UNIVERSITI TEKNOLOGI MARA

ERECTILE DYSFUNCTION: PREVALENCE, ASSOCIATED FACTORS, AND QUALITY OF LIFE IN MEN WITH DIABETES MELLITUS IN KUALA LUMPUR

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MSc

February 2026

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JHEFFANY YAZID

Thesis submitted in fulfilment
of the requirements for the degree of
Master of Nursing
(by Research)

Faculty of Health Sciences

February 2026

CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 22 October 2025 to conduct the final examination of Jheffany bin Yazid on his Master of Nursing (by Research) thesis entitled "Erectile Dysfunction: Prevalence, Associated Factors, and Quality of Life in Men with Diabetes Mellitus in Kuala Lumpur" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The Panel of Examiners was as follows:

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I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

Erectile dysfunction (ED) is a frequent adverse consequence among males with diabetes and can significantly affect their physical, emotional, and social quality of life. The objective of this study was to determine the prevalence of ED, identify sociodemographic and clinical factors associated with ED, and evaluate the quality of life among male diabetes patients in Kuala Lumpur. A cross-sectional study was conducted among 374 male patients attending diabetes clinics in Kuala Lumpur, using stratified sampling from public health clinics. The International Index of Erectile Function (IIEF-15) and the WHOQoL-BREF (Malay version) were used to collect the data. Descriptive statistics, simple logistic regression, and one-way ANOVA were performed. The overall prevalence of ED in this study was 65.5% (21.1% mild to moderate, 24.9% moderate, and 19.5% severe). Younger adults (25-39 years) and those with higher levels of education had significantly lower odds of ED (p=0.018). Clinically, ED was significantly correlated with a longer duration of diabetes (AOR = 1.179, p = 0.012), the presence of comorbidity (AOR = 2.59, p = 0.04), and reduced levels of exercise (AOR = 0.031-0.083, p = 0.033). There were substantial differences in QoL scores across ED severity strata ($p < 0.001$), with the social domain most affected. All QoL domains were the lowest among participants with severe ED. Age, education, clinical conditions, and lifestyle (smoking, diabetes, and hypertension) have a profound impact, with ED being widespread. QoL impairment is significant, highlighting the need to integrate structured ED screening into standard diabetes care protocols to ensure earlier detection, targeted intervention, and more responsive clinical management for affected patients.

Keywords: Erectile dysfunction, diabetes mellitus, quality of life, sociodemographic factors, clinical factors

ACKNOWLEDGEMENT

First and foremost, I would like to express my deepest gratitude to Ms. Suzana Yusof, my supervisor, and Dr. Siti Khuzaimah Ahmad Sharoni for their invaluable guidance, encouragement, and constructive feedback throughout this research. Their unwavering support and expertise have been instrumental in ensuring the successful completion of this study.

I would also like to extend my heartfelt thanks to my colleagues and friends at the Health Clinics, whose camaraderie and assistance have contributed significantly to the smooth progress of my research. A special appreciation goes to Matron Azliha, Matron Wan Maidah, Sister Abdul Rahman Zanal Abidin, and Matron Nurulhusaini for their kind support and invaluable input during the study.

Last but not least, I am profoundly thankful to my family for their unwavering love, patience, and encouragement. Their sacrifices and understanding have been my source of strength throughout this journey. Without their support, this research would not have been possible.

Thank you all for being part of this journey and for making this accomplishment meaningful.

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Abbreviations

BMI	Body Mass Index
CINAHL	Cumulative Index to Nursing and Allied Health Literature
COVID-19	Coronavirus Disease 2019
CI	Confidence Level
ED	Erectile dysfunction
EQ-5D	Euro-QoL Five Dimensions
HBM	Health Belief Model
HbA1C	Haemoglobin A1C
HRQoL	Health-related quality of life
JKWPKL&P	Jabatan Kesihatan Kuala Lumpur dan Putrajaya
IIEF-15	International Index of Erectile Function
PDE5i	Phosphodiesterase Type 5 inhibitors
PKD	Pejabat Kesihatan Daerah
QoL	Quality of Life
SAD-MEN	Sexual Dysfunction in Asian Men with Diabetes
SPSS	Statistical Package for the Social Sciences
SF	Short-Form
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization
WHOQoL-BREF	World Health Organization Quality of Life-BREF

CHAPTER 1
INTRODUCTION

1.1 Research Background

This chapter presents an overview of diabetes, erectile dysfunction (ED), and the significance of investigating this issue. It also includes research questions, hypotheses, background, problem statement, purpose, operational, and conceptual definitions. By using this framework, the study aims to deliver a better understanding of the sexual health issues that diabetes men with DM face and the way the management of these issues can impact the delivery of healthcare to these groups.

1.2 Background Information

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycaemia due to defects in insulin secretion and/or action. Diabetes mellitus is one of the most important global public health issues today; it affects over 422 million people worldwide, as stated by the World Health Organization. This issue is becoming increasingly serious in Malaysia. According to Akhtar et al. (2022) reported that Malaysia has one of the largest diabetes prevalence rates in the world. The national data shows a rapid increase in diabetes prevalence from 11.2% in 2011 to 18.3% in 2019, which is a 68.3% increase over nine years (Arunah Chandran & Mohd Nazri Abdullah, 2019). Approximately 49% of individuals with diabetes are not diagnosed, and therefore, there are about 3.7 million Malaysians who have diabetes but do not know it (Siew Peng et al., 2020). The projection for adult diabetes cases will exceed 7 million by 2025 if the current trend continues, clearly demonstrating the necessity of establishing effective prevention and management measures. Recent estimates using data from NHMS 2023 still indicate a large national burden of diabetes and estimate that 15-16% of adults in Malaysia currently have diabetes and that diabetes is a significant public health issue.

Diabetes mellitus is a long-term metabolic disease characterized by high blood glucose levels resulting from abnormalities in insulin action, insulin secretion, or both. It is a significant public health issue worldwide, affecting 422 million people globally,

according to the WHO. In Malaysia, this issue is worsening. A systematic review and meta-analysis assessed diabetes prevalence across Malaysia and found that it continues to rank among the highest in the world (Akhtar et al., 2022). National statistics reports suggest that diabetes prevalence is increasing sharply from 11.2% in 2011 to 18.3% in 2019, a 68.3% increase over less than a decade (Arunah Chandran & Mohd Nazri Abdullah, 2019). More concerningly, 49% of the population with diabetes are not diagnosed, which amounts to an estimated 3.7 million people (Siew Peng et al., 2020). If this trend continues, by 2025, there will be over 7 million adult Malaysians aged 18 years and older who will likely have diabetes, requiring active efforts to consider preventative and management strategies. More recent analyses based on NHMS 2023 indicate that diabetes remains highly prevalent, with approximately 15–16% of Malaysian adults living with diabetes, confirming that it continues to be a significant public health challenge.

Besides the physiological impacts of diabetes, it is associated with numerous complications such as cardiovascular disease, kidney failure, neuropathy; one complication that is usually overlooked is erectile dysfunction (ED). ED is defined as the persistent inability to achieve and maintain an erection sufficient for gratifying sexual intercourse (Barnard-Kelly et al., 2019; Yafi et al., 2016). ED is one of the most prevalent types of sexual dysfunction in men with DM due to the multifactorial influences of sustained hyperglycaemia, the consequent impact of vascular and neurological changes, and a potential for psychological distress. ED is more than a physical issue; the implications of ED extend into psychological and social realms that ultimately have profound implications for self-image, relationships, and overall well-being.

The World Health Organisation defines Quality of life (QoL) as an individual's perception of their position in life as influenced by culture, value systems, and personal goals (Schweyer, 2017). As such, if ED occurs in men with DM, QoL can be profoundly diminished. Previous studies have demonstrated strong associations between ED, depression, anxiety, and lower relationship satisfaction that reinforce the need to consider sexual health in the management of diabetes (Anwar et al., 2017; Chen et al., 2017; Przydacz et al., 2023). If left unattended as part of broader health management, ED may additionally damage a patient's motivation to participate in the management of their diabetes by disrupting physical intimacy and emotional closeness.

ED in men with DM often occurs sooner; the literature demonstrates that diabetes can result in ED suffering some 10 years sooner due to concurrent metabolic and vascular causes (Malavige & Levy, 2020; Walle et al., 2018). Diabetes causes hyperglycaemia that prevents the body's blood vessels from relaxing due to less nitric oxide (NO) being available to promote vasodilation and cause an erection. Nitric oxide is needed by smooth muscle cells in the corpus cavernosum to relax and allow for proper blood flow into the penis when aroused sexually. When nitric oxide is insufficiently produced, it is difficult to relax the corpus cavernosum smooth muscle and obtain adequate blood flow during sexual stimulation. Hyperglycaemia also promotes atherosclerosis and microvascular damage in individuals with diabetes. These conditions constrict the penile arteries, reducing the overall vascular supply to the erectile tissue (Giugliano et al., 2021).

Hyperglycaemia also causes peripheral neuropathy and impairs nerve function that is important for erection. Peripheral neuropathy is caused by prolonged hyperglycaemia that damages both autonomic and somatic nerves that contribute to erection. Therefore, this causes reduced sensory input and an inability to transmit the neural impulses required to initiate and maintain an erection (Maiorino et al., 2017). Additionally, hormonal abnormalities such as insulin resistance and hypogonadism have been linked to ED. Poor glycaemic control has been shown to reduce circulating testosterone levels and impair hypothalamus-pituitary-gonadal (HPG) axis function (Hackett, 2019). Finally, prolonged duration of diabetes is associated with increased psychological distress, including depression and decreased self-esteem, which can exacerbate sexual dysfunction through the psychogenic pathway.

Despite this information and similar refrains that sexual health is often neglected in the care of patients with chronic diseases, particularly in Malaysia, little attention has been afforded to focusing clearly on localised accounts of ED in male diabetes patients and the correlates to prevalence in the domain of sexual health. While the international literature has made some strides in identifying ED risk factors and impacts, there is still a significant gap in the research regarding ED impact in urban Malaysian populations, particularly in complex urban locales, such as Kuala Lumpur, that are ethnically, socio-economically, and culturally diverse.

While studies internationally have shown an ongoing relationship between

diabetes mellitus (DM) and erectile dysfunction (ED), there is a lack of research into this area in Malaysia. Diabetes in Malaysia has increased significantly over the last decade, with the prevalence rising from 11.2% in 2011 to 18.3% in 2019, according to data collected through the National Health and Morbidity Survey (NHMS) in 2019. However, addressing sexual health issues, including ED, in both clinical practices and public health research continues to be neglected. This continued neglect is primarily due to the cultural sensitivity of sexuality, the stigma of discussing sex and health publicly, and the idea that sexual health should remain a private issue for individuals to address and not a legitimate medical issue for healthcare providers to discuss. Many men diagnosed with DM do not openly express their sexual health issues, and many healthcare providers will also choose to avoid discussing these issues, as they feel they have insufficient time to bring them up or are uncomfortable bringing them up (Yin et al., 2023). Thus, ED experienced by diabetic men in Malaysia remains significantly underdiagnosed and under-treated, although it can negatively affect the quality of life, the marital relationship, and the overall psychosocial well-being of those experiencing it (Kalikuljaman et al., 2023; Rezali et al., 2023).

The issue is particularly relevant in urban and multicultural settings such as Kuala Lumpur, where ethnicity, socioeconomic background, and lifestyle factors interact to influence health awareness and care-seeking behaviours. However, limited studies have explored these contextual differences or examined the relationship between sociodemographic factors and ED among Malaysian men with DM.

In terms of its demographics, socioeconomic status and occupational characteristics, the city of Kuala Lumpur has become one of the most heavily urbanized areas in Malaysia, which presents an ethnically diverse and vastly socially disparate group of people who have varying levels of knowledge regarding their own health and the various ways they live and interact with each other, which can affect how they respond to information about their health and how they seek medical attention when needed. The city's comprehensive, easily accessible public health system is available to everyone, enabling the collection of large amounts of data on diabetic men across various socioeconomic statuses throughout the area. In doing so, this study will provide an opportunity to understand the lives of diabetic men who experience erectile dysfunction (ED) — an issue that remains underdiagnosed and undertreated in Malaysia.

Beyond the realm of sexual health, there is also a greater need to investigate ED in the context of the current diabetes epidemic, because if left untreated or undiagnosed, ED is much more than just a sex related issue; it may be an early clinical indicator of many systemic health issues including endothelial dysfunction, cardiovascular disease and neuropathy, all of which are commonly seen complications of diabetes (Hackett, 2019; Maiorino et al., 2017). Additionally, if left untreated, ED may cause significant emotional distress and low self-esteem to those affected, and may also disrupt their intimate relationships, thus negatively impacting their overall quality of life and their psychosocial well-being (Kalikuljaman et al., 2023). Therefore, understanding the magnitude and correlates of ED in an urban Malaysian population is critical to advancing timely diagnosis of ED, enhancing communication between patient and provider regarding sexual health, and promoting holistic approaches to the management of diabetes that address the physical and psychological aspects of men's health.

Therefore, given the present epidemiologic trends and the ongoing unmet clinical needs of men with DM, the purpose of this study is to explore the prevalence of erectile dysfunction (ED) and its sociological correlates and to assess the effect of ED on health-related quality of life of diabetic patients receiving care at the Kuala Lumpur and Putrajaya Health Department (JKWPKL&P). As the most urbanized region in Malaysia, Kuala Lumpur has a unique public health environment characterized by a diverse mix of ethnic, occupational, and socioeconomic populations. These factors shape the health beliefs and behaviours of individuals in this region, making it an optimal site to examine the variability in the prevalence and impact of ED on diabetic men in urban settings.

Additionally, the public health system under JKWPKL&P is well-developed and includes numerous government health clinics that serve a large and diverse population. Therefore, the public health system under JKWPKL&P provides a consistent and representative sample of urban diabetic men who receive structured diabetic management within the public health system. By studying these men, we will gain a better understanding of the realities of urban living and health access, as well as how these realities contribute to the management and reporting of sensitive conditions like ED.

1.3 Problem Statement

Erectile dysfunction (ED) is a common complication of diabetes mellitus in men. However, there is an abundance of clinical evidence indicating that it is one of the earliest and potentially the most disabling microvascular complications of long-term hyperglycaemia (Avasthi et al., 2017; Siddhanta, 2021). A wealth of international research indicates that ED significantly impacts physical functioning, emotional well-being, marital relationships, and overall quality of life (Przydacz et al., 2023; Yazid et al., 2025). The condition is strongly linked with endothelial dysfunction, neuropathy, and hormonal disturbances, which may lead to an earlier and more severe onset of ED than seen in non-diabetic men (Maiorino et al., 2017; Hackett, 2019). Despite this association, ED still receives too little clinical attention in Malaysian healthcare settings, primarily because sexual health discussions are usually avoided due to cultural sensitivities, limited consultation time, and low provider confidence (Kang et al., 2022; Tay & Ng, 2022). Therefore, the extent of the burden, severity, and psychosocial implications of ED among Malaysian diabetic men remains poorly understood.

Globally, numerous studies examining the prevalence of ED in populations with diabetes indicate that it is highly prevalent among diabetic men, with rates ranging from 31.3% to 100%, depending on the population studied (Yin et al., 2023; Kalikuljaman et al., 2023). For example, countries such as Nigeria (94.7%), China (75.2%), Sri Lanka (73.1%), and Japan (80.9%) report higher prevalence rates, whereas lower prevalence rates are seen in the USA (45.8%) and Italy (43.3%) (Venggadasamy et al., 2021; Yazid et al., 2024). The variation in prevalence rates across countries reflects differences in sociocultural norms, health-seeking behaviours, lifestyle factors, religious beliefs, and clinical practices. Due to Malaysia's unique cultural contexts regarding masculinity, marital expectations, and sexual modesty among Malays, Chinese, and Indians (Kang et al., 2022; Kalikuljaman et al., 2023), extrapolation of these findings to Malaysia would be inappropriate. Additionally, Malaysia has experienced a rapid increase in diabetes prevalence since 2011, increasing from 11.2% in 2011 to 18.3% in 2019 (Siew Peng et al., 2020). As the number of diabetic individuals increases, so will the number of men at risk of developing ED, increasing the need for local and context-specific evidence.

There is very little Malaysian literature on this area. Although Nordin et al. (2019) reported an 81.5% prevalence of ED in a sample of men attending a sexual medicine clinic, the sample was not composed of diabetic men, therefore limiting the generalizability of their findings. Similarly, Chung et al. (2016) utilized the Sexual Dysfunction Assessment in Men with Diabetes (SAD-MEN) tool to assess sexual dysfunction in a sample of diabetic men; however, they did not examine ED as a single entity. All studies conducted in Malaysia have utilized standardized instruments to measure sexual function; however, none of these studies have utilized these tools specifically to identify the prevalence, severity, and correlates of ED among diabetic men. Moreover, no local study has developed a comprehensive analytical model incorporating both sociodemographic and clinical variables, thereby creating a significant knowledge gap for designing targeted interventions.

The absence of robust Malaysian evidence concerning ED among diabetic men has a range of clinical and psychosocial implications. Previous research has demonstrated that ED is significantly correlated with depression, anxiety, reduced self-esteem, and poorer self-management behaviours among diabetic men (Przydacz et al., 2023; Anwar et al., 2017). The adverse psychological effects of ED can exacerbate glycaemic control, thereby creating a vicious cycle of worsening physical symptoms and declining emotional well-being (Mushtaq et al., 2018; Torkamani et al., 2021). In addition to the individual psychological distress caused by ED, the condition also has significant relational implications. Partners of men with ED typically report experiencing emotional pain, decreased intimacy, relational conflict, and internalization of sexual withdrawal as rejection or emotional distance (Rezali et al., 2023; Kalikuljaman et al., 2023). However, relational aspects of ED are mainly absent from routine diabetes management in Malaysia, as sexual matters are often viewed as private or taboo.

Cultural norms greatly influence these attitudes. In Malaysia, discussions about sexual functioning are generally viewed as sensitive, embarrassing, or immoral. Men often fear being labelled "weak" or "unmanly," while partners often avoid discussing ED to avoid causing shame, conflict, or discomfort (Kalikuljaman et al., 2023; Kang et al., 2022). Cultural barriers substantially limit symptom disclosure, delay early diagnosis, and restrict ED treatment adherence. Providers also report low confidence in addressing sexual health discussions and cite a lack of clear guidelines or training in

communicating with men about ED (Hashim, 2023; Bilal-Salim, 2019). Thus, ED assessments are rarely undertaken during routine diabetes reviews.

Healthcare organizational factors in Malaysia also contribute to these gaps. Urban primary care clinics in Kuala Lumpur, particularly those with large patient loads and limited consultation time, direct providers to prioritize HbA1c values, renal profiles, lipid testing, and foot screening over psychosocial issues (Tay & Ng, 2022; Siew Peng et al., 2020). Therefore, sexual health assessments are often omitted. Nurses, who are central to diabetes education, also report receiving insufficient training to address sexual health, resulting in another missed opportunity for early identification (Bilal-Salim, 2019; Hashim, 2023).

Despite international evidence demonstrating that ED negatively impacts quality of life across physical, psychological, social, and environmental dimensions (Thongtang et al., 2020; Defeudis et al., 2023), no Malaysian study has investigated the quality-of-life outcomes of ED among diabetic men using validated instruments such as WHOQOL-BREF. Therefore, this constitutes another significant gap. Given that Kuala Lumpur, as an urban, multicultural city with varied socioeconomic backgrounds and patterns of healthcare access, offers an ideal setting to explore the multi-factorial determinants of ED, it is surprising that no previous research has investigated how ED impacts the lived experience, daily functioning, and environmental satisfaction of diabetic men in this context.

Additionally, international literature highlights that ED is influenced by multiple factors, including age, education level, income, glycaemic control, duration of diabetes, BMI, hypertension, and comorbidities (Alaofè et al., 2022; Hylmarova et al., 2020). However, no Malaysian study has examined all these variables simultaneously. Therefore, without local evidence, clinicians cannot develop accurate risk profiles, nurses cannot deliver targeted educational programs, and policy makers cannot develop culturally tailored interventions.

In summary, the gaps in Malaysian research regarding ED are significant:

(1) Lack of accurate prevalence data.

(2) Lack of ED-specific tools applied to diabetic men.

(3) Lack of analysis of sociodemographic and clinical correlates.

(4) Lack of understanding of cultural barriers and relational implications.

(5) No local evidence regarding the impact of ED on quality of life.

The gaps directly undermine clinical practice and adversely affect patients and their spouses, who continue to endure untreated symptoms, emotional distress, marital difficulties, and diminished quality of life. As a result, there is a pressing need for a methodologically rigorous study investigating the prevalence of ED, associated sociodemographic and clinical factors, and quality of life among men with DM in Kuala Lumpur. Such a study will provide the foundational evidence required to enhance screening practices, improve culturally sensitive clinical communication, support marital and psychosocial well-being, and integrate sexual health into chronic disease management frameworks within the Malaysian healthcare system.

1.4 Significance of the Study

This study aims to examine a sensitive but highly pertinent complication of diabetes, erectile dysfunction (ED), which is often inadequately recognised by clinicians and is often inadequately managed, especially in Malaysian health care settings. Although medically, ED is widely recognised as a complication related to sustained, prolonged hyperglycaemia, neuropathy, and vascular injury, conversations surrounding male sexual health tend to be stifled and negated in traditional Malaysian health contexts due to cultural constructs and personal embarrassment. Therefore, patients often suffer in silence while healthcare professionals conveniently overlook such discussions in routine consultations. This study aims to contribute to the gap in knowledge of the ED in male patients with diabetes by providing evidence concerning prevalence, risk factors, and the impact of ED on quality of life in men with DM in Kuala Lumpur.

The study's contribution is the opportunity to raise awareness and, consequently, improve the management and outcomes of patients with ED. This is part of the significance of this study in Malaysia, where ED remains a taboo subject for men, and despite it being a complication of diabetes, it is rarely a priority in research agendas. The study adopted validated tools of measurement and a theoretical framework that positions erectile dysfunction as a complication of diabetes that must be addressed systematically. It thus should be included in public health agendas in the future. The results of the study will benefit several stakeholders, including patients, healthcare institutions, nurses, and universities such as Universiti Teknologi MARA (UiTM).

1.4.1 Male Diabetes Patients in Malaysia

The study is significant for male patients with diabetes as it provides insight into a complication of diabetes that is often overlooked during daily health encounters. The reality is that for many males living with ED, there is shame, denial, or a sense of hopelessness that manifests itself as relationship breakdowns, decreased emotional well-being, and non-adherence to their diabetes treatment. This research presents an opportunity to have their experiences recognised and validated. Documenting the prevalence and severity of EDS in relation to clinical and socio-demographic variables can help patients understand their risk if they take no action.

Furthermore, the research highlights the psychological implications of ED and furthers the discussion of sexual health. When male patients have access to data and are less isolated, they are more likely to engage with care options. It may lead to better adherence to treatment, less psychological distress, and/or improved overall quality of life. The research ultimately leads men to think more holistically about their health. It comforts them in knowing that ED is a manageable complication that can be addressed, not to be ignored.

1.4.2 Selected Healthcare Facilities in Malaysia

Healthcare institutions play a vital role in implementing ED screening and care referrals in chronic disease management. Currently, the protocols that most diabetes care facilities in Malaysia focus on are physical complications of diabetes, such as nephropathy, retinopathy, or cardiovascular risk. This study illustrates the need to include sexual dysfunction as an identified priority under diabetes assessments. The emergence of new evidence related to ED regarding modifiable factors, such as glycaemic control, obesity, and hypertension, identified by research, enables clinics to implement targeted screening to increase early identification.

The implications also encourage administrators to develop environments that are stigma-free and support male patients in discussing ED. All staff should receive training in cultural sensitivity, empathetic communication, and patient-centred care when discussing such a sensitive topic. By consistently embedding lifelong learning principles into policy and practice, health care providers can position erectile

dysfunction as a legitimate clinical condition needing a systemic clinical approach and no longer as a personal issue. This approach may enhance patient experience and satisfaction, as well as health outcomes.

1.4.3 Nursing Profession

Nurses are the biggest group of healthcare workers in Malaysia. They have a unique opportunity to assess the sexual health of their diabetic patients because they are usually the first medical professionals to see the patient and have an ongoing relationship with the patient. Therefore, they can identify problems (such as erectile dysfunction) that the patient might not want to discuss. However, despite having the opportunity to assess the sexual health of their patients, most do not. The reason for this has to do with a larger problem in healthcare, namely that many clinicians (including nurses) are uncomfortable talking about intimate/reproductive health-related topics because of cultural sensitivity, personal discomfort, or a lack of guidance.

