: 12 January 2024

Valid Date: 12 January 2025

Sign

(Assistant. Professor Ramorn Yampratoom)

Chair of The Burapha University Institutional Review Board
Panel 3 (Clinic / Health Science / Science and Technology)

****Remark: This approval has the following details****

All researchers receiving this certificate of approval must comply with the following conditions:

1. Follow the protocol identified in the research project strictly. Only use documents that are approved and stamped by Burapha University Ethics Committee, such as the Participant Information Sheet (AF 06-02), Consent Form (AF 06-03), Interview protocol, survey, and other related documents (e.g., invitation advertisement to participate in the research project).
2. Submit the Progress Report Form (AF 09-01) to Burapha University Ethics Committee based on the expected timeline or upon request.
3. The certificate of approval lasts one year after Burapha University Ethics Committee agrees to approve the protocol. If the researchers cannot complete the research project within one year, they can extend the approval 30 days before it expires (indicated in this certificate of approval).
4. Suppose there are modifications, such as changing the principal investigator, adding co-investigators, changing the research protocol, or correcting wordings. In that case, the researchers must submit an Amendment Form (AF 08-01) to Burapha University Ethics Committee. The form must indicate the protocol code, details, and reasons for modifications. If the researchers want to add a new investigator, please attach his/her signed and dated CV.
5. Report any Serious Adverse Event (SAE) (AF 10-01) to the participants as indicated in the Standard Operating Procedures (SOP).
6. Report any Study Termination Memorandum (AF 12-01) with written explanations about causes and reasons for terminating the protocol.
7. Submit Non-compliance / Protocol Deviation / Protocol Violation Report (AF 13-01) to Burapha University Ethics Committee and sponsors as soon as receiving complaints of non-compliance.
8. When completing the research protocols, submit the final report (AF 11-01) to Burapha University Ethics Committee within 30 days after completing the protocols.

TELEPHONE: 363 2500
FAX: 317 0155
TELEGRAMS: RABONGAKA
TELEX: 2818 CARE BD



Republic of Botswana

MINISTRY OF HEALTH
PRIVATE BAG 0038
GABORONE

REFERENCE NO: HPRD: 6/14/1

08th March 2024

Health Research and Development Division

Notification of IRB Review: **New application**

Gaogakwe Ramaologa
PO Box 129
Kanye

Dear Gaogakwe Ramaologa

**Protocol Title: FACTORS ASSOCIATED WITH SEXUAL DYSFUNCTION
AMONG MEN WITH TYPE 2 DIABETES MELLITUS IN BOTSWANA**

Review Type: Expedited/ Health Research Development Division
Review Date: 04th March 2024
Approval Date: 08th March 2024
Effective Date: 08th March 2024
Expiration Date: 07th March 2025
Risk Determination: Minimal risk

Thank you for submitting new application for the above referenced protocol. The permission is granted to conduct the study.

This permit does not however give you authority to collect data from the selected sites without prior approval from the management. Consent from the identified individuals should be obtained where applicable.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health within 3 months of completion of the study. Approval is for academic fulfillment only. Copies should also be submitted to all other relevant authorities.

Continuing Review

In order to continue work on this study (including data analysis) beyond the expiry date, submit a Continuing Review Form for Approval at least three (3) months prior to the protocol's expiration date. The Continuing Review Form can be obtained from the Health Research Division Office (HRDD), Office No. 7A.7 or Ministry of Health

the Health Research Division Office (HRDD), Office No. 7A.7 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from HRDD office, e-mail address: hhealthresearch@gov.bw or botshealthresearch@gmail.com. As a courtesy, the HRDD will send you a reminder email about eight (8) weeks before the lapse date, but failure to receive it does not affect your responsibility to submit a timely Continuing Report form.