This study shows the need to include sexual health assessments in the routine assessments of diabetic male patients who have a high chance of developing erectile dysfunction. To address sexual health, nurses will require standardized assessment tools, nursing protocols, and evidence-based interventions. Additionally, if nurses document sexual health assessments in the patients' charts, it will help detect sexual dysfunction earlier and allow for a timely referral. Documenting sexual health assessments will provide a more comprehensive approach to diabetes care by addressing the patient's physical, emotional, psychological, and relational aspects of their disease.

Additionally, the study indicates the necessity of continuous education for nurses so that they can communicate with their patients regarding sexual health. Most nurses reported being uncomfortable, uncertain, or lacking knowledge when communicating with patients regarding erectile dysfunction, resulting in lost opportunities to intervene early. Creating training programs, workshops, and continuing education courses focused on communication skills, culturally sensitive approaches, and the clinical management of sexual health issues would increase nurses' confidence and competence. Such education initiatives would also promote a change in professional attitudes, supporting the view that sexual health is an integral part of total health.

Suppose nurses are educated and skilled in assessing the sexual health of their patients. In that case, they will be able to initiate conversations about sex, educate their patients about erectile dysfunction, and recognize early signs of sexual dysfunction. A proactive nursing role in assessing the sexual health of their patients will allow for better screening of sexual dysfunction, build trust between nurse and patient, and create an atmosphere where men will feel safe to talk about private matters. Strengthening the sexual health education of nurses will result in more holistic and compassionate care for diabetic men, taking into consideration the psychological, emotional, and relational effects of erectile dysfunction. Overall, incorporating sexual health into routine practice will improve the quality of care provided to male diabetic patients.

1.4.4 Universiti Teknologi MARA (UiTM)

This research project aligns with UiTM's mission to lead in academic quality, deliver evidence-based practice, adopt a community health approach, and establish a model of academic leadership in healthcare. The generation of local data on a subject that is often overlooked is an asset to UiTM's reputation in fostering the national debate concerning the management of chronic health issues among men. It will continue to provide original, evidence-informed data that may be useful for policy representation, health education campaigns, and to uphold the academic tradition of publishing within the nursing and public health areas of the health disciplines.

The study will also enhance UiTM's learning and teaching resources. It will be incorporated into the content delivery for nursing, public health, and medical students, where applicable, particularly in programs or modules on chronic disease, quality of life, or patient-centered care. The application of the Health Belief Model in this study exemplified how students can utilize theory to conduct meaningful, practically relevant action research that informs their local government and community on how to create healthier community environments. Ultimately, this study may inspire future undergraduate and postgraduate students to pursue similar questions and promote UiTM's reputation as a leader in applied health research.

1.5 Research Questions

I. What is the prevalence and severity of ED among men with DM?

II. What is the Quality of Life (QoL) level perceived among men with DM?

III. What is the association between socio-demographic factors, including age, education level, ethnicity, and occupation, and the severity of ED among men with DM?

IV. Are the clinical factors, such as the duration of diabetes, BMI, HbA1C level, presence of high blood pressure, presence of other chronic diseases, smoking status, alcohol consumption, physical activity level, and drug or medication use, associated with the severity of ED?

V. Is there a significant difference in quality-of-life (QoL) scores across the categories of erectile dysfunction (ED) severity among men with DM?

1.6 Research Objectives

1.6.1 General Objective

To investigate the prevalence, associated factors, and impact on quality of life of erectile dysfunction among male diabetic patients attending public health clinics in Kuala Lumpur.

1.6.2 Specific Objective

I. To determine the prevalence and severity of erectile dysfunction among men with DM.

II. To evaluate the Quality of Life (QoL) level among men with DM.

III. To examine the association between socio-demographic factors, including age, education level, ethnicity, and occupation, on the severity of ED among.

IV. To examine the association between clinical factors such as the duration of diabetes, BMI, HbA1C level, presence of high blood pressure, presence of other chronic diseases, smoking status, alcohol consumption, physical activity level, and drug or medication use on the severity of ED.

V. To determine whether there are significant differences in quality-of-life (QoL) scores across the categories of erectile dysfunction (ED) severity among men with DM.

1.7 Research Hypothesis

i. Hypothesis 1 (H1):

Null Hypothesis (H_0): Socio-demographic factors (age, education level, ethnicity, and occupation) are not significantly associated with the severity of ED among male diabetes patients.

Alternative Hypothesis (H_A): Socio-demographic factors (age, education level, ethnicity, and occupation) are significantly associated with the severity of ED among male diabetes patients.

ii. Hypothesis 2 (H2):

Null Hypothesis (H_0): Clinical factors (duration of diabetes, BMI, d HbA1C, presence of high blood pressure, presence of other chronic diseases, smoking status, alcohol consumption, physical activity level, and drug or medication use on the severity of ED) do not significantly associate with the severity of ED among men with DM.

Alternative Hypothesis (H_A): Clinical factors (duration of diabetes, BMI, HbA1C level, presence of high blood pressure, presence of other chronic diseases, smoking status, alcohol consumption, physical activity level, and drug or medication use) are significantly associated with the severity of ED among men with DM.

iii. Hypothesis 3 (H3):

Null Hypothesis (H_0): There is no significant difference between the severity of ED and QoL scores among men with DM.

Alternative Hypothesis (H_A): There is a significant difference between the severity of ED and QoL scores among men with DM.

1.8 Conceptual and Operational Definition

Conceptual definition	Operational definition
Prevalence of ED: The overall occurrence or frequency of erectile dysfunction within the male population with diabetes in Kuala Lumpur. It represents the extent to which ED is present in this specific group.	Prevalence of ED: Operationalising this concept involves quantifying the percentage or number of men with DM in Kuala Lumpur who report experiencing ED. This could be measured through surveys, interviews, or medical records.
Erectile dysfunction (ED): ED is a complex condition involving both physiological and psychological factors that impede normal erectile function. It goes beyond a mere mechanical issue, encompassing emotional, relational, and health-related dimensions (Burnett et al., 2018).	The severity of ED can also be measured using validated questionnaires, such as the IIEF-15, as an initial step prior to laboratory testing for confirmation (Malavige & Levy, 2020).
Associated Factors: Variables or elements that are correlated with or influence the occurrence of ED in men with DM. Associated factors could include health-related aspects, lifestyle factors, or other conditions that contribute to ED (Avasthi et al., 2017).	Associated Factors: Operationally, this involves identifying and measuring specific variables, such as blood sugar levels, duration of diabetes, lifestyle factors (e.g., physical activity, smoking), and psychological factors (e.g., stress, anxiety), that are associated with ED (Defeudis et al., 2022). This might involve structured questionnaires or medical assessments (Avasthi et al., 2017).
Malaysian Male: This term refers to the male population in Malaysia who have been diagnosed with diabetes. It serves as the specific demographic under investigation, emphasizing those currently engaged in diabetes care within designated healthcare facilities in	Malaysian Male: Pertains specifically to individuals residing in Malaysia who have been clinically diagnosed with diabetes, encompassing both type 1 and type 2 diabetes. The study focuses on male participants actively undergoing diabetes management in JKWPKL.

Conceptual definition	Operational definition
Kuala Lumpur.	
Diabetes: According to the Clinical Practice Guidelines (CPG) for the Management of Type 2 Diabetes Mellitus in Malaysia, diabetes is a persistent metabolic condition characterized by elevated blood glucose levels (Siew Peng et al., 2020).	Diabetes: Operationally refers to individuals with a confirmed medical diagnosis of either type 1 or type 2 diabetes, supported by clinical records, laboratory results, or ongoing diabetes management and treatment at designated healthcare clinics in Kuala Lumpur.
Quality of Life (QoL) refers to an individual's perception of their overall well-being and satisfaction with various aspects of life, including physical, mental, emotional, social, and environmental dimensions (Schweyer, 2017). It encompasses the ability to enjoy daily activities, maintain satisfying interpersonal relationships, maintain good physical health, maintain psychological well-being, and have supportive environmental conditions.	Operationally, Quality of Life (QoL) can be assessed using validated instruments or questionnaires such as the WHOQoL-100, which is a multidimensional instrument widely recognised for evaluating quality of life (De Vries & Van Heck, 1997; Hasanah et al., 2003)

1.9 Scope of the Study

The current study examined the prevalence, associated factors, and quality of life of male diabetes patients with erectile dysfunction (ED). The current study used a cross-sectional quantitative research design. It was conducted in selected government health clinics under the jurisdiction of the Federal Territories Health Department of Kuala Lumpur and Putrajaya. A total of 374 male respondents with clinically diagnosed diabetes were included in the study through a multistage sampling process. The data were collected through validated structured questionnaires. Ethical clearance was granted by the UiTM Research Ethics Committee and the Medical Research and Ethics Committee (MREC). Written informed consents were obtained from all study participants. The collected data were analyzed using the Statistical Package for the

Social Sciences (SPSS) version 27.

The scope of this study was narrowed to focus specifically on adult male patients receiving care at government health clinics in urban areas. As a result, the findings may not be generalizable to male patients from rural areas or to male patients receiving diabetes treatment from private healthcare providers, where health behaviours, accessibility, and cultural expectations may differ. This study also focused solely on male respondents aged 18 and over, without incorporating the perspectives of female patients, partners, or couple-based views on health-related quality of life. Focusing on male patient perspectives, which were further narrowed by the inclusion of female perspectives, also limited the scope of possibilities to examine interrelated potential relationships in the ED and the associated factors among male diabetes patients. In contrast, leaving the study's scope open creates opportunities for future studies across a variety of populations and contexts.

1.10 Summary

Ultimately, this opening chapter lays the groundwork for a sexual health issue: a comprehensive investigation among male diabetes patients in Malaysia. Essential background information, formulating relevant research questions, outlining the aims of this research, and this study hopes to contribute positively to healthcare in Malaysia. Diabetes mellitus is known to decrease the quality of life, negatively affect productivity and workability, not only in male diabetes patients but also in healthcare facilities, nursing professionals, and academic institutions. With a clear focus on addressing ED and related sexual health issues, this aims to empower male diabetes patients, enhance healthcare services, and bring our hearts and souls to work to help build a more inclusive and compassionate society.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

In this chapter, the researchers provide a comprehensive review of the literature that treats diabetes and erectile dysfunction (ED). The goal of reading those volumes was to clarify what is presently known and assumed about the diabetes-ED nexus in males. This research survey not only presents the significant findings of previous research and theoretical frameworks but also highlights the gaps in the literature that need to be addressed. Besides, it systematises this literature in an integrated fashion, which may lead to excellent treatment. Suppose the current literature review is to position and guide careful analysis of this topic. In that case, the framework introduced here both sets out the goals for research and provides typological descriptions behind each one.

2.2 Literature Search Strategy

The first stage in developing the literature retrieval strategy for this study was to utilize established methodological frameworks to ensure reliability and comprehensiveness. The systematic selection of article sources was organised following the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) from identification to screening and assessment of eligibility (Haddaway et al., 2022; Liberati et al., 2009). Such an approach is explicitly designed to provide transparency, reproducibility, and adherence to methodological best practices as recommended by the PRISMA Group of Systematic Reviews and Meta-Analyses.

The researchers posed the research question according to the PICO framework, which underscores four key concepts: Population or Problem (P), Intervention or Exposure (I), Comparison (C), and Outcome Measures (O) (Stern et al., 2014). For this study, the population comprised men with DM (Type 1 and Type 2). At the same time, interventions were provided to patients who had diabetes but were not necessarily diagnosed as having ED or patients who had contracted the disease already, regardless of whether they were suffering from it. The research question was designed to find out

what percentage of male diabetes patients have, what variables influence this incidence, and how ED diagnosis affects quality of life.

Patient databases and relevant literature were systematically searched across six scientific databases: Scopus, ScienceDirect, World of Science, Google Scholar, PubMed, SAGE, and ResearchGate. The search was restricted to recent English-language publications from January 2012 to 2024. A strategic series of keywords, such as “diabetes,” “Erectile Function International Index of Erectile Function (IIEF) Questionnaire,” “male sexual health,” “erectile dysfunction,” and "sexual wellbeing in diabetes,” were employed to identify pertinent scholarly contributions. The selected articles were carefully evaluated against the inclusion criteria. The articles need to be published in English, be on the prevalence, associated factors, and QoL with ED in the male diabetes population, and follow a quantitative cross-sectional study design. This method was chosen to thoroughly address the research question and cover the main bases, while remaining relevant and within academic standards.

2.3 Erectile Dysfunction (ED) as a Common Health Issue

Erectile dysfunction (ED), or impotence, is a health problem characterised by the inability to get or maintain a hard enough erection to engage in satisfying sexual activity. This is especially true in individuals with diabetes, which harms their nervous systems and blood vessels and reduces blood flow to their sexual organs. These changes affect nerve sensitivity and blood vessel constriction, while also introducing damage to erectile tissues (Siew Peng et al., 2020; Tamás & Kempler, 2014; Yafi et al., 2016).

The relationship between diabetes and ED is clearly linked by the increased risk of developing ED due to chronic hyperglycaemia, which can cause endothelial dysfunction, reduce the availability of nitric oxide, and disrupt the normal process of vasodilation that is required for an erection (Maiorino et al., 2014). The increased incidence of atherosclerosis associated with diabetes also leads to a reduction in penile blood flow, while diabetic neuropathy affects the autonomic and sensory nerves responsible for sexual responses (Tamás & Kempler, 2014). Additionally, hormonal abnormalities such as low testosterone levels also contribute to erectile dysfunction (Hackett, 2019). All these vascular, neurological, and hormonal pathways lead to the fact that men with DM develop ED earlier and more often than males without diabetes

(Walle et al., 2018).

Nevertheless, there may be some nuance to consider in this relationship. The promising case study by Ngu et al. (2023) suggested that some medications, including metformin at 500 mg twice daily to manage diabetes, may be attributed to the development of ED. This nuanced view provides a more comprehensive understanding of the composite nature of ED in the context of diabetes, encompassing both the disease and the pharmacological treatments integrated into its management.

Overall, ED is a common health issue that affects males, and it is known to increase the likelihood of diabetes. A systematic review and meta-analysis by Gebeyehu et al. (2023) confirm that ED is a common health problem in the general male population. Their findings showed that, among people with diabetes, the global incidence is 61.4% (Gebeyehu et al., 2023). The most comprehensive report in Ethiopia outlined an incidence of ED among male diabetes patients of 69.5% (Maiorino et al., 2014).

In conclusion, the interaction in the domain of diabetes and ED is important to acknowledge the implications diabetes has on male sexual health. Empirical studies have had findings that indicate that men with DM have an increased risk of developing ED relative to non-diabetic males, with studies showing that it can occur at a higher rate compared to diabetic individuals. There is also a time element to consider in the relationship, that men with DM experienced ED sooner than those without diabetes. Certain medications for diabetes may contribute to the development of ED, including metformin, which may lead to the complex nature of the body of literature. Notably, the prevalence of ED has been reported to be high across the world, and it is exceptionally high in people with diabetes. The complexity of ED suggests a need for greater consideration of traits that may contribute to ED.

2.4 Prevalence of Erectile Dysfunction (ED) in men with DM

Prevalence estimates of erectile dysfunction (ED) in men with DM vary widely, from a low estimate of 35% to as high as 90% for many types of diseases. ED occurs in a large percentage of the male diabetes population, significantly affecting their quality of life (physically, emotionally, and socially), relationships, and sexual activity, indicating that ED is prevalent but also remains undiagnosed. Therefore, it is important

to promptly evaluate and treat ED.

It is important to understand the prevalence of ED in men with DM to contemplate management and treatment options, and to identify the prevalence of ED. Research in male patients with diabetes usually estimates the prevalence of ED using the International Index of Erectile Function (IIEF) Questionnaire, which was developed in the New England Research Institute (Ezeude et al., 2020; Ghanem et al., 2021; Xu et al., 2019). The IIEF has 15 items that assess various aspects of male sexual dysfunction, including erectile function, sexual satisfaction, and sexual confidence (Rosen et al., 1997).

The prevalence of ED for male diabetes patients shows very variable estimates, of 28.1% to 94.7% (Ezeude et al., 2020; Ghanem et al., 2021; Thongtang et al., 2020; Ugwumba et al., 2018; Xu et al., 2019), and the prevalence may be higher in diabetes patients with type 2 diabetes compared to those with other types of diabetes (Ugwumba et al., 2018). In addition, many studies recruited patients from tertiary hospitals rather than primary care clinics, which may have resulted in a higher prevalence, as hospital-based samples tend to include individuals with more advanced or poorly controlled diabetes (Ugwumba et al., 2018). Sociocultural differences also influence reporting: men in certain populations may underreport symptoms due to stigma, while others may be more forthcoming depending on the study environment (Thongtang et al., 2020).

The higher prevalence of ED among individuals with type 2 diabetes reported by Ugwumba et al. (2018) may also reflect the metabolic and vascular burden associated with type 2 diabetes, which is often accompanied by longer disease duration, obesity, hypertension, and dyslipidaemia, all of which worsen endothelial and neurological dysfunction (Xu et al., 2019). However, the findings must be interpreted cautiously, as many studies did not control for confounders such as age, comorbidities, or medication use. This limits the comparability of prevalence estimates across countries and highlights the need for more standardised, population-based research to determine the actual burden of ED in men with DM.

Several studies evaluating erectile dysfunction (ED) in diabetic men primarily recruited patients from tertiary hospitals rather than primary care clinics (Ghanem et al., 2021; Hurisa & Negera, 2020; Mesfin et al., 2023). Tertiary hospital-based cohorts typically represent individuals who are further along in the progression of their disease

or have poorly managed diabetes; thus, it can be inferred that there is likely an increased prevalence rate compared to those cohort samples representing individuals with less advanced diabetes (Gobena et al., 2023). Reporting of sexual function issues and erectile dysfunction, particularly in men, is also influenced by sociocultural factors. In some cultures, men will under-report ED-related symptoms due to stigma regarding sexual health. In contrast, other cultures may report sexual health problems more readily based on the culture and/or social environment where the study was conducted (Thongtang et al., 2020).

Further, Ugwumba et al. (2018) report a higher prevalence of ED among men with type 2 diabetes. The higher prevalence rates may be directly attributed to the metabolic and vascular burden that occurs with type 2 diabetes. Type 2 diabetes is typically associated with longer disease durations, obesity, hypertension, and dyslipidaemia. These conditions contribute to the worsening of both endothelial and neurological functions (Xu et al., 2019). Although the results should be viewed with caution since most of the studies included in the review did not account for potential confounding variables (e.g., age, co-morbid conditions, etc.), the lack of comparable data across countries underscores the need for additional standardized, population-based studies to determine the actual prevalence of ED among men with DM.

Ugwumba et al. (2018) evaluated the prevalence of ED in type 2 diabetes patients. They reported an alarming prevalence rate of 94.7% among male patients from South-East Nigeria, which is significantly higher than that of participants in some previous studies. These included: an 80% prevalence from Egypt (Ghanem et al., 2021), an estimate of 82.6% from the University Hospital of Libreville (Milama et al., 2022), and 86.55% in a study of Italian males (Defeudis et al., 2023), and for males from Greece, 86.7% (Katsimardou et al., 2023). Remarkably, however, Bongongo et al. (2019) reported 97.3% prevalence, consistent with the findings of Ugwumba et al. (2018).

In contrast, Thongtang et al. (2020) findings uncovered the lowest prevalence of ED for male type 1 diabetes (28.1%), which predates Tucker et al. (2023), where only 30% diagnosed between the ages of 18 and 40 were diagnosed as having ED. This is at odds with an earlier report where there were respondents who, between 40 and 60 years of age (80%), had ED at Alexandria University Hospital, Egypt (Ghanem et al.,

2021). The evidence provides a distinct difference in prevalence between type 1 and type 2 diabetes mellitus in men. However, Hylmarova et al. (2020) reported a prevalence of 28.1%, and Jombo et al. (2020) reported a prevalence of 50.2% among all males living with the general population of men with diabetes (DM living with ED). These results show an important difference in prevalence due to either being of diabetes/or other contributory risk factors that are likely to play a role in diabetes-related ED visits.

Similarly, a study from Malaysia of 385 married males living with diabetes who were aged 29 to 85 years, confirmed that only 7% did not have ED. In contrast, 27%, 30%, 17%, and 19% had mild, moderate, severe, and very severe ED, respectively. The local findings provided evidence to confirm the variability of the prevalence and severity of ED among men with DM, highlighting the need for more targeted treatment plans and assessment (Zainie et al., 2023).

In conclusion, the prevalence rates of ED among men with DM alone highlight the inconsistent nature of the condition. These collective findings require further research and targeted interventions to enhance quality-of-life improvements and improve the health outcomes and overall well-being of individuals living with diabetes and ED.

2.5 Factors Associated with Erectile Dysfunction

2.5.1 Socio-demographic Factors

Diabetes and ED are closely related and interact with different socio-demographic, clinical, and lifestyle factors. Recognising these factors is critical to developing effective management plans tailored to the patients being served. When developing diabetes-related management and intervention plans, it is vital to understand the role of socio-demographic factors in ED among patients with diabetes.

Age is one of the significant predictors of ED risk. The evidence shows that age generally increases the risk of ED in patients with diabetes (Silva et al., 2022; Thongtang et al., 2020). Age is a crucial aspect to consider when assessing and managing ED in diabetes. Age has a broader socio-demographic context and should also be considered, as it can relate to the likelihood of a more severe ED (Ghanem et

al., 2021; Nutalapati et al., 2020). This highlights the need to develop interventions tailored to diabetes clients and to consider age-specific factors to manage ED better and improve quality of life. This is because increasing age naturally compounds the vascular and neurological changes already present in diabetes, making erectile function more challenging to maintain as both ageing and diabetes contribute to reduced blood flow, diminished nerve sensitivity, and hormonal decline (Silva et al., 2022; Thongtang et al., 2020). As a result, older men with DM are exposed to a greater physiological burden, which explains the higher likelihood of more severe ED as reported in previous studies (Ghanem et al., 2021; Nutalapati et al., 2020).

In many social contexts, education is widely regarded as a crucial aspect of personal and social development. It can influence individuals' health and their ability to attain a better quality of life through multiple routes, not just academic ones. Research continues to demonstrate the importance of education about health, particularly its role in reducing and preventing chronic disease ED (Bekele et al., 2022; Thongtang et al., 2020). The lower an individual's educational attainment levels, the greater the likelihood of experiencing ER. Health disparities can be socio-demographic in nature, helping us better understand their impact on health. The study is consistent with prior research on the relationship between educational levels and improved health and mortality, which is partly attributed to the association between better lifestyle choices and a lower likelihood of ER (Raghupathi & Raghupathi, 2020).

Within the realm of economics, research on the relationship between socioeconomic status and erectile function has also been found to have significance (Fang et al., 2023). The study drew attention to how relational economic factors, diabetes management, and sexual health are interrelated (Mesfin et al., 2023). The clinical aspects discussed here encompass an accumulation of risks related to the type of diabetes and the severity of glycaemic control. Type 2 diabetes causes a greater risk of ED than type 1, and poor glycaemic control causes a greater risk of ED than reasonable glycaemic control (Hylmarova et al., 2020; Ugwumba et al., 2018). It is important to assess people with diabetes in a multidimensional way, and the studies presented their findings strongly suggest that glycaemic control predicts risk of ED (Nutalapati et al., 2020; Parmar et al., 2022).

Duration of diabetes has appeared to be a risk factor for ongoing ED, with past

studies indicating that people with longer duration of illness may be at greater risk of developing ED (Mushtaq et al., 2018; Thongtang et al., 2020; Ugwumba et al., 2018). There is a need for early assessment and continual management of diabetes duration, and consideration of diabetes duration as a risk factor for ED, which is supported by further research (Ndang Ngou Milama et al., 2022; Nutalapati et al., 2020; Sondhi et al., 2018). Complications from diabetes, such as nephropathy, introduce further risk (Silva et al., 2022; Hylmarova et al., 2020). Ndang et al. (2022) mentioned an association between nephropathy and ED. Silva et al. (2022) mentioned other complications, such as retinopathy and neuropathy, in association with ED. The more robust healthcare providers are in highlighting the duration of diabetes and its associated complications, the better the chances are of reducing the risk of ongoing ED and improving long-term patient outcomes.

Diabetes-related complications lead to progressive vascular and neurologic injury that has a direct effect on the ability to achieve an erection. For example, nephropathy results from long-standing microvascular injury, and this microvascular injury impairs penile blood flow, thereby preventing adequate vasodilatory responses needed to achieve an erection (Ndang et al., 2022). Retinopathy and neuropathy are both complications that reflect widespread endothelial dysfunction and nerve atrophy in various parts of the body, including those responsible for sexual response via the autonomic and peripheral nervous systems. The cumulative effect of worsening complications will continue to reduce circulation and reduce oxygenation of tissues, which will further increase the potential occurrence and severity of erectile dysfunction (Hylmarova et al., 2020; Silva et al., 2022).

The longer someone has diabetes, the higher their risk of experiencing ED (Shiferaw et al., 2020). These findings are strongly supported by previous studies that establish the link between diabetes and ED in male patients (Defeudis et al., 2022; Asaduzzaman et al, 2020; Nisahan et al., 2019). According to a study by Fan et al. (2021), one of the key factors that serves as a significant and reliable marker for ED among diabetes patients is the longer duration of diabetes (≥49 months). Similarly, a study by Mekonnen et al. (2021) reported that living with diabetes for an extended duration significantly increased the risk of developing ED among men with DM attending chronic outpatient departments at three hospitals in the Northwest Amhara region, Ethiopia. Understanding this temporal aspect is crucial for comprehending the

nuanced interplay between diabetes duration and the likelihood of ED development.

Additionally, obesity and excess body weight increase the risk of ED (Bekele et al., 2022; Ugwumba et al., 2018). Managing obesity is crucial for maximising treatment efficacy, given the shared pathological environment with ED (Moon et al., 2019). However, Torkamani et al. (2021) find no statistically significant relationship between sexual function factors and the standard index of male quality of sexual life in any clinical or health-related factor. Obesity is a common comorbidity with diabetes and is recognised as a risk factor for ED (Defeudis et al., 2022). Vascular diseases, particularly atherosclerosis, are significant causes of disability and death in patients with diabetes (Gandaglia et al., 2014). People with diabetes are more at risk of getting vascular disease because their blood sugar levels have been poorly controlled and higher than usual, affecting the lining of the body's arterial walls and making the inside of the blood vessels more likely to become clogged, causing them to narrow (atherosclerosis) (Scherer & Hill, 2016). Understanding these connections is crucial for a comprehensive approach to managing the complex interplay between obesity, diabetes, and the risk of ED.

2.5.2 Diabetes Complications

Erectile dysfunction (ED) is a complex symptom for those with diabetes due to the potentially different mechanisms involved. These involve physiological, vascular, and neuropathic pathways. The existing body of knowledge underscores the need to better understand these mechanisms to enhance management and improve outcomes in patients with diabetes.

ED in men with DM is a challenging situation due to the multifactorial nature of ED, including the overlap of microvascular, macrovascular, endocrine, and neuropathic factors (Defeudis et al., 2022; Hackett, 2016; Shiferaw et al., 2020). The overlap leads to issues related to sexuality (ED and sex) but also serves as an independent marker for the future presence of coronary artery disease (CAD). ED may appear anywhere from three to five years before CAD, representing a warning sign (Hackett, 2016). Acknowledging the complexity of ED in individuals with diabetes is crucial to providing timely, comprehensive healthcare management and improving outcomes.

Furthermore, complications from diabetes, such as nephropathy, pose an additional risk (Silva et al., 2022; Hylmarova et al., 2020). Ndang et al. (2022) identify nephropathy as a significant risk factor for ED, reporting an odds ratio of 12.67 (95% CI: 1.71−93.66), $p = 0.002$. Silva et al. (2022) also identified significant complications (42%, $p < 0.001$) related to retinopathy and ED, as well as neuropathy (38.4%, $p = 0.041$) and ED. This makes it clear how intricately diabetes complications are tied to increased risk for ED and directs healthcare management to effectively manage ED and determine possible connections to complications to mitigate/impact engagement for patients living with diabetes.

The impacts of diabetes are more than directional beyond blood vessels under anatomical and physiological circumstances that significantly hinder one's ability to flush blood to juvenile sexual organs, notably the penis (Gandaglia et al., 2014). This vascular damage presents a barrier for patients to achieve adequate, timely, and successful erections. Additionally, diabetes introduces neuropathy concurrently, where damage to nerves has occurred. The nerves to access an adequate erection have impaired signals directly related to the diminished patient capacity to control their repeated erections (Defeudis et al., 2015; Tamás & Kempler, 2014). The intricate interplay of vascular and neural components provides evidence of the complex nature of erectile challenges experienced by those with diabetes.

In conclusion, addressing the complexities expressed through socio-demographic, clinical, and lifestyle factors is a decisive aspect of addressing ED in persons with diabetes. Individualised approaches to education, socioeconomic support, diabetes management, and lifestyle changes are important in enhancing erectile function.

2.5.3 Early Onset and Contributing Factors

The precise correlation between ED and diabetes is multifaceted, with ED occurring as a significant complication among the adult cohort of the chronic disease. Studies have shown that ED is ubiquitous among patients with type 2 diabetes, with rates of occurrence of 35 to 70% (Gebeyehu et al., 2023). Patients with diabetes not only have greater prevalence rates of ED, but they also tend to develop the dysfunction at younger ages (Hameed et al., 2023). While ED is correlated with diabetes duration

and the intensity of the diagnosis, even psychological dimensions of ED aetiology could comprise the organic factors of vasculogenic, and neurological disease related to diabetes.

The complex association between diabetes and ED necessitates recognition by healthcare providers for prompt management and engagement. For patients, ED can even present before diagnosis, if not at least concurrently (Defeudis et al., 2022). Risk factors related to ED can include blood sugar control (Mekonnen et al., 2021), advanced age (Maiorino et al., 2014), hypertension (Hackett, 2016), or cholesterol issues (Bellad & Sahu, 2019). For instance, poor blood sugar control and risk of diabetes can culminate in early ED symptoms should the factors warrant (Defeudis et al., 2022). The relationships between risk factors and lifestyle interventions can help improve screening for ED among the diabetes population, thereby further improving overall health-related outcomes.

2.5.4 Lifestyle Factors and ED

Lifestyle factors can have an even larger impact on ED for male diabetes patients. Smoking, inactivity, poor control of blood glucose, and poor dietary habits all represent major contributors to ED risk and severity in this population (Defeudis et al., 2022).

Physical activity is a crucial factor in mitigating the impact of ED on diabetes treatment. It improves cardiovascular fitness, minimizes endothelial dysfunction, increases endothelial-derived nitric oxide (NO), reduces oxidative stress, and enhances the recruitment of endothelial progenitor cells (EPCs) for repair and cell generation. Aside from the physiological benefits of training, exercise has well-established positive effects on self-esteem and mental well-being. All of which can contribute to alleviating the psychological dimensions of sexual dysfunction (Alyafei, 2020). Research on exercise and erectile dysfunction has reported a statistically significant improvement in erectile function score (mean difference 3.85, 95% CI 2.33 to 5.37) (Andre et al., 2017).

Additionally, there is a strong relationship between lifestyle factors and ED for male diabetes patients. Smoking, inactivity, poor glucose management, and poor diet may contribute to this issue (Kikuchi et al., 2015; Maiorino et al., 2014; Mekonnen et

al., 2021). Resolutely, all the sex-related lifestyle factors must be accounted for to maintain and protect men's sexual health when managing diabetes. The analysis for these factors together must be consolidated to address better lifestyle factors that intersect the sexual health considerations males experience, managing diabetes, and ED.

2.5.5 Psychological Factors

In examining the complex interactions between diabetes and its consequences, it is recognised that diabetes affects more than just physical health, as the interplay between diabetes and ED extends well beyond physical manifestations into the phenomenon of psychological distress, indicating that a broader approach is required to understand and respond to the complexities of the association fully. Development and management of diabetes and ED present not only a physiological challenge but also reveal a more complicated set of emotional and psychological sequelae for patients that include stress and anxiety, including depression (Akbari et al., 2020).

A previous study in China with 619 subjects highlighted some of these complexities, reporting a statistically significant increase in overall psychological distress scores for the type 2 diabetes subjects compared to the control, which were also non- diabetes males (58.51% vs. 26.76%, $p< 0.001$). Another study identified a statistically significant negative relationship for the type 2 group between psychological distress and the severity of ED (Chen et al., 2017). These findings help define the relationship between psychological stress and severity of ED for the type 2 diabetes population, as well as the relationship complexity of psychological distress and ED in individuals diagnosed with diabetes.

Findings from studies appear to be generally consistent concerning the importance of psychological distress and ED, illustrating critical implications for the relationship dimension to offer further scholarly consideration. Many of the studies have identified a significant relationship between heightened levels of anxiety, increased depressive symptoms, and ED in the population of people with type 1 and type 2 diabetes mellitus (Chen et al., 2017; Jaskulski et al., 2021). Further exploration of the complexities of the relationship described above could yield esteemed clinical applications and enhance knowledge of the complexities associated with ED-experienced individuals living with diabetes mellitus.

2.6 Gaps in Existing Research and Future Directions

Research in Malaysia faces a significant challenge due to the lack of data on the prevalence of ED among patients with diabetes mellitus. A study carried out in Johor, Malaysia, reported an overall prevalence of 81.5%. However, this study was not limited to male patients with diabetes mellitus (Nordin et al., 2019). Chung et al. (2016) examined 222 male diabetics, using the SAD-MEN questionnaire, and identified that sexual dysfunction was a widespread issue in this group of patients. However, this was not the primary purpose of the study, as they were aiming to define the extent of the SAD-MEN tool to assess sexual dysfunction in men with DM.

While international studies exist (Gebeyehu et al., 2023), a deeper understanding of the Malaysian context and the tailoring of specific healthcare interventions require local data. Future research will need to focus on comprehensive studies to assess the frequency, patterns, and factors contributing to ED among patients with diabetes mellitus in Malaysia.

In addition, while several studies have discussed the difficulties patients experience when talking about issues related to ED during healthcare treatment (Ezhova et al., 2020; Forbes et al., 2017; Hadisuyatmana et al., 2023; Leonardi-Warren et al., 2016), less dialogue has been had about the challenges patients have with discussing this issue. Having a heavy workload of diabetes mellitus (Kang et al., 2022), along with an increase in the number of patients, contributes to the ED receiving less attention (Malaysian Healthcare Performance Unit, 2019).

Therefore, further research examining the challenges and management faced by patients is also needed in the Malaysian context. Thus, to address this issue, further research is needed that focuses specifically on collecting prevalence data concerning ED among male diabetes mellitus patients in Malaysia. This study would need to consider demographic factors, such as age, lifestyle factors, type of diabetes mellitus, and other factors that might affect ED. This way can get a more detailed and accurate endorsement to clarify the prevalence of ED in male diabetes mellitus patients in Malaysia. The findings of such a study provide a more explicit endorsement for managing and treating patients in the locality.

Although several gaps in knowledge about erectile dysfunction (ED) among diabetic male patients in Malaysia exist within the current body of research, the present

study directly addresses each of those gaps. First, a significant limitation in the current body of literature is the lack of prevalence data specific to Malaysia. By limiting this study to male diabetic patients at public health clinics in Kuala Lumpur, this study provided previously unavailable, context-specific prevalence rates for ED in the urban Malaysian population. Thus, it filled the epidemiological gap in the literature and better illustrates the burden of ED in this population.

Second, most prior Malaysian studies either did not investigate ED as a primary outcome or did not focus on diabetic males as a distinct subgroup. This study addressed both methodological gaps by utilizing a validated measure of ED (the IIEF-15) and by analyzing ED as the central variable. Therefore, the results provide additional specificity and detail that were previously lacking in prior research.

Third, while prior research has identified communication barriers and stigma associated with discussing sexual health issues, there is very little research that describes how these issues impact diabetic male patients in Malaysia. This study addressed this issue by including both sociodemographic and clinical factors as covariates in the analyses. As such, it demonstrated how age, education, lifestyle, and other comorbid conditions influence ED patterns in this population. In doing so, it clarified the sociocultural and behavioural factors that are responsible for ED and its under-reporting.

Fourth, the lack of local data has hindered the development of targeted interventions for practitioners. The results of this study will help close this gap by providing evidence that practitioners and policymakers can use to enhance screening practices, improve early detection of ED, and strengthen sexual health discussions as part of diabetes mellitus care. Therefore, this study fulfils two criteria: first, it identifies knowledge gaps, and second, it provides viable pathways to address them in the Malaysian context.

2.7 Systematic Literature Review Findings on Erectile Dysfunction Among Males with DM

To enhance transparency and clarity, the search and screening processes used to select relevant studies are first described, followed by a discussion of the findings. Since this thesis does not constitute a full systematic review, as no quality appraisal or meta-

analysis was conducted, this chapter describes a structured search strategy to support a comprehensive narrative synthesis of the current literature on erectile dysfunction in diabetic men.

Using the seven major databases (ResearchGate, SAGE, Google Scholar, PubMed, ScienceDirect, Web of Science, and Scopus), a comprehensive search was conducted of English-language studies published between 2018 and 2024. In addition to using each database individually, the search was also conducted utilizing a combination of keywords, including "erectile dysfunction," "International Index of Erectile Function," "male sexual health," "quality of life," and "type 1 diabetes mellitus" or "type 2 diabetes mellitus." Boolean operators (AND/OR) were utilized to narrow the search parameters. To include studies in this review, the studies had to have (a) male participants who were adults, (b) participants diagnosed with diabetes mellitus, (c) used valid measurement tools to assess the presence of erectile dysfunction, and (d) provided information about the prevalence, contributing factors, and/or quality of life related to erectile dysfunction. Exclusion criteria included (a) review articles, (b) non-empirical papers, (c) studies that were conducted with non-diabetic populations, and (d) studies that did not focus specifically on erectile dysfunction as the sole outcome variable.

The search yielded 172 records; however, 33 duplicate records were removed via automated filtering in Mendeley and manual verification. A total of 139 records remained and were screened for titles and abstracts. Of the 139 records screened, 77 studies were excluded based on the inclusion criteria. Subsequently, the remaining 62 full-text studies were thoroughly examined; however, 51 studies were subsequently excluded from further consideration during the eligibility assessment due to their failure to report erectile dysfunction data relevant to this study, the failure to distinguish erectile dysfunction from other forms of sexual dysfunction, and/or the failure to fit within the methodological boundaries of the current research. Therefore, a total of 11 studies met all of the established inclusion criteria and were ultimately included in the final synthesis. The overall process of identifying, screening, assessing eligibility, and selecting studies for inclusion in the final synthesis is illustrated in the PRISMA flow diagram in Figure 2.1.

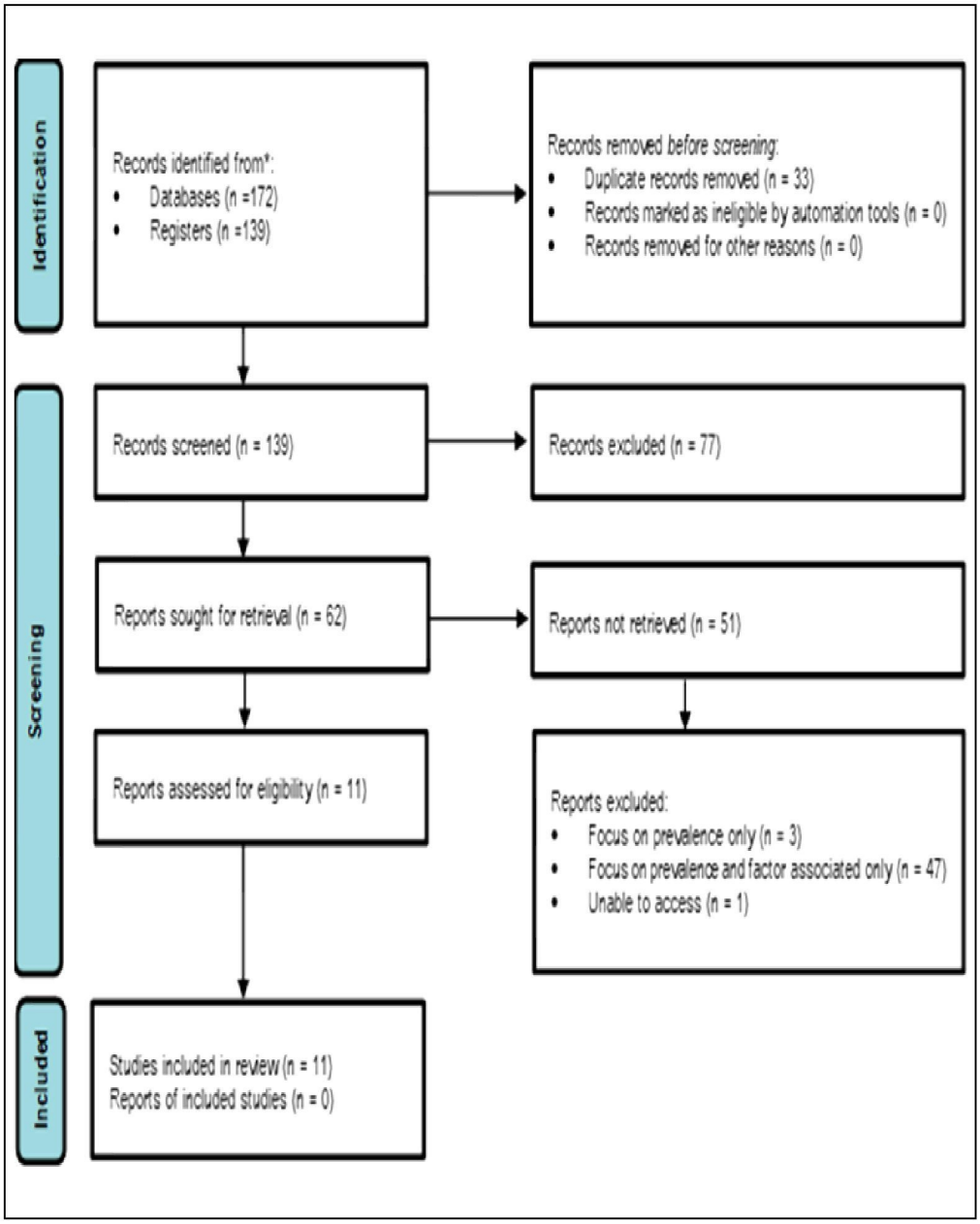

Figure 2.1: PRISMA 2009 Flow Diagram. Flow chart to summarize the selection of patent articles for the review, adopted from Haddaway et al. (2022)

The eleven studies that were selected to be included within this analysis have demonstrated an understanding of how erectile dysfunction (ED) has global prevalence and is influenced by demographic and clinical factors, how the use of measurement tools (IIEF-5 and IIEF-15), and how differences in quality-of-life outcomes occur between men who have diabetes mellitus. The structure of this chapter lends itself to a more analytical approach to the literature, particularly by offering a possible explanation for why prevalence rates of ED differ across different parts of the world.

The variability in prevalence rates for ED can be attributed to cultural influences on the willingness to disclose sexual issues, differing methods of assessment of ED, availability of health care resources, and the quality of care received for diabetes mellitus management. The lack of Malaysian-based studies investigating erectile dysfunction (ED) among diabetic males further enhances the need to undertake this research in Kuala Lumpur, which will allow for the collection of data from a culturally diverse population using a wide range of public health services.

Erectile dysfunction (ED) constitutes an important complication of diabetes mellitus in men with DM, with a marked adverse effect on quality of life. A systematic literature review was performed to synthesise current evidence regarding men with DM experiencing erectile dysfunction (ED) in terms of prevalence and factors associated with it, as well as the quality of life (QoL) impacts of erectile dysfunction (Yazid et al., 2024). The systematic literature review (SLR) aims to summarise current knowledge, identify data gaps, and demonstrate how ED influences the diabetes mellitus population. PRISMA guidelines were followed for transparency and rigour in conducting a systematic review. In total, eleven articles from 2018 to 2024 were included. Peer-reviewed studies reporting on the prevalence of ED, associated factors, and its impact on QoL in male patients with diabetes mellitus were included. The researchers searched databases (by keywords including "erectile dysfunction", "diabetes mellitus"," e.g., prevalence", "quality of life", and "risk factors"), including PubMed, Scopus, and Web of Science. With screening and quality evaluation, the selected studies presented high methodological quality and involved populations with both Type 1 and Type 2 diabetes mellitus.

The SLR showed a wide variation in the prevalence of ED in diabetic males, which varied from 28.1% to 94.7% based on glycaemic control, age, duration of disease, and accompanying comorbidities. In Type 2, studies consistently reported a higher prevalence of ED than those with Type 1. This difference can be attributed to chronic hyperglycaemia and its subsequent vascular and neurological complications (Silva et al., 2022). Furthermore, the review highlighted important risk factors for increased ED risk, including older age, longer duration of diabetes mellitus, poor glycaemic control (HbA1c $\geq$ 8.0%), obesity , and sedentary lifestyle. Other important predictors identified include smoking and the presence of hypertension or cardiovascular disease (Bekele et al., 2022). Furthermore, the above-mentioned individual clinical factors are risk factors.

ED in men with DM was consistently associated with reduced quality of life. Studies have reported that patients with moderate to severe ED have significantly lower scores in four of the physical, social, and emotional domains of QoL compared to patients without ED (Gobena et al., 2023). Psychological distress, such as anxiety and depression, was often reported, which highlights the need for integrated mental health support as well as diabetes mellitus management. The prevalent and severe forms of ED were significantly lower among patients with reasonable glycaemic control and an active lifestyle than those without, suggesting that changing lifestyle practices, such as controlling diabetes mellitus, would have significant advantages.

The SLR results underscore the importance of incorporating the physiological and psychosocial domains into the management of ED in patients with diabetes mellitus. This high variability in prevalence suggests that a holistic approach, incorporating lifestyle and mental health into routine care by healthcare professionals, may offer an advantage. Additionally, the absence of longitudinal studies highlighted in this review indicates that future studies should emphasise the evolution of ED over time and its relationship to long-term QoL. These prospective cohort studies would help fill these gaps and further our understanding of the significance of diabetes mellitus management and lifestyle modification in improving ED outcomes.

The systematic literature review revealed that ED is a common condition among men with DM, which is influenced by various surrounding factors, some of which are interdependent. Targeting these comprehensive factors with both clinical and community-based interventions is crucial for better understanding and improving patient outcomes. Moreover, increasing healthcare providers' awareness of the psychological aspects of ED can help create a more holistic approach to treatment, as this disorder affects not only the physical but also the mental aspects.

Table 2.1

Results of the prevalence of ED, factors associated with ED, and the QoL among male patients with diabetes mellitus

Author (year) Country	Study Objective	Sample size	Prevalence	Factor Associated	Quality of Life
Hylmarova et al. (2020) Czech Republic	Influence of T1DM on sexual function and hormones	57	28.1% (ED prevalence)	Diabetic nephropathy ($p = 0.008$), poor glycaemic control ($p = 0.041$)	T1DM lowers males' QoL with high rates of ED, reduced sexual satisfaction, and retrograde ejaculation.
Torkamani et al. (2021) Iran	Sexual function comparison in T2DM males	276	NA	BMI, age, and a significant impact on sexual function ($p < 0.05$)	No statistically significant differences in sexual function, including various aspects, between diabetic and non-diabetes infertile males' diabetes.
Silva et al. (2022) Sri Lanka	ED prevalence and impact in a diabetes clinic	212	79.2%	Longer diabetes duration, older age ($p < 0.001$), retinopathy ($p = 0.04$), neuropathy ($p = 0.041$)	QoL and Treatment Seeking: Despite 60.5% experiencing psychological and/or relationship effects due to ED, 85.6% did not disclose it to a health provider.
Fang et al. (2023) China	ED and socioeconomic status	1,739	NA	Lower education, income ($p = 0.02$), obesity ($p < 0.0001$), smoking habits ($p = 0.04$)	Quality of sexual life: Participants with higher family income to poverty (PIR) were more likely to report good erectile function than those with lower PIR (p-value=0.005).
Ugwumba et al. (2018) Nigeria	ED predictors in T2DM males	325	94.7%	Poor glycaemic control ($p = 0.0001$), older age ($p = 0.02$), obesity ($p < 0.0001$)	Predicts poor QoL in males with T2DM, affecting their well-being and often accompanied by low treatment-seeking behaviour.
Defeudis et al. (2023) Italy	Health literacy and ED in T2DM males	167	86.5%	Adherence to treatment linked to physical activity, diet ($p < 0.01$), family diabetes history ($p = 0.03$)	Males with T2DM and ED, lower health literacy and higher BMI worsen QoL.
Mushtaq et al. (2018) Pakistan	Hypogonadism and ED in T2DM males	160	62.5%	Severe ED linked to longer diabetes duration ($p < 0.0001$), subnormal testosterone ($p = 0.0001$)	Quality of sexual life: 40% of patients with ED suffered from some form of hypogonadism with subnormal testosterone levels. The difference in testosterone levels

Author (year) Country	Study Objective	Sample size	Prevalence	Factor Associated	Quality of Life
					between patients with and without ED was statistically significant (p-value 0.0001).
Barnard-Kelly et al. (2019) United Kingdom	Psychosocial impact of ED in diabetes	100	66%	Loss of self-esteem (49%), relationship issues (62%), loneliness (46%)	Diabetes and associated sexual health issues have a considerable negative psychosocial impact. Specific aspects affecting QoL include self-esteem, relationships, attractiveness, and feelings of loneliness.
Thongtang et al. (2020) Thailand	ED predictors in T2DM males	582	71.5%	Higher education linked to better QoL ($p < 0.05$)	Overall QoL was moderate (mean = 95.42 ± 11.39). Domain scores: Psychological and Environmental were good (23.84 ± 3.42, 31.4 ± 3.98), while Social Relationships and Physical were moderate (10.77 ± 1.93, 24.9 ± 3.13).
Jombo et al. (2020) Nigeria	Diabetes with ED and QoL	103	50.2%	Diabetes duration ($p = 0.04$), poor glycaemic control ($p = 0.02$), depression ($p = 0.002$)	ED was found to be significantly associated with psychological (depression) impact (p-value = 0.002).
Bekele et al. (2022) Ethiopia	ED magnitude and QoL in T2DM males	307	82.1%	Older age ($p = 0.023$), comorbidities ($p = 0.001$), type of diabetes ($p = 0.001$)	Quality of sexual life: About half of the participants (48.2%) had difficulties with penetration after achieving an erection. Approximately 39.7% of participants reported never being satisfied with sexual intercourse.