Amendments

During the approval period, if you propose any change to the protocol such as its funding source, recruiting materials, or consent documents, you must seek HRDC approval before implementing it. Please summarize the proposed change and the rationale for it in the amendment form available from the Health Research Division Office (HRDD), Office No. 7A 7 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from HRDD Office, e-mail address: hhealthresearch@gov.bw or botshealthresearch@gmail.com. In addition submit a copy of an updated version of your original protocol application showing all proposed changes in bold or "track changes".

Reporting

Other events which must be reported promptly in writing to the HRDC include:

- Suspension or termination of the protocol by you or the grantor
- Unexpected problems involving risk to subjects or others
- Adverse events, including unanticipated or anticipated but severe physical harm to subjects.

If you have any questions please do not hesitate to contact Mr. Abia Sebaka at asebaka@gov.bw, Tel +267-3632754 and Mr. K. Motlhanka at kgmmotlhanka@gov.bw, Tel +267-3632751. Thank you for your cooperation and your commitment to the protection of human subjects in research.

Yours sincerely


Mr. Kgomo Motlhanka
for /PERMANENT SECRETARY



Vision: A Healthy Nation by 2023.
Values: Botho, Equity, Timeliness, Customer Focus, Teamwork, Accountability.





TELEPHONE: 3621400 FAX: 3973776

PLOT NO. 1836 HOSPITAL WAY

RE: PMH 2/11AII (370)

Gaogakwe Ramaologa

P O Box 129 Kanye

20th March 2024

REPUBLIC OF BOTSWANA

RESEARCH APPROVAL: FACTORS ASSOCIATED WITH SEXUAL DYSFUNCTION AMONG MEN WITH TYPE 2 DIABETES MELLITUS IN BLOCK 6 GABORONE BOTSWANA

This letter is to inform you that Princess Marina Hospital Ethics and Research Committee has reviewed your and approved your above-mentioned protocol. The approval period is 20th March 2024–20th March 2025.

This approval is subject to compliance with the following requirements:

1. All changes of amendments, deviations, violations of your protocol are to be submitted for review again and approval by Princess Marina Hospital Ethics and Research Committee before implementation.
2. Only approved documents like informed consents, questionnaires and materials submitted with the protocol will be used.
3. Researcher must not change any aspect of the research without permission from the Princess Marina Hospital Institutional Research Board.
4. Any unforeseen circumstances including termination of the study must be reported to Princess Marina Hospital Research Board immediately.
5. The Princess Marina Hospital Research Board must have access to the on-going study anytime for auditing purposes.
6. After completion of the study, the researcher must submit a hard copy and soft copy of protocol to Princess Marina Hospital Ethics and Research Board.

PRINCESS MARINA HOSPITAL P. O. BOX 258 GABORONE BOTSWANA

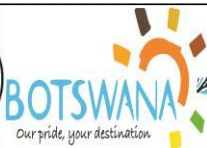
Wish you prodigious triumph in your study.

Yours faithfully

Akanyang Tshiamo

Secretary PMH REC

For Hospital Superintendent



Vision: A Model of Excellence in Quality Health Services. Values: Botho, Equity, Timeliness, Customer Focus, Teamwork.



BIOGRAPHY

NAME	MRS.GAOGAKWE RAMAOLOGA
DATE OF BIRTH	30 March 1980
PLACE OF BIRTH	Kanye, Botswana, Africa
PRESENT ADDRESS	Kanye -Leru ward Lorwana- Mmolopita ward PO Box 129 Kanye Botswana
POSITION HELD	2014 To date Senior Nursing Officer 2010-2013 Principal Registered Nurse 2008-2010 Senior Registered Nurse 2004-2007 Registered Nurse
EDUCATION	2022-2024 Master of nursing sciences Faculty of Nursing (Adult Nursing) Burapha university Chonburi province, Thailand 2019-2020 bachelor's degree in public health Institute of Development Management Gaborone, Botswana 2001-2004 Diploma in General Nursing Institute of Health Science Lobatse, Botswana
AWARDS OR GRANTS	Supreme award most innovative nurse 2010, awarded by Ministry of Health Botswana