2.8 Theoretical Framework

2.8.1 Theoretical Framework of Perceived Susceptibility within the Health Belief Model

The Health Belief Model (HBM) is a psychological theory developed in the early 1950s by social psychologists at the U.S. Public Health Service to understand individual health-related behaviours, particularly why individuals were reluctant to take

disease-prevention measures or screening tests (Murphy, 1977; Rosenstock et al., 1994). The model focuses on individual beliefs about health conditions and predicts individual health-related behaviours. Its key components include perceived Susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. The model has been widely used to guide health promotion and disease prevention programs, and it can be used alone or in combination with other theories or models (Ajzen, 2012; Kacunko, 2018).

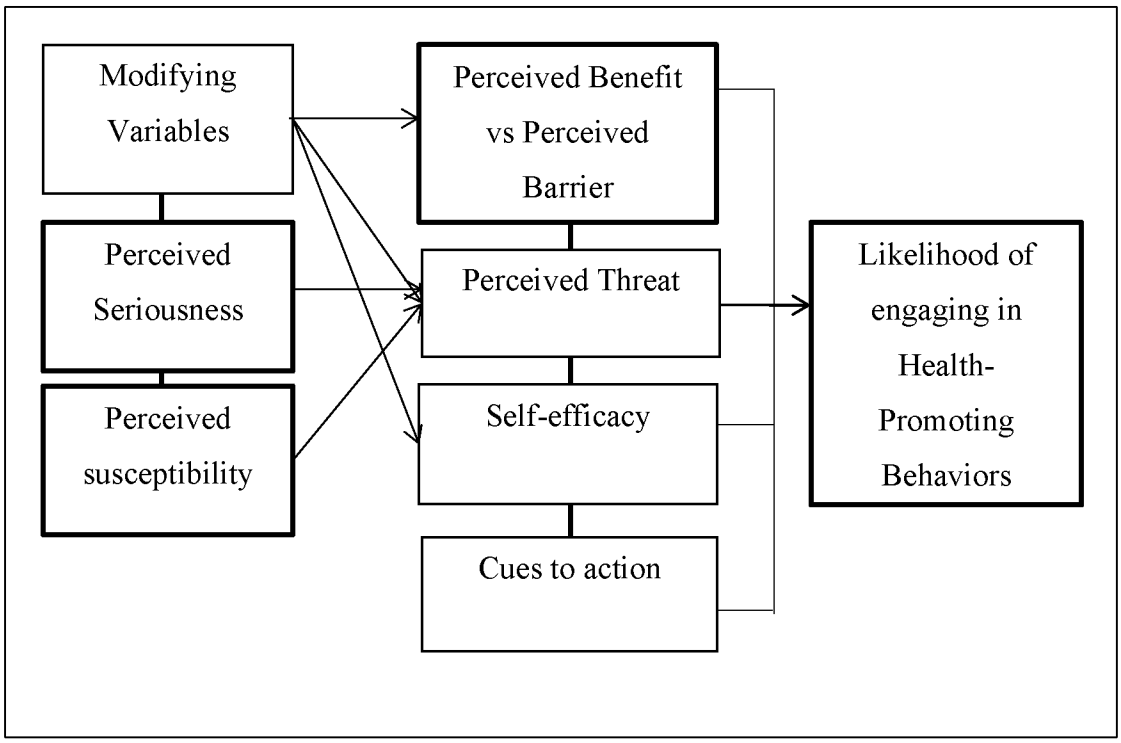

Figure 2. 2: The Health Belief Model (Sources: Rosenstock 1974)

The HBM posits that an individual's belief in their vulnerability to illness or health issues, along with their belief in the effectiveness of recommended health behaviours, are the two primary components of health-related behaviour (Ajzen, 2012). The HBM has been applied to various health-related behaviours, including HIV risk behaviour change (Rosenstock et al., 1994). The HBM has undergone modifications over time to address its limitations and make it more suitable for diverse populations and different types of health behaviours. The HBM suggests that an individual's decision to engage in a health behaviour is influenced by a combination of factors, including:

I. Perceived Susceptibility: The individual's belief about their likelihood of

developing a health condition or disease.

II. Perceived severity: The individual's perception of the seriousness of the health condition or disease.

III. Perceived benefits: The individual's belief about the positive outcomes or benefits of taking a specific health action.

IV. Perceived barriers: The individual's perception of the obstacles or difficulties in taking a specific health action.

V. Cues to action: These are factors that prompt an individual to act, such as reminders, prompts, or social support.

In the context of using the Health Belief Model (HBM) with a single dominant factor, namely Perceived Susceptibility, to link factors causing ED, focus on how individuals' perceptions of their risk for experiencing ED influence their actions towards the disease. In the context of using the Health Belief Model (HBM) with a single dominant factor, namely Perceived Susceptibility, to link factors causing ED, one can focus on how individuals' perceptions of their risk for experiencing ED influence their actions towards the disease.

First, men with DM may demonstrate greater vulnerability to ED if they perceive their diabetes has lasted a long time, as they may believe that having a longer duration of diabetes mellitus means that they have a greater risk for complications that increase their risk for ED. Second, individuals with poor diabetes mellitus control levels may perceive themselves as more vulnerable to ED. Individuals with poor control of their blood sugar levels may believe that unstable blood sugar levels mean that they have a higher risk for ED. Third, individuals with high blood pressure may perceive they are more vulnerable to ED, particularly if they believe high blood pressure is a risk factor for sexual health problems. Similarly, individuals with other chronic health problems, such as heart problems or kidney problems, may also have an increased perception of vulnerability to ED because they are aware that complications of chronic health problems increase their risk for ED.

Moreover, active smokers may also view themselves as being at an increased vulnerability for having ED because they are aware of the relationship between smoking and sexual health problems in general. Likewise, alcohol abusing individuals may perceive themselves as having increased vulnerability to ED because they are generally aware of the adverse effects of alcohol on sexual health. In addition, individuals who

are sedentary or have poor physical activity levels may also view their food choices as a situation of increased vulnerability to ED, as they are aware that an unhealthy lifestyle is associated with increased sexual health problems. Finally, the use of certain drugs, or medications, especially drugs with the known side effects of having ED, can also cause the individual to have an awareness of increased vulnerability. In summary, the consideration of the duration of diabetes mellitus, diabetes mellitus control levels, if high blood pressure is present, if other chronic diseases are present, smoking status, alcohol consumption levels, physical activity levels, and drug or medication use are all influences on individuals' perceived Susceptibility to ED according to the HBM.

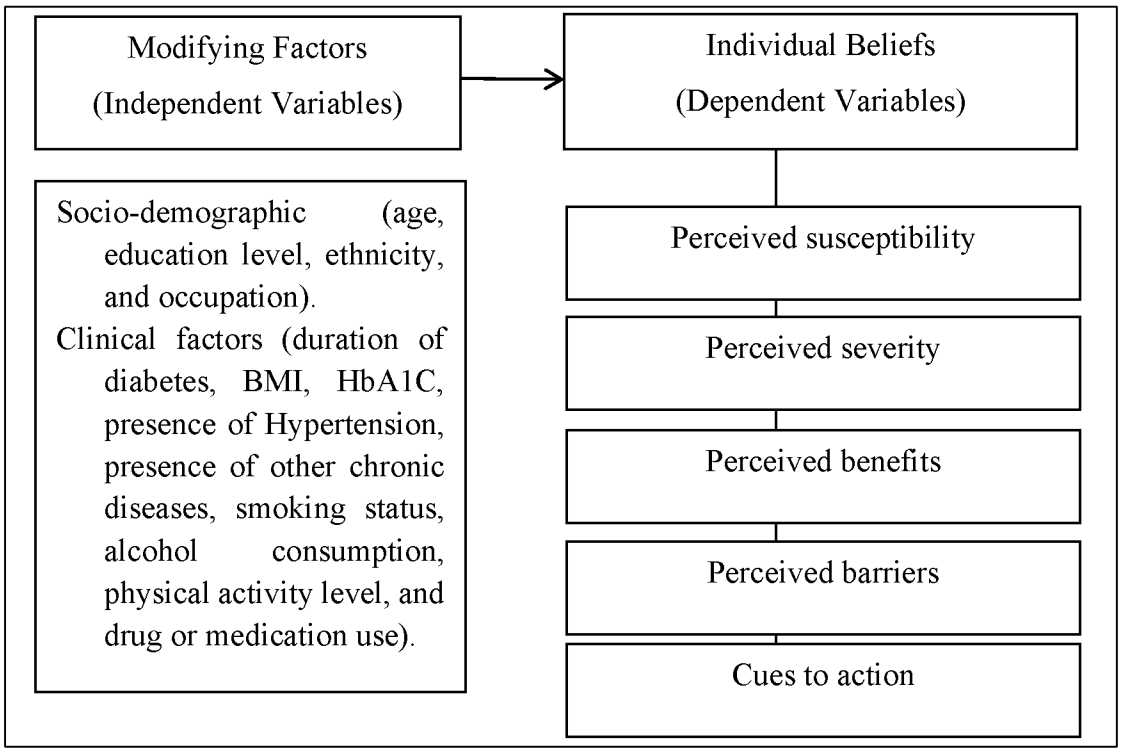

Figure 2.3: Perceived Susceptibility in Health Belief Model and ED Factors

2.8.2 Utilizing the HBM and Health-Related Quality of Life to Explore the Relationship between ED and QoL

Health-related quality of life (HRQoL) is a multidimensional concept that represents the multiple dimensions of an individual's physical, mental, and social well-being that occur within the individual's culture, beliefs, and values. Several HRQoL models have emerged to inform research in this area, such as Wilson and Cleary's model, Ferrans and colleagues' model, and the World Health Organisation model

(Bakas et al., 2012). These HRQoL models have informed reviews, observational studies, and the development of instruments. This study could later derive disease-specific models from these commonly employed HRQoL models, and this study suggests utilising one of these models unless there are justifiable reasons to use something else (Cepeda-Valery et al., 2011).

HRQoL can be described by several dimensions that capture an individual's physical, mental, and social well-being. This study can base these dimensions into three broad categories - physical, mental, and social - where the physical domain includes pain, fatigue, and physical function; the mental domain includes depression, anxiety, and cognitive function; and the social domain includes social support, social function, and social participation (McCaffrey et al., 2016). Other notable dimensions of HRQoL include emotional, occupational, spiritual, intellectual, environmental, and financial aspects of that individual's well-being. HRQoL is meaningful for considering the larger burden of ED on patients' overall well-being.

HRQoL will enable researchers to examine how ED can impact many aspects and constructs of health-related quality of life, well beyond the classical physiologic phenomena. Considering the HRQoL theoretical domain related to ED is essential for understanding the full impact of this disease on individuals. The health belief model (HBM) provides a theoretical framework for understanding how individuals recognise and respond to health issues, such as ED. The focus on perceived Susceptibility in the HBM provides insights into how an individual perceives they may be at risk of developing ED and how these perceptions shape their behaviours regarding the condition.

HRQoL is significant for understanding the overall experience of ED on individuals' lives. Considering multiple HRQoL constructs will enable researchers to assess how these multifaceted implications are operationalised well beyond their physiological expression. Understanding the theoretical HRQoL with ED is important for understanding how ED can affect individuals holistically. The HBM provides a theoretical basis for interpreting individuals' perceptions and behaviours related to health matters. The HBM addresses perceived Susceptibility, which gives insight into how individuals perceive their risk of developing ED and how these perceptions influence actions that could help manage the condition. By integrating the HBM into

the HRQoL theoretical framework, this study aims to advance existing knowledge of how individuals' perceptions of ED measures and HRQoL interact.

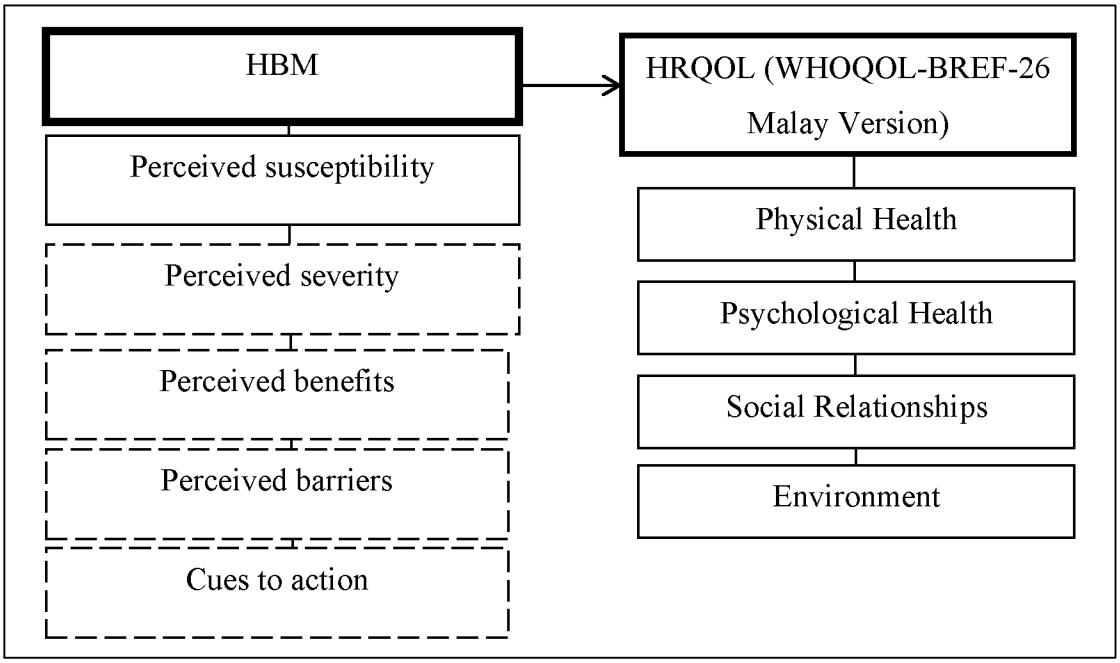

Figure 2.4: Perceived Susceptibility in Health Belief Model and HRQoL theory

2.8.3 Conceptual Framework of the Study

This study extends the theoretical framework by incorporating HBM to examine how perceptions of ED relate to HRQoL. In the context of the HBM, perceived Susceptibility is an important factor in determining individuals' perceptions of their susceptibility to ED. Perception of Susceptibility to ED can be affected by factors such as duration and control of diabetes mellitus, the presence of high blood pressure, and other health conditions. This study seeks to understand the implications of various factors on individuals' perceptions of Susceptibility to ED and how these perceptions subsequently translate into HRQoL by assessing how they shape a person's perception of ED and their high risk of developing the condition.

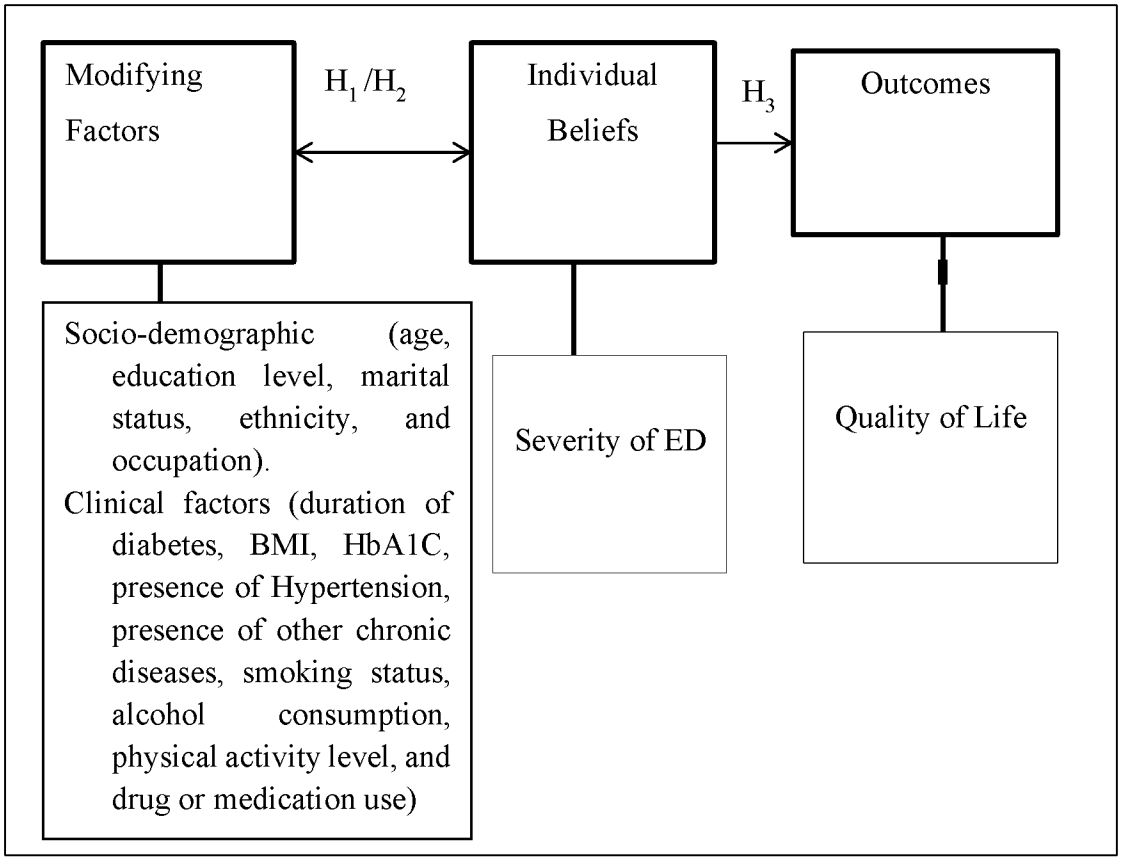

Figure 2.5: Conceptual framework of study

2.9 Summary

This study provides an in-depth investigation into men with DM, exploring the correlation between the two conditions. As discussed, through the introduction of the theoretical framework and literature review, this study understands that diabetes mellitus plays a significant role in the occurrence and management of ED. Within the HBM framework, perceived Susceptibility stands out as an important construct relative to how individuals determine their risk for ED and how such perceptions affect their behaviours for treatment of the condition. In addition, this study describes factors associated with ED, including socio-demographic, clinical, and quality-of-life factors. By understanding these factors, researchers can design more effective management strategies to improve the quality of life for male patients with diabetes mellitus who experience ED. In conclusion, this study lays a solid foundation for further research in this field, while emphasising the need for more specific local studies and a holistic management approach.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides an exhaustive detail of the processes and methods used to undertake the present research study. The chapter discusses the study context, research design, target population, and sampling method, all of which are equally important to ensure the research findings are accurate, valid, and consistent. A description of the tools and instruments used to collect the data is also included in this chapter, including the purpose and structure of the research instruments and how they relate to the research question.

Ethical issues are richly detailed in this chapter to ensure alignment with recommended research ethics and participant rights to confidentiality. In addition, the chapter presents the findings of a pilot study conducted prior to data collection, which was designed to assess the validity and reliability of the instruments used. Finally, this chapter presents an overview of the data analysis plan, outlining the statistical method used to synthesize, interpret, and draw conclusions from the collected data. The chapter justifies the research methodology undertaken and enables the researchers' representativeness, credibility, and rigour in the study.

3.2 Study Location

All clinics in this study were governed by Jabatan Kesihatan Wilayah Persekutuan Kuala Lumpur dan Putrajaya (JKWPKL&P). Under the JKWPKL&P structure, there are five central District Health Offices (Pejabat Kesihatan Daerah, PKD): PKD Kepong, PKD Titiwangsa, PKD Cheras, PKD Lembah Pantai, and Putrajaya Health Office. Each district manages approximately 20 government health clinics that provide primary healthcare services to communities within and around Kuala Lumpur.

This study focused on only three PKDs: PKD Lembah Pantai, PKD Titiwangsa, and PKD Kepong. The Tanglin Health Clinic was selected from PKD Lembah Pantai. The selected sites from PKD Titiwangsa were the Kuala Lumpur Health Clinic, Kampung Pandan Health Clinic, and Setapak Health Clinic. Lastly, PKD Kepong operated three clinics: Sentul Health Clinic, Segambut Health Clinic, and Jinjang Health Clinic. The selected PKDs from the

Department of Health, Kuala Lumpur and Putrajaya (JKWPKL&P), were important considerations for executing the study and for ensuring the implementation was both feasible and representative.

The selection of these three District Health Offices was deliberate and well-reasoned. First, the choice of the PKDs was influenced by the relatively larger number of patients with diabetes mellitus in those respective locales. The researchers felt confident that, with the selection of the PKDs, the patient's load was high enough to potentially recruit the required number of participants to reach the estimated sample size. This, the researchers anticipated, would yield valid and generalizable findings. Furthermore, information and suggestions from health officials from JKWPKL&P were further supported in the site selections. Health officials with comprehensive knowledge of the clinic landscape administration provided practical advice regarding the operation and accessibility of clinics.

Just as crucial in this process were the local health administrators, who contributed valuable insights into the care of the patients in their care and the operations of the clinics they oversaw. In this capacity, they guided the researchers in determining their clinic sites. Their advisory role described the collaboration of public health practitioners and researchers while also capturing the diverse knowledge base of these stakeholders as a joint effort towards a shared goal.

Exclusion of PKD Cheras and Putrajaya Health Office from the sampling framework was due to specific geographical and administrative factors. Putrajaya, the federal administrative capital of Malaysia, is administratively separate from the Kuala Lumpur territory. Cheras is located at the border between Selangor and Kuala Lumpur, both a geographical and an administratively distinct area. These factors could create logistical challenges or indicate differences in methodologies related to geographical location or clinic type. Therefore, both sites were dismissed for methodological and operational purposes related to the study.

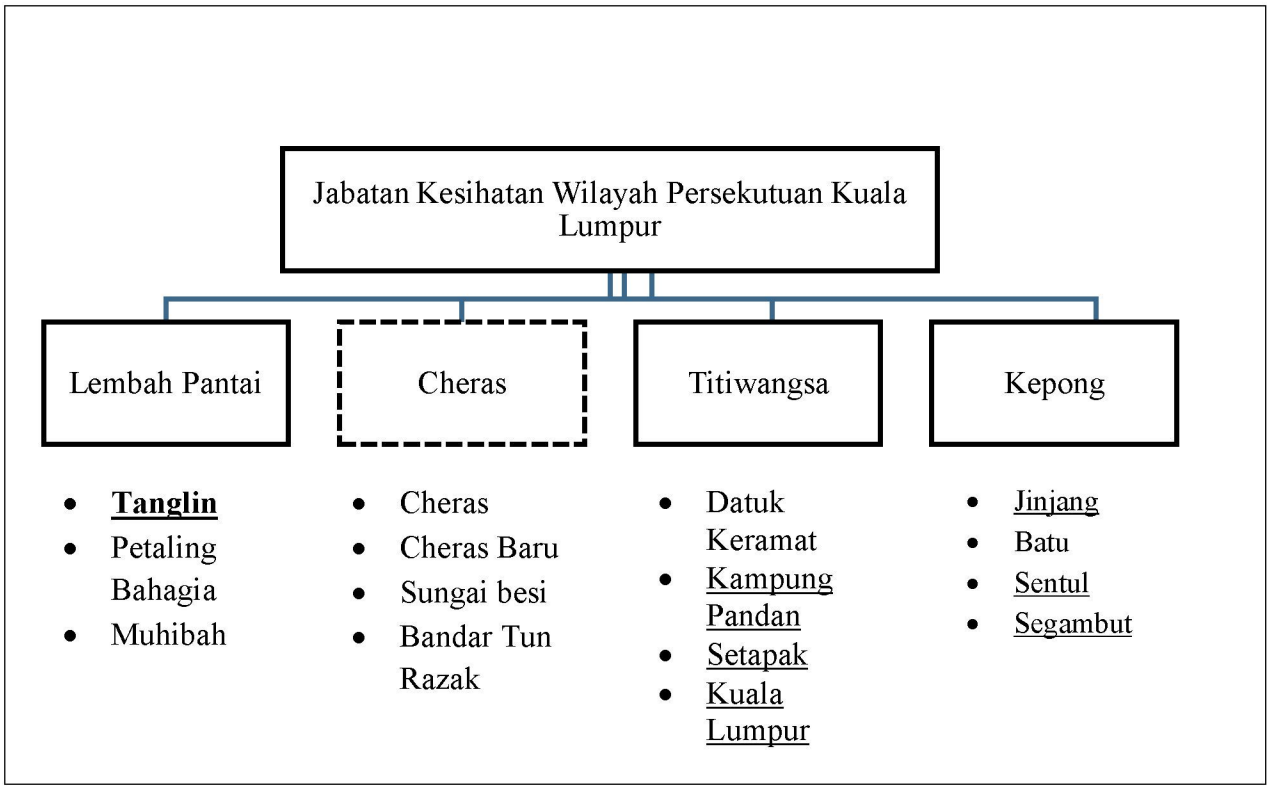

Figure 3.1: Health clinics in the vicinity of Kuala Lumpur and Putrajaya

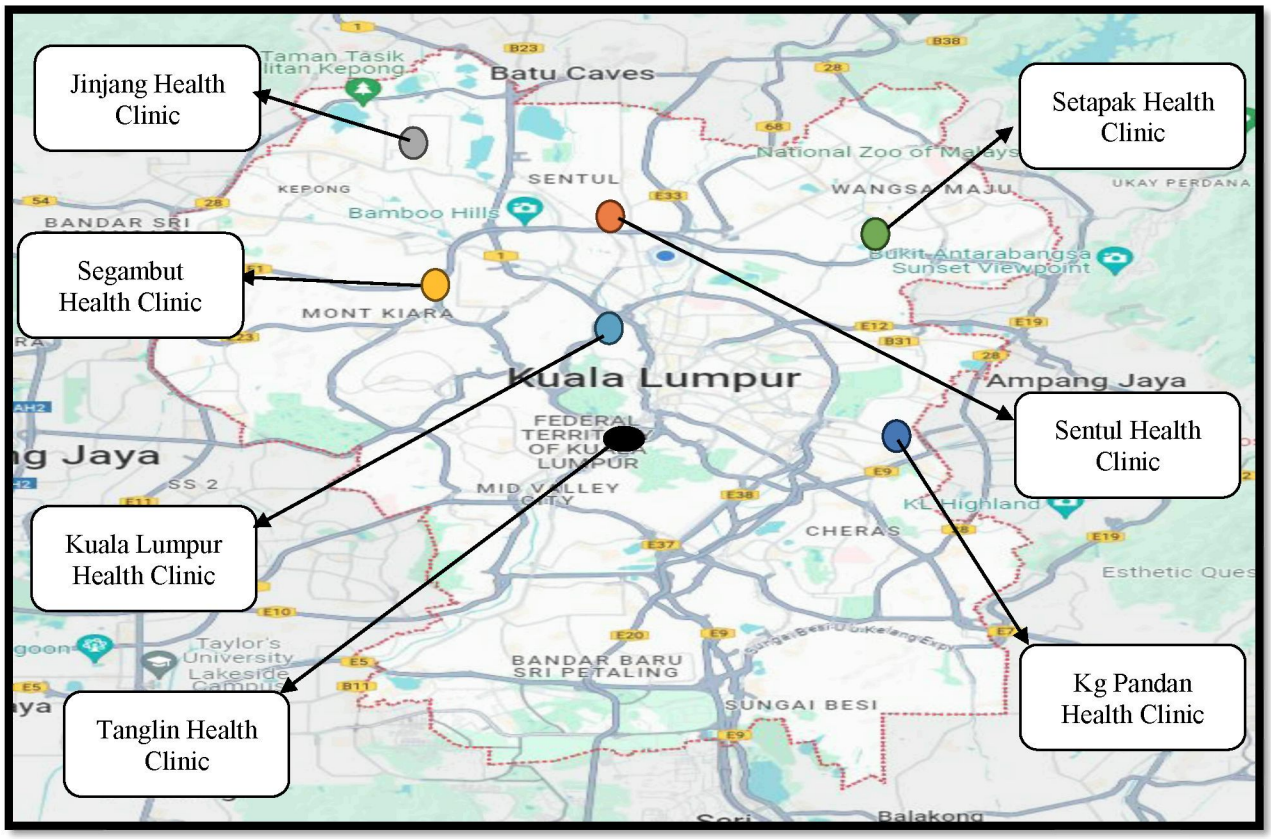

Figure 3.2: Selected health clinic locations in KL based on maps (Source: Google Maps)

3.3 Study Design

A quantitative research method was the primary approach used in this study. Researchers wanted to use a quantitative approach to generate basic numerical evidence about the research issue, specifically the incidence of erectile dysfunction among male patients with diabetes mellitus. A quantitative method enabled researchers to gather measurable, objective data that could be analysed statistically and interpreted in terms of patterns, relationships, and trends associated with the variables of interest.

The study employed a descriptive cross-sectional research design. The descriptive design is more frequently used when researchers wish to describe characteristics or phenomena without altering them (i.e., through an intervention). The researchers relied on structured surveys or questionnaires to collect numerical data for variables of interest, explicitly aligned with the study's purpose. The researchers were able to obtain critically valuable demographic, clinical, and quality-of-life data, as well as measure the features and severity of erectile dysfunction in the study population.

Using structured surveys offered consistency in data collection, increasing the reliability of the findings. By utilising exclusively quantitative methods, researchers permitted respondents to select unambiguous responses, supplementing the statistical analysis plan in this report. This also enabled researchers to identify relationships between variables and significant patterns. As noted previously, each questionnaire cannot rely solely on a quantitative approach. However, the study form was based on the researchers' use of a quantitative descriptive design, which encompassed a bounded data-collection period from January 2025 to February 2025. The use of surveys provided a suitable and expedient means to elicit relevant information from respondents over the defined time interval. Because the questionnaire method was structured and the study did not demand selection from within multiple clinics, the data collection process was consistent with the study's aims and objectives. Subsequently, all respondents provided relevant and timely feedback over a realistic collection period.

3.4 Study Population

The study population was defined by participants' biological sex and diabetes mellitus status. The focus for this study was on male patients diagnosed as either type 1 diabetes mellitus (T1DM) or type 2 diabetes mellitus (T2DM). This study was directed towards only this population because of the direct importance it had on the aims of the research to investigate the prevalence of erectile dysfunction (ED) and factors associated with ED in diabetes men with DM. Hence, the study group comprised male patients of confirmed diabetes, as they are known to carry a much greater risk of ED than diabetes cases in the population.

Diabetes mellitus, whether classified as type 1 diabetes mellitus (T1DM) or type 2 diabetes mellitus (T2DM), has established pathophysiological mechanisms involving both physiological elements contributing to the risk of ED. Type 1 diabetes mellitus is characterized by the autoimmune destruction of the pancreatic islet beta cells, resulting in absolute insulin deficiency. Type 2 diabetes mellitus is characterised by insulin resistance and progressive beta-cell dysfunction, leading to a relative insulin deficiency (Siew Peng et al., 2020). Both T1DM and T2DM are associated with long-term complications that potentially involve vascular, neurological, and endocrine systems, which in turn have important implications for the development of ED.

In addition to the physiological risk relationship of diabetes mellitus and ED, there are psychological links as well as lifestyle overlay factors. Chronic disease states such as diabetes mellitus are often associated with emotional stressors, anxiety, and depression, which can all compound sexual dysfunction. Furthermore, behaviours such as a sedentary lifestyle and poor dietary habits change; hypertension and dyslipidaemia-associated comorbidities are likely associated with diabetes in men.

Understanding the lived experiences and alterations of male diabetes patients regarding how ED associated with diabetes affected their experience was relevant to a broadly identified public health implication. Therefore, given that the study was interested in male experiences, the male participants were currently managing their diabetes and receiving treatment at selected government health clinics in the Kuala Lumpur region. As such, the findings from this study cohort could inform policies aimed at addressing this group of men, particularly those focused on enhancing their quality of life and sexual health.

3.5 Study Sample

3.5.1 Sample Size Population

According to Raosoft's sample size calculator (2004), an estimate based on the total active follow-up statistics for 2024 suggests that approximately 13,165 male diabetes mellitus patients were actively followed up (N=32,269); the researchers require 374 male diabetes mellitus patients (N=32,269) in our study. This calculation considered a 5% margin of error, a 99% confidence interval, and a 50% distribution rate. The selected health clinics employed stratified sampling to ensure representative selection until the target was reached. This adjustment was made to mitigate any potential deficiencies in the sample size that could arise during the study, ensuring the reliability and validity of the research findings.

X=Z (c/100)2r(100-r)

n= N x/ [(N-1) E2+x]

E =Sqrt [(N-n) x/n(N-1)]

N =the population size

n =sample size

E=margin error

r =the fractions of error you are interested in

Z (c/100) =the critical value for confidence level c

(Sample Size Calculator by Raosoft, Inc.,2022)

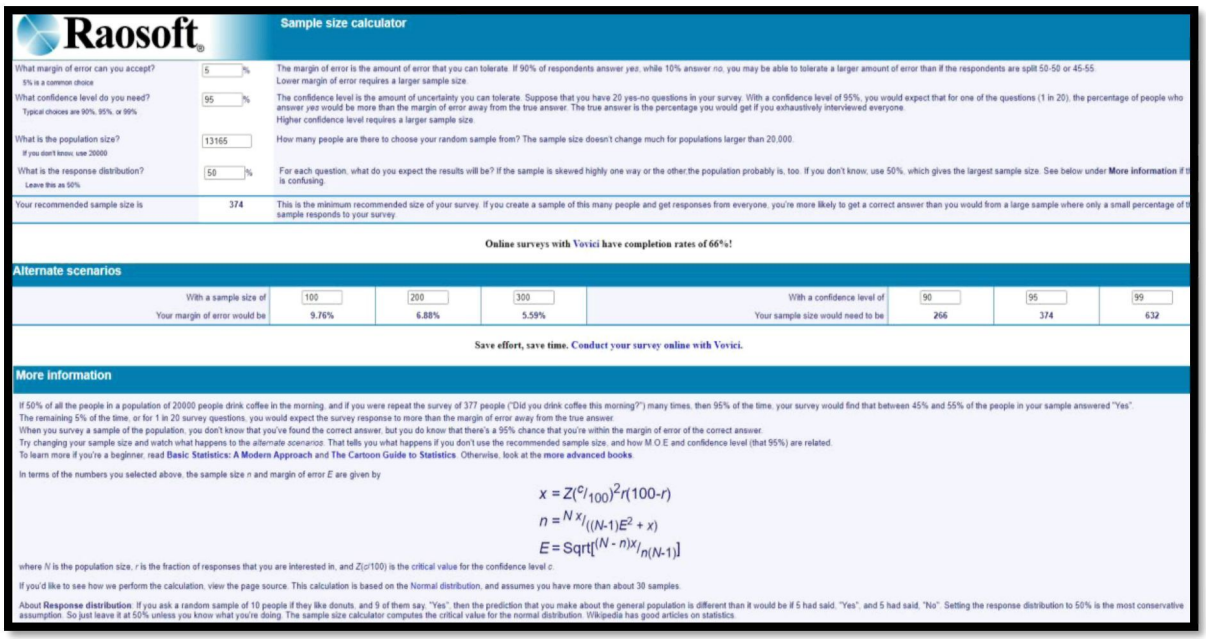

Figure 3.3: Raosoft Inc. Calculated Sample Size

3.5.2 Sampling Methods

A multistage sampling technique was employed in this study. At the initial stage, purposive sampling was applied to define the study population, which was restricted to male patients diagnosed with diabetes mellitus who attended selected government health clinics in Kuala Lumpur. This approach ensured that the study focused specifically on the target group relevant to the research objectives.

Following this, stratified proportionate sampling was conducted based on the patient load in each participating clinic. This stratification was necessary to ensure proportional representation from both larger and smaller clinics, thereby reducing the risk of over- or under-representation of specific sites within the urban setting.

Within each stratum, simple random sampling was used to select respondents, ensuring that every eligible patient in the sampling frame had an equal chance of being chosen. However, in practice, the final recruitment process also reflected elements of convenience sampling, as only patients who were present at the clinic during the data collection period and consented to participate were included in the study.

The use of purposive, stratified proportionate, and simple random sampling techniques, combined with the practical realities of convenience sampling, provided a balanced and feasible approach to obtaining representative data. This method enabled the study to capture a nuanced picture of erectile dysfunction prevalence among urban male diabetes mellitus patients, while ensuring that the sample was both practically attainable and reflective of the population of interest.

The study included 374 male patients, including 38 participants from the pilot phase. This number was deemed sufficient to achieve the study's objectives and to conduct the appropriate statistical analyses required to report the prevalence of erectile dysfunction and its associated factors.

Table 3.1

Number of men with DM

Health Clinic	Number of male patients with diabetes mellitus	Ratio (%)	Sample size	
			Pilot study	Actual sample
Kuala Lumpur	980	13.6	5	51
Sentul	684	9.5	4	36
Jinjang	1932	26.9	10	101
Setapak	1037	14.4	5	54
Kampung Pandan	561	7.8	3	29
Tanglin	1994	27.7	11	104
Total	**13165**	**100**	**38**	**374**

Sources: JWPKL& Putrajaya database

3.5.3 Inclusion and Exclusion Criteria

The study had strict inclusion criteria to select a defined sample of participants that accurately represented the characteristics of the target population. First, this study included only male patients who were diagnosed with diabetes mellitus (regardless of Type 1 or 2) and were married. In addition to confirming medical diagnosis, this study required all participants to be married. The rationale for this selection criterion was that it would reflect a defined context in which erectile dysfunction (ED) could be measured appropriately (as it related to sexual activity while married) and would provide an everyday basis for further comparison of outcomes that would reflect a defined social structure.

Admitting that the sample of only married men limits the applicability of the data to the broader population of men with DM in Kuala Lumpur (including unmarried, divorced, or widowed individuals) is acknowledged as a limitation in terms of the external validity of the findings. To address the need for internal validity and to support consistent sexual behaviour across participants who meet the IIEF-15 criteria, the choice of only married men was necessary. While the findings may not be representative of all men with DM, they are still very relevant to primary care practices since many men with sexual problems will be seeking medical attention. Therefore, the findings of this study should be generalizable to married men with DM.

However, by limiting the sample to married men, the researcher has increased the reliability of estimates of the prevalence of sexual functioning issues and strengthened the evidence supporting the relationship between sexual functioning issues, quality of life, and

diabetes mellitus-related clinical factors. The results from this study provide a significant foundation for further studies that may expand to include single men or use a qualitative approach to examine sexual health issues experienced by different types of diabetic patients.

Second, participants had to be at least 18 years of age to ensure that they possessed the cognitive capacity to provide informed consent and engage meaningfully in the study. Future ethical reviews are likely to endorse research that includes only legally adult individuals. It was essential for participants to understand the study, its implications, objectives, procedures, and their rights as research subjects.

The last inclusion criterion was that all participants were actively seeking management and treatment for diabetes mellitus at selected government healthcare clinics in Kuala Lumpur. This requirement ensured a similar experience with the health system, the treatment setting, and standard medical care practices. Additionally, it also means that participants had, at a minimum, some clinical engagement, which would impact both the diabetes mellitus management and the experience of the ED.

Conversely, the study undertakings also stipulated several exclusion criteria to ensure data internal consistency, thereby minimising the risk of confounding variables. First, patients with acute physical or mental illness that would likely interfere with their ability to engage meaningfully were excluded to ensure all participants could fully engage with the research instruments and provide reliable, verifiable data. Second, individuals who lacked basic competency in both English and Malay, the two languages used in the data collection tools, were excluded to prevent misinterpretations during data collection and to facilitate a smooth dialogue between researchers and participants.

Thirdly, individuals experiencing cognitive impairments were excluded from the study. This was because cognitive impairments may impede that individual's learning and ability to answer sensibly and consistently. Accepting individuals with cognitive impairments would raise questions about the validity of any conclusions drawn from the data, as the study did not assess the intended population. Finally, individuals with a history of psychiatric disorders were excluded, as these disorders could precipitate confounding variance when attempting to isolate the diabetes mellitus factors impacting ED. Those psychiatric conditions could influence the self-reporting of ED symptoms as valid or reliable, which further extinguished any attempted interpretations of the findings.

To further strengthen selection rigour, the researchers assessed participant eligibility

through a multidisciplinary team of clinicians, including physicians, psychologists, and psychiatrists. Each professional provided consultation when needed to determine patient eligibility based on clinical history, cognitive function, and mental state. Their involvement ensured recruitment remained clinically relevant, ethically responsible, and responsibly aligned with the study's purpose. The systematic application of inclusion and exclusion criteria added credibility and integrity to the research findings.

3.6 Instrument Tools

3.6.1 Questionnaires

The researchers used a questionnaire divided into three sections: Part A, Part B, and Part C. Part A collected respondents' socio-demographic and clinical data, comprising 13 questions. Socio-demographic variables included age, the highest level of completed education, ethnicity, and occupation (Table 3.2). Adding this information can help analyse differences in socioeconomic status and cultural background that may influence the study's findings.

In contrast, Table 3.3 presents clinical data-related variables, including BMI (body mass index), duration of diabetes mellitus, HbA1C level, coexistence of high blood pressure, other chronic diseases, smoking status, alcohol consumption, physical activity level, and use of drugs or medications. These factors examine various aspects of participants' health, including medical history, lifestyle behaviours, and general health characteristics.

Table 3.2

Part A; List of Variables in the Study (Socio-demographic)

No	Variable	Type of Question	Explanation
1	Age (years)	Open-ended numerical	Participants provide their age in years, enabling specific, quantitative responses.
2	BMI (Body Mass Index)	Open-ended numerical	Participants provide their weight and height, which are used to calculate BMI for quantitative data.
3	Education Level	Multiple-choice or categorical	Participants select their highest level of education from predetermined categories to facilitate simplified data categorization.
4	Ethnicity	Multiple-choice or categorical	Participants choose their ethnicity from predetermined categories to examine potential ethnic-

No	Variable	Type of Question	Explanation
			based variations.
5	Occupation	Multiple-choice or categorical	Participants select their current occupation from predefined categories, aiding in understanding socioeconomic factors.

Table 3.3

Part A; List of Variables in the Study (Clinical data)

No	Variable	Type of Question	Explanation
1	Duration of diabetes mellitus	Open-ended numerical	Participants provide the number of years since diabetes mellitus diagnosis, offering quantitative data.
2	HbA1C	Open-ended numerical	Participants provide the number of years since diabetes diagnosis, offering quantitative data.
3	High Blood Pressure	Binary (Yes/No)	Participants indicate whether they have high blood pressure, providing straightforward categorical data.
4	Other Chronic Diseases	Binary (Yes/No)	Participants indicate if they have other chronic diseases, yielding categorical data.
5	Smoking Status	Binary (Yes/No)	Participants specify their smoking status, providing categorical information on a known risk factor.
6	Alcohol Consumption	Binary (Yes/No)	Participants indicate their alcohol consumption, offering categorical data on a potential lifestyle factor.
7	Physical Activity Level	Multiple-choice or ordinal	Participants select their physical activity level from predefined categories, providing categorical or ordinal data.
8	Drug or Medication Use	Binary (Yes/No)	Participants specify if they take medications, providing categorical information.

The International Index of Erectile Function (IIEF-15) is a 15-item, self-administered questionnaire developed by Dr. Raymond C. Rosen and colleagues in 1997 (Rosen et al., 1997). Dr. Rosen, a leading researcher in sexual medicine, sought to develop a short, robust test to assess male sexual function as a whole. The questionnaire has been linguistically validated in 10 languages, including a Malay version validated in Malaysia (Quek et al., 2002). The IIEF-15 employs a Likert scale approach for responses, with participants indicating their level of agreement on a scale of 1–5 (ranging from "Strongly Disagree" to "Strongly Agree" or "Never" to "Always"). It consists of 15 questions organized into five subdomains: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall

satisfaction. The questions on each subdomain cover various aspects of male sexual function, providing a comprehensive perspective.

Permission to use the Malay version of IIEF-15 was likely required from the copyright owner or the organization overseeing the translation and validation process of the questionnaire in Malay. Generally, it would be best to seek permission from those responsible for the linguistic validation of the IIEF-15 in Malay, especially the researchers who conducted the validation study in Malaysia (Quek et al., 2002). In particular, the International Index of Erectile Function (IIEF) is a 15-item questionnaire that covers five domains of male sexual function: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction. A score below 25 for erectile function is indicative of the presence of ED, while patients may be further classified into five categories according to the ED severity: mild ED, for erectile function scores from 22 to 25; mild to moderate ED, for erectile function scores from 17 to 21; moderate ED, for erectile function scores from 11 to 16; and finally severe ED, for erectile function scores from 6 to 10.

The WHOQOL-BREF, developed by the World Health Organization (WHO) (WHOQOL-BREF, 1996), is a condensed version of the WHOQOL-100 questionnaire designed to assess the quality of life in individuals and populations. Comprising 26 questions distributed across four domains, which are Physical Health, Psychological, Social Relationships, and Environment. Respondents provide their perceptions on a 1-5 Likert scale, where one indicates "disagree" or "not at all." At the same time, five signifies "completely agree" or "extremely."

Scores for each domain are calculated by aggregating the minimum item scores and multiplying the result by 4. The replacement of minimum scores facilitates handling missing data, substituting missing items with the minimum scores of non-missing items within the same domain when there is no more than one missing value per domain. Researchers are not required to seek permission from the WHO to utilize the WHOQOL-BREF instrument in English, as it is widely available. However, permission has been obtained from Hasanah et al. (2003) to use the questionnaire in Malay as of 1 September 2024 (Appendix 2).

The WHOQOL-BREF is one of the most widely used, psychometrically robust, and clinically relevant measures of quality of life for people with chronic conditions such as type 2 diabetes mellitus and erectile dysfunction (ED). Use of the WHOQOL-BREF in this study can be justified based on at least four criteria.

Firstly, while erectile dysfunction may have primarily sexual and biomedical components, it also has a significant impact on an individual's overall well-being (i.e., physical functioning, emotional stability, social relationships, intimacy, and environmental satisfaction). As such, the WHOQOL-BREF is better suited than disease-specific quality of life instruments to measure the wide-ranging effects of erectile dysfunction on quality of life.

Secondly, the WHOQOL-BREF has been demonstrated to be valid across a variety of cultural, language, and clinical populations, including diabetic patients and those with chronic sexual health concerns. Therefore, given the use of a validated Malay version (Hasanah et al., 2003), this study will utilize a culturally appropriate and methodologically sound measure of quality of life for a multicultural urban population in Kuala Lumpur.

Thirdly, the WHOQOL-BREF is designed to be generic, allowing for comparison between different illness groups, including chronic illnesses such as diabetes mellitus. Given that the purpose of this study is to assess the effect of ED on quality of life in relation to diabetes mellitus severity, lifestyle factors, and comorbidities, the use of a generic measure like the WHOQOL-BREF provides a standard measurement platform.

Finally, the WHOQOL-BREF is recommended for use in public health and population-based research, which is consistent with the study's intention to provide evidence to inform public health policy in Malaysia. In addition, the brevity of the WHOQOL-BREF (26 items) minimizes respondent burden, which is especially pertinent in a governmental clinic environment where patients with diabetes mellitus are likely to have other ongoing health care needs.

3.6.2 Validity and Reliability of Questionnaire

The reliability and validity of the instruments used in this study have been clearly confirmed by previous studies. The studies have indicated that the instruments used in this study possess good to excellent psychometric properties, as demonstrated by testing of internal reliability, test-retest reliability, and convergent validity, which supports their use in research, regardless of whether the research is conducted using paper-based or online methods. One example of this was published in the Journal of Medical Internet Research (JMIR) and examined the reliability and validity of the short form (IIEF-5) and full version (IIEF-15) of the International Index of Erectile Function. Van Kollenburg et al. (2019) study included 179

patients from a urology outpatient clinic in a randomised crossover design. For internal reliability testing, the electronic IIEF-5 showed excellent internal reliability (intraclass correlation coefficient (ICC) = 0.902). The IIEF-15 also demonstrated good to excellent internal reliability across its subdomains, with ICCs ranging from 0.834 to 0.962. In terms of test-retest reliability, the IIEF-5 reflected excellent reliability (ICC = 0.924). The IIEF-15 domains and their test-retest reliability ICCs ranged from 0.778 to 0.950. Both instruments demonstrated good convergent validity, with R-values of 0.923 for IIEF-5 and 0.951 for IIEF-15, indicating a strong correlation with similar constructs.

In the Malaysian context, the Malay version of the IIEF-15 has also undergone validation and psychometric evaluation. Quek et al. (2002) conducted this validation among Malaysian males experiencing lower urinary tract symptoms (LUTS), a population in which erectile dysfunction commonly co-occurs. The study confirmed that the Malay version of the IIEF-15 was reliable, valid, and sensitive to clinical changes within this population. Strong internal consistency was observed across all items and domains, with high Cronbach's alpha values. Additionally, test-retest reliability demonstrated high intraclass correlation coefficients (≥ 0.59), indicating stability of responses over time. While the validation was performed among patients with LUTS, the instrument's robust psychometric properties support its broader applicability in assessing erectile dysfunction among Malaysian men.

The WHOQOL-BREF, developed by the World Health Organization, has demonstrated strong psychometric properties across multiple studies and settings, with high reliability and validity. The WHOLQOL-BREF, comprising 26 items, assesses quality of life across four domains: Physical Health, Psychological Well-being, Social Relationships, and Environment. It demonstrated good construct validity in terms of correlations with various related constructs (r = 0.62 to 0.90). The WHOQOL-BREF correlated well with conventions that represent similar constructs without being confounded by them.

Content validity was maintained across populations and settings, supporting the questionnaire's ability to capture individuals' overall quality of life. The WHOQOL-BREF also demonstrated good discriminant validity, allowing researchers to distinguish between individuals with varying levels of well-being. The internal consistency of the overall scale was good at 0.88 (Cronbach's alpha), and each domain provided acceptable reliability, including the social relationships domain, which was rated as adequate. The test-retest reliability for each domain ranged from 0.73 to 0.89, indicating the WHOQOL-BREF's ability to deliver stability

over time. Previous studies also supported these reliability data (Hasanah et al., 2003; Jude & Awadalla, 2017), further confirming its suitability for use in quality-of-life evaluations across varied populations, including Malaysia.

Based on the psychometric evaluations, both the IIEF-15 and WHOQOL-BREF are valid and reliable measures for use in this study. Their internal consistency, reliability over time, and responsiveness to clinical and psychosocial changes make both instruments ideal evaluation measures for erectile dysfunction and quality of life in a population of men with DM in Kuala Lumpur.

Table 3.4

The Summary of the Questionnaire

Author (Year)	Name of instrument	Language	No of items/Domain/Subscale/standard	Type of scale	Reliability and Validity	Approved
Self-made	Section A: Socio-demographic and clinical data.	Bilingual (Malay and English)	Total: 13 items Open-ended question type and multiple answers	Multiple-choice and open-ended questions.	-	-
the Malay version and Rosen et al. (1997) for the English version.	Section B: The IIEF-15	Bilingual (Malay and English)	Total: 15 items 5 domains: Erectile functions (items 1-5,15), Orgasmic function (items 9-10), sexual desire (items 11-12), intercourse satisfaction (items 6-8) and overall satisfaction (items 13-14). Score range: 0-5	Likert	• Cronbach's alpha: 0.73 to 0.94 (Quek et al., 2002; Rosen et al., 1997) • Interclass correlation coefficients (ICCs): 0.64 to 0.88 (Quek et al., 2002). • Inter-rate reliability, with Cohen's kappa: 0.62 to 0.88 (Quek et al., 2002).	Granted via email
the Malay version and WHOQOL-BREF (1996) for the English version.	Section C: WHOQOL-BREF-26.	Bilingual (Malay and English)	Total: 26 items 4 domains: Physical Health, Psychological Health, Social Relationships, and Environment. Each item is rated from 1 to 5, where 1 represents "not at all" and 5 represents "completely". Score: Sum the scores for each item in the Physical domain (items 3-10), Psychological domain (items 11-18), Social Relationships domain (items 19-26), and Environment domain (items 27-34).	Likert	• Strong correlation coefficient of 0.82, indicating good agreement between the two measures (Islam et al., 2021). • Cronbach's alpha coefficient of 0.92, suggesting high reliability in measuring quality of life (Islam et al., 2021).	Granted via email

3.7 Data Collection Process

Data for the study were collected over two months, from January to February 2025, at six selected government health clinics in Kuala Lumpur. The primary data collection methods employed were a self-administered questionnaire, specifically the Malay version of the International Index of Erectile Function (IIEF-15) and the WHOQOL-BREF-26. These methods were chosen because they had proven to be valid and reliable in the context of Malaysia.

The sampling of subjects was conducted via a multistage approach that involved both stratified sampling and simple random sampling. Stratified sampling was conducted first to ensure a representative sample of male diabetes mellitus patients from each clinic, based on the portion (N). Once stratified, this study performed simple random sampling within the strata to ensure that the selection of respondents was unbiased and properly distributed. The inclusion criteria for the qualitative sample were male patients with a confirmed diagnosis of type 1 or type 2 diabetes, aged 18 years or older, who were currently receiving treatment for diabetes mellitus at the selected health clinics. The exclusion criteria included male patients with significant physical or mental health issues who were unlikely to fulfil the participation requirements, as well as individuals with limited proficiency in English or Malay, the two languages used in the questionnaire.

The distribution of the questionnaires was done manually in hard copy during face-to-face sessions at each clinic. This allowed the research team to provide instructions and some clarification on questions that arose during completion by participants. It also allowed for other aspects of the study to be communicated face-to-face. Six diabetes mellitus educators/researchers from the respective clinics administered the questionnaires. However, to avoid ethical quandaries and potential bias, the educators/researchers did not distribute questionnaires in their clinics, as it was assumed that participants might personally know the diabetes mellitus educators/researchers. This was necessary for ethical reasons to address participant comfort and anonymity for the study.

The questionnaires were read, delivered, and collected in neutral spaces within both clinic settings, such as private consultation rooms and waiting rooms presumably owned by the clinics, which allowed respondents to fill out the questionnaires in an

anonymous setting devoid of peer or co-worker influence. This improved the study's ethical quality in respecting respondents' choices and boundaries.

The overall process was also monitored by an on-site supervisor from Family Medicine and Specialist (FMS), who assisted in data collection while promoting recruitment, ethically collecting data, and providing clinical insight when appropriate and possible. The additional supervision ensured the integrity of the quality and reliability of the data being collected.

All individuals participating were current patients either at clinics receiving diabetes mellitus education and supplements, or at family doctors' offices, or specialists' clinics for diabetes mellitus care. All individuals received an orientation to the study and its procedures, along with a participant consent form. Participation was entirely voluntary, and no incentives or coercion were involved in the deployment of questionnaires. The questionnaires were both bilingual (Malay and English), basic, and uncomplicated for the population studied. They were designed to be respectful, transparent, and non-intrusive, given the sensitive nature of the topic.

Participants were informed that it would take approximately 30 minutes to complete the questionnaire. A 30-minute estimated time for completion was reasonable and respectful of the participant's clinical time. The 30-minute time frame for completion was also designed to ensure that data could be collected efficiently without interfering with ongoing treatment or placing a burden on the participants. This method provided a positive data collection experience, avoiding interference and unethical approaches while being efficient with time (~30 minutes), and promoting positive behaviour to encourage participation/engagement and data reliability.

To ensure the comfort and respect of participants throughout the recruitment process, given the sensitive nature of the study topic, several measures were implemented. Clinic staff identified suitable patients before approaching them individually in a private and non-intrusive manner. During this initial contact, patients were informed that the questionnaire would cover general health topics, with sexual health being just one aspect, which helped decrease potential discomfort and facilitated honest participation from patients. Given that all participants were already at the clinic for their scheduled follow-up appointments, the recruitment process was implemented smoothly without disrupting the normal flow of patients or increasing wait times.

Although erectile dysfunction is a sensitive topic, the study received a complete response rate because the data collection was administered in a controlled clinical setting where respondents' privacy, trust, and compliance were supported. The data collection process commenced immediately after obtaining participants' consent, thereby reducing the risk of dropout. To protect respondents' privacy, the study provided a neutral area for participants to complete the questionnaire. Once the questionnaire was completed, they placed it in a sealed envelope to protect their anonymity. Since respondents understood that neither the clinic staff nor the researcher could link their responses to their identities, social desirability bias was minimized. In addition, the self-administered, bilingual questionnaire format allowed respondents to answer without an interviewer, thereby promoting honest responding and maintaining the integrity of the collected data.

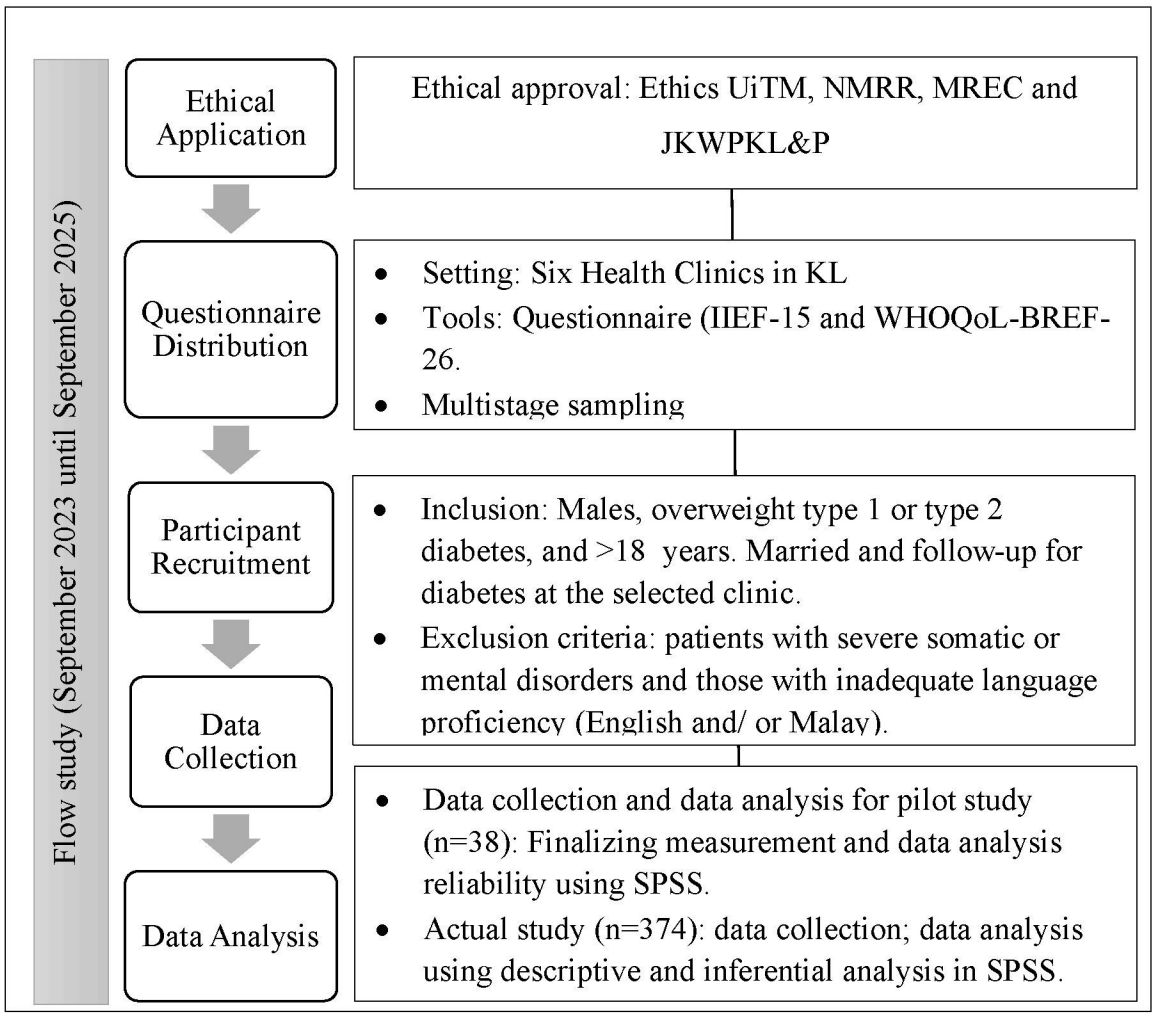

Figure 3.4: Research Flowchart

3.8 Ethical Consideration

The research was initiated with a Defend Research Proposal (DRP) presentation (March 2024), whereby the research scope, methodology, and ethical considerations were thoroughly scrutinised. This step was critical to ensure that the study's design was consistent with academic standards, feasible, and aligned with the study's objectives. Subsequently, an application was submitted to the Research Ethics Committee (REC) of Universiti Teknologi MARA (UiTM) with REC number REC/01/2025 (PG/MR/32) to secure ethical clearance at the university level. Ethics approval was necessary to ensure that the study adhered to the institution's standards, respected participant rights, and maintained the integrity of the research process.

Simultaneously, an application was also submitted to the National Medical Research Register (NMRR) using research number ID-24-00134-S8D to obtain approval from the Medical Research Ethics Committee (MREC) with Ethical Approval number NMRR ID-24-01907-GTP (IIR), as the study was conducted in a facility under the Ministry of Health (MOH). Obtaining the MREC approval was essential for compliance with MOH regulatory requirements and granting access to government healthcare facilities to conduct the research.

After receiving MREC approval, the study protocol was submitted to Jabatan Kesihatan Wilayah Persekutuan (JKWP) with referral number Bil (2) dlm. JKWPKL/203/4/Bhg. 20 for further evaluation. The presentation was required to ensure alignment with regional health priorities and to receive endorsement from the state health authority. After JKWP's approval, three Pejabat Kesihatan Daerah (PKD) (Kepong, Lembah Pantai, and Titiwangsa) involved in the study was also granted approvals. These included obtaining approval from the district health offices, ensuring sufficient space at the district level, and considering logistical factors relevant to data collection in the selected areas. Once the required administrative permissions were secured, meetings were held with the heads of the selected health clinics to explain the study and obtain site-level permission. These discussions played a crucial role in building rapport, orienting research activities, and securing the clinics' cooperation for participant recruitment and data collection.

Prior to distributing the questionnaire's, informed consent was obtained from all participants. Participants were provided with detailed explanations regarding the

study's purpose, procedures, potential risks, and benefits, ensuring their understanding and voluntary participation. This process adhered to ethical principles, safeguarding participant autonomy and promoting transparency.

3.9 Pilot Study

Initially, a pilot study was not included within the methodological framework of this study. However, as the planning progressed, it was determined that a pilot study would be valuable in refining the instruments and procedures before scaling back to data collection. This provided a value-added function of piloting the study to ensure that the instruments were appropriate and understood by the target population.

A total of 38 participants were selected for the pilot study, representing approximately 10% of the total sample size (n = 374). The participants were drawn from the same population as the intended study population, that is, male patients with diabetes mellitus being treated at the selected government clinics in Kuala Lumpur. Assuring that pilot study participants were drawn from the intended study population ensured that the pilot study approximated the intended study population's characteristics and settings.

The two primary data collection instruments used during the pilot were the International Index of Erectile Function (IIEF-15) and the World Health Organisation Quality of Life – Brief (WHOQOL-BREF) questionnaire. Both instruments had previously been linguistically and culturally adapted into Malay and validated among the Malaysian population. However, the pilot study served an important purpose in assessing the instruments' applicability and comprehensibility, specifically for male patients with diabetes mellitus within a clinical context in Malaysia.

Thus, the pilot study accomplished multiple objectives. First, it helped the researchers evaluate the structure and content of the questionnaire items, ensuring they were clear, understandable, and relevant. Second, it allowed the researchers to identify potential ambiguities and misconceptions participants may encounter in filling out the survey. This step enabled the researchers to make necessary adjustments before the main study commenced, thereby improving the quality and reliability of the instruments. Third, the pilot phase enabled the research team to rehearse the logistics of data collection, specifically administering the questionnaire, obtaining informed

consent, and recording the data.

To determine instrument reliability, Cronbach's Alpha was calculated for internal consistency. The findings are summarised in Table 3.5. The IIEF-15 had a Cronbach's Alpha of 0.90 in the pilot study, indicating a high level of internal consistency. In the full study, the reliability increased to 0.98, which is significantly higher than the reported reliability levels of 0.73 to 0.94 in the original instrument (Rosen et al., 1997). The WHOQOL-BREF reported a Cronbach's Alpha of 0.91 in the pilot phase, increasing to 0.95 in the actual study, which is comparable, but slightly lower, than the reported alpha value of 0.92 in the original validation study (WHO, 1996).

Overall, these results confirm that both instruments had strong internal reliability in the context of this study. The high levels of internal consistency, both in the pilot phase and in the actual study phase, suggest that the tools are strong, reliable, and suitable for measuring erectile dysfunction and quality of life in men with DM in Malaysia. The pilot study, therefore, was critical to establishing the methodological rigour of the research. It enabled the researchers to make informed refinements regarding the data collection process, ensured the reliability of the instruments, and confirmed that the questionnaires were linguistically and culturally appropriate for the target group. The lessons drawn from the pilot also helped support the overall validity of the study, contributing to the process of enacting the primary data collection phase.

Table 3.5

Cronbach's Alpha Coefficient yielded from the Original Tools, the pilot, and the Actual Study

Research tool	**No. of items**	**Cronbach's Alpha Coefficient**		
		Original	**Pilot (n=38)**	**Actual (n=374)**
IIEF-15	15	0.73 to 0.94	0.90	0.98
WHOQOL-BREF	26	0.92	0.91	0.95

3.10 Data Preparation and Analysis Plan

3.10.1 Data Cleaning and Screening

After the data was cleaned, the dataset was screened. Full data screening provided researchers with an indication of whether the data set was ready for analysis and its relevant quality. This stage involved checking the data for outliers, reviewing the data distribution, and reporting on the overall usefulness of the data set. Outliers were inspected to ensure that extremely isolated data points did not violate the underlying pattern of the data. Item checks on the distribution were conducted to confirm that the data set met the assumptions required for analysis with specific statistical procedures, including normality and homogeneity of variances. If any bizarre anomalies were observed in the outlier and distribution checks, detected very early in the process, the researchers were able to make necessary alterations and take the necessary steps to ensure that the statistical findings retained their reliability and validity.

Data cleaning and screening procedures were progressed to the next stage of data analysis: data preparation. The preparation to analyze data began with data entry, which required the researcher to enter the questionnaire responses into the statistical analysis software, IBM SPSS Statistics version 27. Using data from the completed questionnaires, responses were first verified and then manually entered. Each questionnaire item was double-checked, validated, and entered to mitigate the potential risk of transcribing errors that can occur when moving from paper to digital format.

Then, data coding was completed to prepare qualitative or categorical data for quantitative statistical analysis, whereby respondents were assigned coded values to their categorical responses, such as 1 for "Male" and 2 for "Female", or coding variables of levels of education, employment status, and ethnicity. Researchers wrote all the appropriate labels for the variables and definitions to ensure the accurate interpretation of variables in SPSS during analysis. Researchers also had to define the measurement scale associated with each variable (e.g., nominal, ordinal, interval, ratio) in SPSS according to its nature and metric relationships.

Thorough completion of data cleaning, screening, entry, and coding was instrumental in enhancing the reliability of the data analysis. As a result of the

researchers' accurate and thorough preparation, the primary dataset was considered reliable. It was fully prepared for both descriptive and inferential statistical analysis, along with reporting and interpretation following extensive, rigorous, and systematic data exploration.

Data cleaning was the first step in the data analysis process, which involved filtering out and correcting any errors, inconsistencies, and missing values in the dataset. This process prevented the use of erroneous information during analysis. After data cleaning, data screening was performed. The first part of data screening involved checking for outliers, examining variable distributions, and assessing overall data quality. This intervention highlighted any potential problems that could impact the accuracy of the analysis.

3.10.2 Normality Testing

This study conducted a normality assessment to test whether the continuous variables followed a normal distribution. That step is essential because the validity and reliability of many parametric statistical techniques, including the t-test, analysis of variance (ANOVA), and Pearson's correlation, depend on the assumption that the data are typically normally distributed. The normal distribution means that data are distributed symmetrically around the mean, with the largest concentration close to the middle and a progressively lesser concentration towards both extremes. Failure to satisfy that assumption may threaten the validity of the statistical inferences drawn from the study and could lead to erroneous conclusions.

Two formal statistical tests were used to assess normality, the Kolmogorov–Smirnov (K–S) and Shapiro–Wilk (S–W) tests. Both tests have the null hypothesis that the sample distribution does not differ significantly from a normal distribution. In this study, the significance level was set at alpha 0.05. In either the K–S or S–W test, if the p-value was greater than 0.05, the null hypothesis was retained, indicating that the data were approximately normally distributed. If the p-value was below 0.05, then the data distribution could indicate a meaningful difference from normality, and the use of non-parametric procedures may be warranted for subsequent analyses. The Kolmogorov–Smirnov is more often used in larger sample sizes; the Shapiro–Wilk test is somewhat more sensitive and reliable for identifying departures from normality when sample sizes

are lower (Ogunleye et al., 2018). The combination of both tests, in this study, ensured that the assessment of normality was accurate and methodical.

However, tests for normality, and especially with larger samples, may be too sensitive to minor and practically insignificant departures from normality, wrongly flagging them as statistically significant. To account for this and provide further indicators, skewness and kurtosis were also evaluated to assess the shape and symmetry of the data. Skewness is a measure of the level of asymmetry, with a value of zero indicating perfect symmetry. A positive skew indicates that there is a long right tail, and a negative skew indicates a long-left tail. In this study, skewness values between −1 and +1 were considered to indicate approximate symmetry. Kurtosis measures the "tailedness" or "peakiness" of the distribution relative to a standard curve. A kurtosis scores close to zero indicates mesokurtic (normal) distribution, a positive kurtosis score indicates a more peaked distribution (leptokurtic), and a negative kurtosis score indicates a flatter distribution (platykurtic). In this study, kurtosis values of between negative two and positive two were considered acceptable (Davey et al., 2022; Kim, 2013).

Normality was checked for two continuous variables: the International Index of Erectile Function (IIEF-15) and the World Health Organisation Quality of Life – Brief (WHOQOL-BREF-26). The assessment entailed two tests for normality, followed by the skewness and kurtosis tables based on the raw values, which were computed using the standard errors. Visual inspections were made using histograms and Q-Q plots, as these visual methods provide an intuitive sense of their distributional characteristics that the other statistical tests may miss. Since this data set was quite large (n = 374), visual inspection is essential in assessing whether the violations of normality are critical in pragmatic terms.

The analysis measures are summarised in Table 3.6. For the IIEF-15, the skewness was −0.41 (SE = 0.13) and the kurtosis value was −0.63 (SE = 0.25), indicating a slight negative skew and a distribution that was slightly flatter than the ideal standard curve. For the WHOQOL-BREF-26, the skewness was −0.07 (SE = 0.13) and the kurtosis value was −0.35 (SE = 0.25), indicating that the distribution was almost perfectly symmetrical and exhibited only a slight reduction in peakiness. All of the values were well within the acceptable limits, thus confirming that both data sets could

reasonably be regarded as normally distributed.

The combined evidence from statistical tests, shape measures, and visual inspection enabled us to conclude that both variables are normally distributed. It is worth noting that the Kolmogorov-Smirnov and Shapiro-Wilk tests, by themselves may have indicated too great a sensitivity in concluding whether or not the distributions were identical to a normal distribution solely as a result of the large sample size, particularly given the skewness and kurtosis results and the histogram and Q-Q plot only indicated there was no vital evidence to suggest the distributions were not normally distributed. Thus, it was reasonable and thoughtful to use parametric statistical tests for the subsequent analyses, such as independent t-tests, one-way ANOVA, and Pearson's correlation, while maintaining methodological validity and ensuring the analyses were understandable. The reason for this is that the primary study variables were found to meet the necessary statistical requirements for conducting a parametric test (i.e., normality and continuous measurement), as previously reported in the normality results. Since the independent t-test, one-way ANOVA, and Pearson's r provide a greater power and sensitivity in identifying significant differences or correlations than non-parametric tests do, they were appropriate choices for determining the relationship between the severity of erectile dysfunction and clinical aspects, as well as comparing the average scores of each group for the different quality of life domains. The application of these tests was therefore both statistically valid and consistent with the standard methodologies of quantitative research.

Table 3.6

Normality Test for IIEF-15 and WHOQOL-BREF -26 (n=374)

Variables	**Skewness**		**Kurtosis**		**Kolmogorov-Smirnov test (p-value)**
	Statistic	**Std Error**	**Statistic**	**Std Error**	
IIEF-15	-0.41	0.13	-0.63	0.25	<0.01
WHOQOL-BREF	-0.07	0.13	-0.35	0.25	<0.01

3.10.3 Data Analysis Plan

To ensure that data would be coded and organised in a manner suitable for statistical analysis, a systematic data coding plan was developed. Each of the variables in the dataset, either from demographics, clinical characteristics, or standardised measures, was coded in a clear, logical, and consistent numeric code. This allowed the data to be entered easily and fit the SPSS version 27, which was used for all the analyses in this study.

Categorical variables, such as ethnic group and occupation, were coded into nominal codes, which allow for group comparisons. For example, the ethnic group categories were coded numerically (e.g., Malay = 1, Chinese = 2, Indian = 3, Others = 4). The same coding format was applied to occupation types. Ordinal variables, such as education levels and Likert-type responses for the IIEF-15 or WHOQOL-BREF, were coded in an ascending fashion (from the lowest level, i.e., zero, to the highest level). Ordinal coding still allowed us to retain the interpretability of the data while allowing us to use different approaches for inferential tests.

Once the coding scheme was completed, all responses and data types were checked against the coding book to ensure coding consistency. By following the coding structure, this study minimised misclassification bias and maintained the data integrity of variables within the dataset. Moreover, with the numeric coding of non-continuous variables, the variables could now be entered into parametric and non-parametric testing based on the normality statistics. For this research study, estimating the prevalence of erectile dysfunction (ED) among male patients with diabetes mellitus was a key epidemiological outcome. This prevalence estimation was calculated by identifying male patients with ED, according to IIEF-15 cut-off scores, and comparing them with the total number of male respondents with diabetes mellitus in this study. The formula used was:

The prevalence statistic gave the investigator an idea of the degree of ED in the diabetes mellitus population. It assisted the investigator in interpreting subsequent analyses, particularly when these were stratified based on severity and associated risk factors. The formula used for calculating the prevalence of ED was as follows:

$$\text{Prevalence of ED (\%)} = \frac{\text{Number of male diabetics with ED}}{\text{Total number of male patients with diabetes mellitus}} \times 100\%$$

After the data were coded and the variables were transformed, analyses were conducted to address five primary research objectives. Each objective was focused on specific variables and methods of statistical analysis and selected based on the level of measurement and distribution properties of the data.

The first research objective was to establish the prevalence and severity of ED among male patients with diabetes mellitus, using the erectile function domain of the IIEF-15, based on total scores that were categorised following established thresholds for ED (ranging from severe ED to no ED). Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarise responses to the erectile function domain.

The second research objective was to identify the quality of life (QoL) among male patients with diabetes mellitus, using the WHOQOL-BREF. Once again, descriptive statistics were used, and the analysis was based on the domain scores (physical, psychological, social relationships, and environment) and a four-point Likert scale and appropriate wording.

The third and fourth research objectives were designed to analyze associations between the severity of ED and selected socioeconomic variables, as well as clinical variables. The selected socio-demographic variables included the following: age, BMI, education, ethnicity, duration of diabetes mellitus, HbA1c, hypertension, and comorbidities. Bivariate and multivariable binary logistic regression analysis were used to analyse stable relationships, and multiple regression techniques helped identify independent predictors of ED while controlling for confounding variables.

Before executing the multivariable logistic regression analysis, several statistical assumptions were reviewed to confirm that the model was appropriately applied to the study's data. First, the assessment of multicollinearity among the independent variables was conducted using the Variance Inflation Factor (VIF) and Tolerance Values. To ensure model stability and minimize the risk of estimation error, these statistics were used to verify that none of the independent variables were highly

correlated. Second, the Box-Tidwell Procedure was used to evaluate the linearity assumption between the continuous predictor or predictors and the logit of the dependent variable. This procedure examines whether each continuous variable has a linear relationship with the logit-transformed outcome, a necessary condition for the logistic regression model that includes continuous predictors. Third, goodness-of-fit tests were used to assess the suitability of the logistic regression model. Since it assesses how closely the predicted probabilities match the actual data, the Hosmer-Lemeshow Test was chosen as the main indicator of model fit. The Receiver Operating Characteristic (ROC) curve, pseudo-R-squared measures, and classification accuracy were found to be additional metrics for assessing model performance. To ensure that the multivariable logistic regression model was suitable, statistically valid, and methodologically sound for identifying risk factors associated with erectile dysfunction in men with DM, these assumption assessments were conducted.

The fifth objective focused on the differences between the severity of ED and QoL scores. To analyse whether there were any significant differences in quality of life across varying levels of severity of ED, one-way Analysis of Variance (ANOVA) was undertaken. The rationale for this statistical inferential analysis, based on the research objectives, was that it permits comparisons of means across multiple groups and rationalises the broader psychosocial effects of ED in diabetes mellitus.

In total, this well-structured, methodical, and robust coding and analysis plan will enable valid, reliable, and clinically meaningful interpretations of the patterns of prevalence, severity, and correlates of erectile dysfunction among male patients with diabetes mellitus in Kuala Lumpur.

Table 3. 7

Data analysis

Objective	Variables	Measurement	Level of Measurement	Data Analysis
RO1: To identify the prevalence and severity of ED among male diabetes mellitus.	Section B: IIEF-15	• 5 domains: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction. • It consists of 15 items, with responses rated on a Likert scale or scored numerically. • Bloom cut point: a) Severe ED: Total score ≤ 10 b) Moderate ED: Total score 11-16 c) Mild to moderate ED: Total score 17-21 d) Mild ED: Total score 22-25 e) No ED: Total score ≥ 26	Ordinal	Descriptive: Frequency (Percentage) and Mean (SD)
RO2: To identify Quality of Life (QoL) among male patients with diabetes mellitus.	Section C: WHOQOL-BREF-26	• 4 domains: physical health, psychological health, social relationships, and environment. • It consists of 26 items, with responses rated on a Likert scale ranging from 1 (very dissatisfied/very poor) to 5 (very satisfied/very good)	Ordinal	Descriptive: Frequency (Percentage) for categorical data and Mean (SD for numerical data
RO3: The impact of socio-demographic factors, including age, BMI, education level, ethnicity, and occupation, on the severity of ED among male diabetes.	Part A: Socio-demographic and Part B: IIEF-15	• Between Independent variables and dependent variables	Ratio, Nominal and Ordinal	Bivariate and multivariable binary logistic regression analysis
RO4: The impact of clinical factors such as the duration of diabetes, HbA1C level, presence of high blood pressure, and presence of other conditions on the severity of ED	Part A: Socio-demographic and Part B: IIEF-15	• Between Independent variables and dependent variables	Ratio, Nominal and Ordinal	Bivariate and multivariable binary logistic regression analysis

Objective	Variables	Measurement	Level of Measurement	Data Analysis
among male diabetes patients.				
RO5: Differences between the severity of ED, measured, and QoL scores among male diabetes patients.	Part B: IIEF-15 and Part C: WHOQOL -BREF-26	• Between two Dependent variables (numerical data).	Ratio, Nominal and Ordinal	Inferential one-way and analysis of variance (ANOVA)

3.10.4 Presentation of Findings

The results of the data analysis were systematically presented using tables, figures, and graphs for improved clarity and understanding. The visual depictions were used to summarise key data points, indicate noted patterns or trends, and assist in interpreting the findings as appropriate, given the research aims. Each table or graph was accompanied by descriptive narratives to guide the reader, ensuring that the presentation was not only informative but also appropriate to the actual research questions being studied. When appropriate, the findings were compared to highlight similarities and differences across relevant variables, while accounting for possible associations or differences among subgroup participants. Additionally, statistical outputs from both descriptive and inferential analyses were presented in a structured, logical manner to facilitate meaningful interpretation of the results, specifically regarding the prevalence of erectile dysfunction, associated factors, and the relationship with quality of life among male patients with diabetes mellitus.

3.11 Summary

Chapter 3 outlined the research methodology, including the study location, design, population, sampling, instruments, and ethical considerations. The study was conducted at selected health clinics under the Jabatan Kesihatan Wilayah Persekutuan Kuala Lumpur dan Putrajaya (JKWPKL&P), targeting male patients with diabetes mellitus aged 18 and above. A quantitative descriptive design and multistage sampling were employed to ensure the collection of representative data. The sample size was set at 374 to account for potential attrition. The instruments used included Part A for socio-demographic and clinical data, the IIEF-15 for ED assessment, and the WHOQOL-

BREF-26 for quality of life, all of which were validated for reliability. Data collection involved face-to-face distribution of questionnaires, adhering to ethical approvals obtained from UiTM REC, NMRR, MREC, and local health authorities. Informed consent was secured from participants to ensure voluntary participation. A pilot study with 38 respondents refined the tools and procedures. Data analysis involved cleaning, normality testing, and the application of descriptive and inferential statistics, with SPSS version 27. The methodology ensured a robust, ethical, and systematic approach to achieving the research objectives.

CHAPTER 4
RESULTS

4.1 Introduction

This chapter contains the results from the study on the prevalence of erectile dysfunction (ED) in diabetic males in Kuala Lumpur, Malaysia, and the factors that were associated with the prevalence of ED, and how ED affected the quality of life (QOL) in diabetic males. The results are organized into three sections based on the study's objectives.

The first section presents the socio-demographic characteristics (e.g., age, ethnicity, education level, occupation) and clinical characteristics (e.g., duration of diabetes mellitus, comorbidities, glycaemic indicators) of the participants. The results presented in this section provide background information about the participants and assist in interpreting the subsequent analyses.

The second section focuses on the results from the statistical inference analyses conducted to investigate the relationships between ED and various predictor variables. Specifically, the analyses investigated whether there were differences in the prevalence or severity of ED based on participants' socio-demographic characteristics and their clinical characteristics related to diabetes. Additionally, these analyses provided a snapshot of how ED exists in the male diabetic population at one time and how the severity levels of ED differed based on the participants' demographic and clinical characteristics.

The third section examines the impact of ED on participants' QOL using the World Health Organization Quality of Life (WHOQOL-BREF). This analysis examined whether participants with varying degrees of ED showed statistically significant differences in their scores across the physical, psychological, social, and environmental domains. Although this study did not assess participants' general quality of life, it did focus on their quality of life related to ED. Therefore, the results from this study can be used to understand the effects of sexual dysfunction on the participants' well-being and how sexual dysfunction impacts daily functioning. In addition, the study analysed the extent to which ED affected participants' functioning across all four domains of quality of life. In summary, the results from this study provide insight into the burden of ED on

individuals with diabetes and highlight the multifaceted effects of sexual dysfunction, including physical limitations, emotional distress, social disconnection, and disruption of daily functioning. Therefore, this study provides evidence for the importance of addressing sexual dysfunction in the management of diabetes and contributes to developing a more comprehensive understanding of how sexual dysfunction affects quality of life in male diabetic populations.

Finally, the last section of this chapter presents the results from the multivariate logistic regression analysis, which identified the independent predictors of ED while controlling for potential confounding variables. Identifying these predictors is important for clinicians to identify the specific factors that increase the risk of ED in Malaysian male diabetic patients. These predictors can be targeted as high-risk areas for screening, prevention, and intervention in the management of ED in diabetic male patients. Therefore, the results of this study lay the groundwork for the interpretation and critical discussions presented in Chapter 5, connect to the existing literature and conceptual frameworks, and provide a basis for future studies that will explore the impact of ED as an integral component of diabetes care.

4.2 Response Rate

The study achieved a 100% response rate, with all 374 respondents completing the survey. This response rate illustrates not only the level of commitment and cooperation from the participants in this study but also the effectiveness of the recruitment and engagement strategies employed. A full response rate improves data quality by enabling the collection of high-quality, trustworthy, and representative data from the target population, with limited exposure to non-response bias. This is primarily a concern when conducting cross-sectional studies. Participants' willingness to partake in this study may also indicate the importance and relevance of the research topic, as erectile dysfunction refers to an important but sensitive subject matter among male patient populations with diabetes mellitus.

A 100% response rate further enhances the accuracy of the planned sample size calculations for the planned statistical analyses, as all were met without the need for any changes. The organisation and willingness of healthcare staff, including diabetes educators and clinic staff, to enable this participation were critical supports to the project. In addition, the straightforward and concise organisation of the questionnaires

(i.e., IIEF-15 and WHOQOL-BREF) and the guidance provided to participants throughout the data collection process were likely significant factors in the process's efficiency.

4.3 Socio-Demographic and Clinical Characteristics of Respondents

The study employed a stratified, proportionate random sampling method to obtain a representative distribution of male patients with diabetes mellitus attending selected public health clinics in Kuala Lumpur. This technique was designed to maintain the proportions of male patients with diabetes mellitus across clinics, thereby minimising sampling bias and enhancing the generalisability of the results. A total of 374 respondents were recruited, proportionally distributed across six clinics based on the number of registered male patients with diabetes mellitus. Specifically, 13.6% were from the Kuala Lumpur Health Clinic, 9.5% from the Sentul Health Clinic, 26.9% from the Jinjang Health Clinic, 14.4% from the Setapak Health Clinic, 7.8% from the Kampung Pandan Health Clinic, and 27.7% from the Tanglin Health Clinic. This stratification ensured that clinics with a higher diabetes burden contributed a greater share of respondents than those with fewer patients. By adopting this proportional sampling strategy, the study closely reflected the actual distribution of male patients with diabetes mellitus across urban public health clinics, thereby strengthening the reliability and validity of its findings on the prevalence of erectile dysfunction and its associated factors.

Table 4.1 presents the socio-demographic and clinical characteristics of respondents, aged 26 to 84 (M = 51.72, SD = 11.83), with most middle-aged adults (n = 212, 56.7%). Most were Malay (n = 265, 70.9%), with the majority holding a skills certificate or diploma (n = 285, 76.2%) and being employed in the government, private, or self-employed sectors (n = 282, 75.4%). Regarding BMI classification, most subjects were classified as obese I (n = 152, 40.6%), followed by pre-obese (n = 132, 35.3%). The proportion of subjects classified as underweight was only 0.8% (n = 3). Mean diabetes mellitus duration was 8.16 years (SD = 5.83), and more than half of respondents (n = 198, 52.9%) had elevated HbA1c (>6.5%), indicating poor glycaemic control, whereas 35.8% (n = 134) had normal HbA1c levels. Also, 61.0% (n = 228) were reported to have hypertension, and 72.2% (n = 270) had no other chronic diseases

apart from diabetes mellitus. Lifestyle-wise, most were non-smokers (n = 227, 60.7%) and non-alcoholics (n = 328, 87.7%). For physical activity, most respondents were moderately active (n = 182; 48.7%), with 22.7% (n = 85) active and 3.5% (n = 13) very active. Finally, 95.2% (n = 356) had never received treatment for ED, compared to 3.5% (n = 13) who had received treatment.

Table 4.1

Socio-Demographic and Clinical Characteristics of Respondents (males with DM) (n=374)

Socio-demographic data	**Frequency**	**Percentage**
Age (years), Min-max: 25-84; mean (SD): 51.69 (11.88)		
Young Adult (25–39)	62	16.6
Middle Adult (40–59)	212	56.7
Old Adult (60–84)	100	26.7
BMI		
Not answering	16	4.3
Underweight	3	0.8
Normal range	46	12.3
Pre-obese	132	35.3
Obese I	152	40.6
Obese II	18	4.8
Obese III	7	1.9
Education		
No school	50	13.4
Skills certificate/ Diploma	285	76.2
Degree/ Master/ PhD	39	10.4
Ethnicity		
Malay	265	70.9
Chinese	41	11.0
India	62	16.6
Sabah/Sarawak/ Others	6	1.6
Occupation		
Unemployed/ Retired	92	24.6
Employed in the Government/Private/ Self-employed sector	282	75.4
Duration of diabetes mellitus **(years)**		
Min-max:1-41	*8.06	**5.44
HbA1c level		
Not answering	42	11.2
Normal range (<6.5%)	134	35.8
High (>6.5%)	198	52.9
Do you have high blood pressure?		
No	146	39.0
Yes	228	61.0
Do you have any other chronic diseases besides DM?		
No	270	72.2
Yes	104	27.8
Smoker		
No	227	60.7
Yes	147	39.3
Alcoholic		
No	328	87.7
Yes	46	12.3

Socio-demographic data	Frequency	Percentage
Exercise		
Not answering	5	1.3
Not active	25	6.7
Slightly active	64	17.1
Moderately active	182	48.7
Active	85	22.7
Very Active	13	3.5
Treatment ED		
Not answering	5	1.3
No	356	95.2
Yes	13	3.5

*Mean; **SD

4.4 Erectile Function and Sexual Satisfaction Among Respondents

4.4.1 International Index of Erectile Function (IIEF-15)

Table 4.2 describes the distribution of responses to the International Index of Erectile Function (IIEF-15) from 374 male patients with diabetes mellitus. The IIEF-15 instrument measures critical areas of sexual function, such as erectile ability, ability to penetrate, retention of erection, satisfaction with the sexual experience, desire, orgasmic function, and confidence as a sexual partner. The analysis below highlights the highest response category for each item to illustrate the most prominent trends in sexual function among the male participants.

For the item that measures the ability to achieve an adequate erection to engage in sexual activity, the most significant number of respondents (n = 103, 27.5%) reported "most times". This indicates the presence of erectile trouble, but more than a quarter of participants reported they can achieve an erection more than half of the time. In the item measuring the ability to achieve erections firm enough for penetration, 25.4% (n = 95) chose "most times" as their option. This suggests that difficulties may exist; however, a large proportion of respondents reported maintaining at least adequate erectile firmness during penetrative encounters.

In the item measuring the ability to penetrate a partner, "most times" was the most frequently reported response, at 25.7% (n = 96). This implies the consistent ability of several male participants in this study to achieve penetration with their partners. For retaining an erection following penetration, the highest response category once again was “most times” (n = 105, 28.1%), suggesting that a large part of the respondents was able to maintain their erection for considerable portions of the sexual act. However,

concerning holding an erection until the end of intercourse, the category most selected was “a few times” (n = 90, 24.1%). This shows that although many could hold an erection initially, keeping an erection until the end of the intercourse was a recurrent challenge to a significant segment of the participants.

For attempts of frequency of sexual intercourse, the most common answer was "three to four attempts” (n = 116, 31.0%). This shows that, despite having erectile dysfunction, most participants remained moderately sexually active. For interpersonal satisfaction with sexual intercourse, 24.3% (n = 91) of respondents reported “most times". This indicates that some participants still found sexual intercourse generally satisfying despite their condition. Regarding an enjoyable sexual intercourse experience, the most frequent response was “fairly enjoyable" (n = 100, 26.7%). Though this did not indicate a high level of pleasure, it does support the idea that a significant number of respondents still found at least some moderate satisfaction from it. For the item regarding frequency of ejaculation, the most common response was "sometimes" (n = 99, 26.5%). This suggests there was variability in the ability to ejaculate, yet some level of function was retained.

The frequency of orgasm/climax items yielded similar results, where the frequency of "sometimes" and "most times" was chosen by 26.7% (n = 100) of participants, also demonstrating some level of sexual function was retained, albeit not experienced consistently across all encounters. Concerning the frequency of sexual desire, the most frequent category was "sometimes," indicated by 30.2% (n = 113) of participants. This still demonstrates a moderate level of libido in the sample itself. Concerning the overall level of sexual desire, "moderate" was the most frequently chosen response (n = 133, 35.6%), thereby indicating that most participants would be classified as having had some level of sexual desire but not at a high-intensity level.

In terms of overall satisfaction with sex life, the most common response was "equally satisfied and dissatisfied" (n = 130, 34.8%), and a similar response was observed regarding satisfaction with the sexual relationship with the partner (34.2%, n = 128), also indicating equal satisfaction and dissatisfaction. Finally, for the item regarding confidence in the ability to get and keep an erection, the highest response was "moderate" (n = 151, 40.4%). Overall, among the participants, this would suggest there was an overall state of uncertainty or fluctuating confidence in the ability to gain and

maintain an erection.

In summary, the data from the IIEF-15 indicate that while many male diabetes mellitus patients in the study seemed to retain some level of sexual function, including the ability to attain erections, penetrate, ejaculate, and experience desire, these functions were often inconsistent. Moderating sexual functioning and mixed levels of satisfaction appeared to be the dominant pattern, further demonstrating the complex, multifactorial influences of erectile dysfunction on sexual health and psychosocial well-being in men with DM.

Table 4.2

International Index of Erectile Function (IIEF-15) (n=374)

Question	Response Category	n	%
How often were you able to get an erection during sexual activity?	No sexual activity	55	14.7
	Rarely or never	16	4.3
	A few times (less than half the time)	80	21.4
	Sometimes (about half the time)	84	22.5
	Most times (more than half the time)	103	27.5
	Almost always or always	36	9.6
When you had erections with sexual stimulation, how Were your erections hard enough for penetration?	No sexual activity	55	14.7
	Rarely or never	14	3.7
	A few times (less than half the time)	82	21.9
	Sometimes (about half the time)	86	23.0
	Most times (more than half the time)	95	25.4
	Almost always or always	42	11.2
When you attempted intercourse, how often were you able to penetrate (enter) your partner?	Did not attempt intercourse	51	13.6
	Almost never or never	19	5.1
	A few times (less than half the time)	77	20.6
	Sometimes (about half the time)	85	22.7
	Most times (more than half the time)	96	25.7
	Almost always or always	46	12.3
During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	Did not attempt intercourse	49	13.1
	Almost never or never	24	6.4
	A few times (less than half the time)	73	19.5
	Sometimes (about half the time)	92	24.6
	Most times (more than half the time)	105	28.1
	Almost always or always	31	8.3
During sexual intercourse, how difficult was it to maintain your erection until completion of intercourse?	Did not attempt intercourse	51	13.6
	Almost never or never	36	9.6
	A few times (less than half the time)	90	24.1
	Sometimes (about half the time)	86	23.0
	Most times (more than half the time)	87	23.3
	Almost always or always	24	6.4
How many times have you attempted sexual intercourse?	No attempts	54	14.4
	One to two attempts	73	19.5
	Three to four attempts	116	31.0
	Five to six attempts	67	17.9
	Seven to ten attempts	47	12.6
	Eleven or more attempts	17	4.5
When you attempted sexual intercourse, how often	Did not attempt intercourse	53	14.2
	Almost never or never	27	7.2

Question	Response Category	n	%
Was it satisfactory for you?	A few times (less than half the time)	85	22.7
	Sometimes (about half the time)	84	22.5
	Most times (more than half the time)	91	24.3
	Almost always or always	34	9.1
How much have you enjoyed sexual intercourse?	No intercourse	51	13.6
	No enjoyment at all	21	5.6
	Not very enjoyable	73	19.5
	Fairly enjoyable	100	26.7
	Highly enjoyable	99	26.5
	Very highly enjoyable	51	13.6
When you had sexual stimulation or intercourse, how	No sexual stimulation or intercourse	23	6.1
	Almost never or never	66	17.6
How often did you ejaculate?	A few times (less than half the time)	98	26.2
	Sometimes (about half the time)	99	26.5
	Most times (more than half the time)	37	9.9
	Almost always or always	51	13.6
When you had sexual stimulation or intercourse, how	Almost never or never	51	13.6
	A few times (less than half the time)	81	21.7
often did you have the feeling of	Sometimes (about half the time)	100	26.7
orgasm or climax?	Most times (more than half the time)	100	26.7
	Almost always or always	42	11.2
How often have you felt sexual desire?	Almost never or never	42	11.2
	A few times (less than half the time)	83	22.2
	Sometimes (about half the time)	113	30.2
	Most times (more than half the time)	104	27.8
	Almost always or always	32	8.6
How would you rate your level of sexual desire?	Very low or none at all	37	9.9
	Low	67	17.9
	Moderate	133	35.6
	High	110	29.4
	Very high	27	7.2
How satisfied have you been with your overall sex life?	Very dissatisfied	36	9.6
	Moderately dissatisfied	64	17.1
	Equally satisfied and dissatisfied	130	34.8
	Moderately satisfied	111	29.7
	Very satisfied	33	8.8
How satisfied have you been with your sexual relationship with your partner?	Very dissatisfied	40	10.7
	Moderately dissatisfied	66	17.6
	Equally satisfied and dissatisfied	128	34.2
	Moderately satisfied	101	27.0
	Very satisfied	39	10.4
How do you rate your confidence that you could get and keep an erection?	Very low	35	9.4
	Low	51	13.6
	Moderate	151	40.4
	High	105	28.1
	Very high	32	8.6

4.4.2 Prevalence of ED

Table 4.3 shows the prevalence and distribution of severity of erectile dysfunction (ED) in the 374 male patients with diabetes mellitus in Kuala Lumpur who completed the study, based on the 15-item International Index of Erectile Function (IIEF-15) scores. 337 respondents (90.1%) reported some level of ED. In contrast, 37

(9.9%) were classified as having a standard range of erectile function. This finding tells us that a high proportion of male patients with diabetes mellitus experience some degree of erectile difficulty. The severity classification was reported with 73 (19.5%) severe, 93 (24.9%) moderate, 79 (21.1%) mild-to-moderate, and 92 (24.6%) mild. Therefore, moderate and mild ED were the most reported categories.

Severity of ED cases among men with DM:

$$73\ (\text{severe}) + 93\ (\text{moderate}) + 79\ (\text{mild-to-moderate}) + 92\ (\text{mild}) = 337$$

Formula (Prevalence):

$$\text{Severity (\%)} = \left(\frac{\text{Number of existing ED cases}}{\text{Total number of participants studied}}\right) \times 100$$

$$\left(\frac{337}{374}\right) \times 100 = 90.1\%$$

To ascertain clinically significant prevalence, ED was classified as mild-to-moderate, moderate, or severe erectile dysfunction (IIEF-15 score ≤ 21), while "No ED" included respondents who were classified as normal range of erectile function or mild ED; this was implemented consistently with the previous study (Rezali et al., 2023). Using the above operational definition in the current study, the overall prevalence of clinically significant ED was 65.5% (21.1% mild to moderate, 24.9% moderate, and 19.5% severe). This operational definition excludes mild ED, which may be transient or not severe enough to warrant urgent clinical consultation. These findings establish a significant health burden for the respondents, where one in five respondents reported having severe ED; ED has a substantial relationship to sexual health, psychological health, and quality of life.

Prevalence of ED cases among men with DM:

$$73\ (\text{severe}) + 93\ (\text{moderate}) + 79\ (\text{mild-to-moderate}) = 245$$

Formula (Prevalence):

$$\text{Prevalence (\%)} = \left(\frac{\text{Number of existing ED cases}}{\text{Total number of participants studied}}\right) \times 100$$

$$\left(\frac{245}{374}\right) \times 100 = 65.5\%$$

Table 4.3

Prevalence of ED Among Respondents (n = 374)

ED Level	n	%
Severe	73	19.5
Moderate	93	24.9
Mild to moderate	79	21.1
Mild ED	92	24.6
Normal	37	9.9

Criteria based on ED score (Items 1, 2, 3, 4, 5, and 15), where severe ED: 1–10; moderate ED: 11–16; mild-to-moderate ED: 17–21; mild ED: 22–25; no ED: 26–30.

4.4.3 Descriptive Analysis of Sexual Function Domains Among Respondents

Descriptive statistics were presented in Report section 4.4 for the various domains of sexual function using the International Index of Erectile Function (IIEF-15). These domains were erectile function, orgasmic function, sexual desire, satisfaction from sexual intercourse or sexual activity, and overall satisfaction from sexual experience. Each domain is scored using a niche set of IIEF items, and each respondent's standardised scale score provides a snapshot of sexual function. Respondents' IIEF-15 total scores ranged from 6.00 to 75.00, with a mean total score of 42.07 and a standard deviation of 17.81. Upon examining the IIEF total scores, considerable variability was observed, suggesting that some respondents experienced either very mild or moderate dysfunction. Others were along the spectrum, laterally experiencing more severe dysfunction.

Erectile function scores had the most extensive range, from 1.00 to 30.00, because six unique items (Items 1, 2, 3, 4, 5, and 15) measured this domain or subdomain. The mean for the sub-domain erectile function score was 16.63 with a standard deviation of 7.96, which would indicate a moderate degree of ability to achieve an erection appears apparent across the sample, implying that ED appears mild to moderate for many of the respondents and is in keeping with the prevalence estimates discussed above. The orgasmic function sub-domain (Items 9 and 10) range of scores was from 1.00 to 10.00; their mean score was near 5.76 (SD = 2.60), which measures function related to orgasmic response, which would suggest that respondents were experiencing a moderate level of function; however, this data is likely field worthy since

this domain would be highly variable across respondents.

The sexual desire sub-domain (Items 11 and 12) ranged from 2.00 to 10.00. The mean for the sexual desire sub-domain was 6.06, with an average standard deviation of 2.11. Overall, this plenary score would indicate that respondents retained moderate sexual interest or libido towards a range of scores, with some not satiating their sexual needs, while others probably did. The domain of sexual intercourse satisfaction (items 6, 7, and 8) yielded scores that ranged from 0.00 to 15.00; the mean score was 7.42 (SD = 3.99). Overall, the mean responses would indicate a generalised level of satisfaction with experiences while masturbating, presumably making sense also considering many respondents indicated to some extent that all had moderately fulfilling sexual practices, with some only indirectly federally limited by satisfaction because of their experience of ED.

Overall, the dimension examining overall satisfaction with sexual life (Items 13 and 14) yielded scores ranging from 2.00 to 20.00; the overall mean score was 6.20 (SD = 2.19). Overall, respondents indicated moderate levels of satisfaction with their sexual life and experiences with a significant partner in life. In conclusion, this descriptive data provides some richness to sexual functioning patterns on several levels. The patterns described would suggest that while ED is a common experience among the respondents, it is more moderate in terms of experiences; paradoxically, indicators of sexual desire and orgasmic function were less affected.

Table 4.4

Descriptive Statistics of Sexual Function Domains

Function domain	**Items**	**Min**	**Max**	**Mean**	**SD**
Erectile Function	1,2,3,4,5 and 15	1.00	30.00	16.63	7.96
Orgasmic Function	9 and 10	1.00	10.00	5.76	2.60
Sexual Desire	11 and 12	2.00	10.00	6.06	2.11
Intercourse Satisfaction	6,7 and 8	0.00	15.00	7.42	3.99
Overall Satisfaction	13 and 14	2.00	10.00	6.20	2.19
Total of IIEF_15		**6.00**	**75.00**	**42.07**	**17.81**

4.5 Quality of Life and Health Satisfaction Among Respondents

4.5.1 Quality of life and Satisfaction domain across the participants

Table 4.5 provides a detailed summary of the most common responses across numerous quality-of-life and satisfaction domains reported by men with DM in this study (n = 374). The results represented participants' subjective assessments of multiple aspects, including physical, psychological, social, environmental, and functional status. The overall quality of life of almost half of the participants (n = 184, 49.2%) was rated as good. It is not easy to interpret these results without access to comparative studies. Still, it seems safe to assume that diabetes mellitus affected their quality of life for about half of the participants. Additionally, 163 respondents (43.6%) reported being "satisfied" with their current health, indicating that most viewed their health condition positively or at least as acceptable at the time of data collection.

Pain was also a significant factor in determining the overall quality of life. Exactly half of the participants (n = 187, 50.0%) reported having a "moderate amount" of physical pain that interfered with their daily activities and could impair their everyday functioning. The amount of pain experienced by these diabetic patients does not necessarily cause them to be completely disabled; however, it does impact how they function daily. The degree of pain that diabetic patients experience is common, as chronic hyperglycaemia often results in both musculoskeletal and neuropathic pain, resulting from the ongoing discomfort that affects the individual's ability to perform daily activities. As a result of the prolonged effects of chronic hyperglycaemia on nerves, many diabetic patients suffer from peripheral neuropathic pain. Peripheral neuropathic pain includes burning, tingling, numbness, or sharp pain in the legs, which may increase over time. To add to this view of daily life, most people in this sample (n = 193, 51.6%) indicated a "moderate amount" of medical treatment was needed to function normally in their daily lives. Thus, most people in this sample acknowledged that they relied on some form of treatment to perform their daily life tasks.

Regarding psychological well-being, 45.2% (n = 169) of participants indicated a "moderate amount" of enjoyment in life, whereas 46.3% (n = 173) suggested their lives were meaningful to a "great extent." These results indicate that many people can maintain purpose and a relatively positive emotional outlook despite living with a

chronic health condition. Similarly, cognitive function was intact among participants; 44.1% (n = 165) reported that they could concentrate "to a great extent" when needed.

Safety and environmental aspects were also measured. A considerable portion of participants reported feeling "a great deal" of safety in their everyday lives (n = 161, 43.0%), and among the 46.3% (n = 173) who indicated that their physical environment was "moderately healthy." This suggests that participants generally felt safe and had healthy living conditions, which is a positive indicator of well-being. As in the energy domain, which measures vitality and physical endurance, 48.9% (n = 183) reported having "enough energy to a great extent" to engage in various everyday tasks. In the same way, body image perception was relatively positive, with 45.5% (n = 170) of participants stating they were "able to accept their body appearance "to a large extent."

In terms of financial resources, when asked how much money they had to meet their needs, 45.5% (n = 170) stated they had "somewhat enough" money, indicating possible moderate financial security. Information needed for daily living was also reported as "somewhat available" by 44.1% (n = 165) of participants, indicating that while the information was somewhat accessible, it may not have met all participants' optimal needs. Leisure activity opportunities were relatively limited; 43.3% (n = 162) reported they "somewhat" had opportunities to engage in leisure physical activities. Physical mobility (as a general indicator of functioning) was perceived positively, with 46.8% (n = 175) of participants rating it as "very well", indicating that they could physically move about, suggesting that at least partial functional ability was retained within this cohort.

When asked about sleep quality, 43.9% (n = 164) of respondents reported being "satisfied." At the same time, regarding daily activity performance, this study found moderate levels of satisfaction, with 44.4% (n = 166) of respondents expressing satisfaction with their ability to accomplish daily living activities. Similarly, the capacity to work was reported, with 44.7% (n = 167) of respondents expressing confidence in their ability to perform work roles or responsibilities. Regarding self-perception, moderate levels of satisfaction were observed, with 46.8% (n = 175) of respondents reporting being "satisfied" with themselves. In terms of personal relationships, 44.1% (n = 165) were satisfied, and a noteworthy proportion (46.8%, n = 175) of respondents reported being "neither satisfied nor dissatisfied" regarding their

sex life, indicating a neutral stance or ambivalence towards this intimate aspect of life.

Social support was relatively adequate: 43.9% (n = 164) were satisfied with the level of support they received from friends, and 47.9% (n = 179) were satisfied with the quality of their described living conditions. Healthcare services were rated "satisfactory" by 44.1% (n = 165), while transportation accessibility was rated "satisfactory" by 45.5% (n = 170). Lastly, respondents' emotional well-being was also examined by querying about adverse emotional conditions such as low mood, anxiety, or depressive feelings. For the current study, 49.2% (n = 184) reported that the feelings occurred "infrequently," suggesting a relatively stable psychological status for nearly half of the group.

Overall, the information gathered from this domain suggests a moderately positive pattern in the perceived quality of life for men with DM. Examining key domains such as health perception, emotional well-being, functional independence, and environmental satisfaction appears to have positive capacities. However, the evidence from pain interference, dependence on medical treatments, insufficient leisure activity engagement, and neutral sexual satisfaction results suggests that some dimensions of quality of life may still be inhibited in the participating population.

Table 4.5

Quality of Life and Satisfaction Among Respondents (n=374)

Question	**Response Category**	**n**	**%**
How would you rate your quality of life?	Very poor	1	0.3
	Poor	10	2.7
	Neither poor nor good	130	34.8
	Good	184	49.2
	Very good	49	13.1
How satisfied are you with your health?	Very dissatisfied	2	0.5
	Fairly Dissatisfied	18	4.8
	Neither satisfied nor dissatisfied	158	42.2
	Satisfied	163	43.6
	Very Satisfied	33	8.8
To what extent do you feel that physical pain prevents you from doing what you need to do?	Not at all	34	9.1
	A Small amount	100	26.7
	A Moderate amount	187	50.0
	A great deal	51	13.6
	An Extreme amount	2	0.5
How much medical treatment do you need to function in your daily life?	Not at all	14	3.7
	A Small amount	110	29.4
	A Moderate amount	193	51.6
	A great deal	53	14.2
	An Extreme amount	4	1.1
How much do you enjoy life?	Not at all	1	0.3

Question	Response Category	n	%
	A Small amount	13	3.5
	A Moderate amount	169	45.2
	A great deal	156	41.7
	An Extreme amount	35	9.4
To what extent do you feel your life is meaningful?	Not at all	0	0.0
	A Small amount	11	2.9
	A Moderate amount	147	39.3
	A great deal	173	46.3
	An Extreme amount	43	11.5
How well are you able to concentrate?	Not at all	0	0.0
	A Small amount	12	3.2
	A Moderate amount	161	43.0
	A great deal	165	44.1
	An Extreme amount	36	9.6
How safe do you feel in your daily life?	Not at all	0	0.0
	A Small amount	12	3.2
	A Moderate amount	151	40.4
	A great deal	161	43.0
	An Extreme amount	50	13.4
How healthy is your physical environment?	Not at all	0	0.0
	A Small amount	14	3.7
	A Moderate amount	173	46.3
	A great deal	139	37.2
	An Extreme amount	48	12.8
Do you have enough energy for everyday life?	Not at all	0	0.0
	Slightly	12	3.2
	Somewhat	149	39.8
	To a great extent	183	48.9
	Completely	30	8.0
Are you able to accept your bodily appearance?	Not at all	0	0.0
	Slightly	7	1.9
	Somewhat	158	42.2
	To a great extent	170	45.5
	Completely	39	10.4
Have you enough money to meet your needs?	Not at all	5	1.3
	Slightly	30	8.0
	Somewhat	170	45.5
	To a great extent	126	33.7
	Completely	43	11.5
How available to you is the information you need in your daily life?	Not at all	0	0.0
	Slightly	21	5.6
	Somewhat	165	44.1
	To a great extent	141	37.7
	Completely	47	12.6
To what extent do you have the opportunity for leisure activities?	Not at all	3	0.8
	Slightly	27	7.2
	Somewhat	162	43.3
	To a great extent	156	41.7
	Completely	26	7.0
How well are you able to get around physically?	Not at all	1	0.3
	Slightly	13	3.5
	Moderately	126	33.7
	Very	175	46.8
	Extremely	59	15.8
How satisfied are you with your sleep?	Very dissatisfied	2	0.5
	Fairly Dissatisfied	14	3.7
	Neither satisfied nor dissatisfied	146	39.0
	Satisfied	164	43.9
	Very Satisfied	48	12.8

Question	Response Category	n	%
How satisfied are you with your ability to perform your daily living activities?	Very dissatisfied	2	0.5
	Fairly Dissatisfied	10	2.7
	Neither satisfied nor dissatisfied	153	40.9
	Satisfied	166	44.4
	Very Satisfied	43	11.5
How satisfied are you with your capacity for work?	Very dissatisfied	3	0.8
	Fairly Dissatisfied	14	3.7
	Neither satisfied nor dissatisfied	147	39.3
	Satisfied	167	44.7
	Very Satisfied	43	11.5
How satisfied are you with yourself?	Very dissatisfied	1	0.3
	Fairly Dissatisfied	13	3.5
	Neither satisfied nor dissatisfied	135	36.1
	Satisfied	175	46.8
	Very Satisfied	50	13.4
How satisfied are you with your personal relationships?	Very dissatisfied	2	0.5
	Fairly Dissatisfied	7	1.9
	Neither satisfied nor dissatisfied	153	40.9
	Satisfied	165	44.1
	Very Satisfied	47	12.6
How satisfied are you with your sex life?	Very dissatisfied	4	1.1
	Fairly Dissatisfied	26	7.0
	Neither satisfied nor dissatisfied	175	46.8
	Satisfied	126	33.7
	Very Satisfied	43	11.5
How satisfied are you with the support you get from your friends?	Very dissatisfied	2	0.5
	Fairly Dissatisfied	23	6.1
	Neither satisfied nor dissatisfied	142	38.0
	Satisfied	164	43.9
	Very Satisfied	43	11.5
How satisfied are you with the conditions of your living place?	Very dissatisfied	0	0.0
	Fairly Dissatisfied	10	2.7
	Neither satisfied nor dissatisfied	134	35.8
	Satisfied	179	47.9
	Very Satisfied	51	13.6
How satisfied are you with your access to health services?	Very dissatisfied	1	0.3
	Fairly Dissatisfied	8	2.1
	Neither satisfied nor dissatisfied	135	36.1
	Satisfied	165	44.1
	Very Satisfied	65	17.4
How satisfied are you with your transport?	Very dissatisfied	0	0.0
	Fairly Dissatisfied	12	3.2
	Neither satisfied nor dissatisfied	135	36.1
	Satisfied	170	45.5
	Very Satisfied	57	15.2
How often do you have negative feelings such as blue mood, despair, anxiety or depression?	Never	132	35.3
	Infrequently	184	49.2
	Sometimes	42	11.2
	Frequently	14	3.7
	Always	2	0.5

4.5.2 Descriptive Analysis of Quality-of-Life Domains Among Respondents

Table 4.6 presents the descriptive statistics for each domain of the World Health Organisation Quality of Life (WHOQoL) instrument. This statistical analysis presents

the distribution of mean scores for the five major domains: physical, psychological, social, environmental, and overall quality of life (QoL), as well as general health, among 374 male respondents with diabetes mellitus.

Among the five domains measured, the overall QoL and general health category had the highest mean score, 3.64, with a standard deviation (SD) of 0.69. This indicates that, on average, the respondents reported positive overall well-being and life satisfaction. This suggests that the respondents were moderately satisfied with their overall quality of life and health status. Even when accounting for the restrictions with diabetes mellitus and the implications that go along with it, like erectile dysfunction, these respondents still provided an encouraging perception.

The environmental domain had a mean score similarly high (3.62, SD = 0.62), indicating that respondents were also satisfied with their environment, like safety, access to healthcare and transportation services, housing conditions, and access to important information. Again, a higher score indicated that respondents felt largely secure and at ease in their surroundings, qualities that influence the quality of life, particularly for individuals diagnosed with chronic conditions. The social domain, which included satisfaction with personal relationships, perceived social support, and sexual activity, reported a mean score of 3.58 (SD = 0.68). Although slightly lower than the environmental and overall QoL domains, this indicates a moderate to high level of satisfaction with social interactions. The respondents had access to social networks and support systems that are important for emotional health and resilience in managing chronic disease.

The physical domain indicated a slightly lower mean score of 3.39 (SD = 0.44). This domain encompasses perceptions of pain, energy, sleep, mobility, and performing daily life activities. The score indicates that participants perceived their physical functioning as moderate. While not alarmingly low, the score reflects the physical burden participants may experience due to diabetes-related complications, contributing to fatigue, mobility challenges, or body discomfort that impede their physical performance.

The psychological domain had the lowest mean score among the domains (M = 3.34, SD = 0.49). This domain captures areas such as self-esteem, body image, mood, concentration, and experiencing positive emotions. The lower score suggests that

emotional and mental well-being may be more significantly impacted in this population because of several possible factors, including anxiety, depressive symptoms, and emotional distress associated with chronic disease and sexual dysfunction.

When summed across all five domains, the average score for the overall WHOQoL was 3.49 (SD = 0.50), indicating a moderate perceived quality of life. This mean score indicates that, overall, respondents reported fair satisfaction levels across domains, but that specific areas of potential concern, such as those related to physical and psychological health, may need to be the focus moving forward. Overall, the results suggest that respondents were reasonably satisfied with their social relationships, their environment, and their general perceptions of health. The findings highlight concerns about physical stamina and psychological resilience, as well as the need for targeted interventions to improve overall well-being among male patients with diabetes mellitus living in urban Malaysia.

Table 4.6

Overall Quality of Life Across Different Domains (n=374)

Domains	Items	Min	Max	Mean	SD
Physical	3,4,10,15,16,17 and 18	1.86	5.00	3.39	0.44
Phycological	5,6,7,11,19 and 26	2.00	4.83	3.34	0.49
Social	20,21 and 22	1.33	5.00	3.58	0.68
Environment	8,9,12,13,14,23,24 and 25	2.00	5.00	3.62	0.62
Overall QoL and General Health	1 and 2	1.00	5.00	3.64	0.69
	Mean WHOQoL	1.92	4.81	3.49	0.50

4.6 Impact of Socio-demographic factors on ED

4.6.1 Regression Analysis of Socio-Demographic Factors Associated with ED

The results of the simple logistic regression analysis presented in Table 4.7 examined the relationships between socio-demographic variables and the presence of erectile dysfunction (ED) among respondents. The dependent variable (ED) was analyzed dichotomously, with "No ED" including respondents with normal erectile function and mild ED. At the same time, "ED" included respondents reporting mild-to-moderate, moderate, and severe ED based on the situation in previous studies (Rezali et al., 2023). Each socio-demographic variable was subjected to simple logistic regression, one at a time, with the variable chosen for inclusion in the multiple logistic

regression model based on a p-value < 0.25, as suggested by Hosmer (2013).

When individuals in the age group were analyzed, the young adult respondents (25-39 years) experienced significantly lower odds of ED compared to older adult respondents (60-84 years) (β = -2.52, Wald statistic = 38.78, crude odds ratio (OR) = 0.08, 95% confidence interval (CI) = 0.04 to 0.18, p < 0.001). Middle-aged individuals (40-59 years) reported reduced odds of ED (β = -1.45, Wald = 18.32, OR = 0.23, 95% CI = 0.12 to 0.46, p < 0.001). When education level was analyzed, respondents with no formal schooling had significantly higher odds of ED than those with skills certificates or diplomas (β = 2.18, Wald = 12.88, OR = 8.87, 95% CI = 2.69 to 29.20, p < 0.001). During the analysis of education level, it is also noteworthy that respondents with higher education (degree, master's, and PhD) reported reduced odds of ED compared to those with skills certificates or diplomas (β = -0.93, Wald = 7.17, OR = 0.39, 95% CI = 0.20 to 0.78, p = 0.007).

When the respondents' ethnicities were analyzed, Chinese respondents had greater odds of ED than Malays (β=0.95, Wald=5.25, OR=2.58, 95% CI=1.15 to 5.81, p=0.022). There was once again a greater odd of ED for Indian lies (OR=1.80), which was almost statistically significant (p=0.064). There was no statistically significant relationship among Sabah/Sarawak/other ethnicities (p = 0.570). When employment status was analyzed, there were higher odds of ED for respondents who were unemployed or retired compared to those who reported their occupation as either government, private, or self-employed (β = 1.45, Wald = 20.06, OR = 4.25, 95% CI = 2.26 to 8.0, p < 0.001).

Table 4.7

Simple Logistic Regression Analysis of Sociodemographic Factors Associated with ED (n = 374)

Variable	Simple logistic regression			
	Beta	**Wald (df)**	**Crude OR (95% CI)**	**p-value**
Age Group (Years)				
Young Adult (25–39)	-2.52	38.78 (1)	0.08 (0.04, 0.18)	**0.000***
Middle Adult (40–59)	-1.45	18.32 (1)	0.234 (0.12, 0.46)	**0.000***
Old Adult (60–84)	Ref.	Ref	1.00	Ref
Education				
No school	2.18	12.88 (1)	8.87 (2.69, 29.20)	**0.000***
Skills certificate / Diploma	Ref.	Ref	1.00	Ref
Degree/Master/PhD	-0.93	7.17 (1)	0.39(0.20, 0.78)	**0.007***
Ethnicity				

Sabah/Sarawak/others	-0.47	0.32 (1)	0.626 (0.12, 3.16)	0.570
India	0.59	3.44 (1)	1.799 (0.97, 3.16)	0.064*
Chinese	0.95	5.25 (1)	2.581 (1.15, 5.81)	**0.022***
Malay	Ref.	Ref	1.00	Ref
Occupation				
Unemployed/ Retired	1.45	20.06 (1)	4.25 (2.26, 8.00)	**0.000***
Employed in Government/ Private/ Self-employed sector	Ref.	Ref	1.00	Ref

Adjusted for all sociodemographic for ED, Multiple Logistic regression was applied.
The model assumptions were met; No multicollinearity was found.
Hosmer–Lemeshow test: p-value = 0.601.
Significant values are in * (p-value<0.05).

In the multiple logistic regression model, variables with p-values < 0.25 from the simple logistic regression were entered. These variables included age group, educational level, ethnicity, and employment status. The model's assumptions were not violated, and no multicollinearity was shown. In the goodness-of-fit assessment, the Hosmer-Lemeshow test was non-significant (p=0.601), indicating a good fit of the model to the data.

Erectile dysfunction (ED) was dichotomised into two categories, "No ED" (regular and mild ED) and "ED" (mild to moderate, moderate, and severe ED), based on literature implying that the latter group deserves clinical attention. The findings from the multiple logistic regression analyses are presented in Table 4.8. ED was significantly associated with the age group. Young adults (25–39 years) were 84.6% less likely to experience ED than older adults (60–84 years) (AOR = 0.154, 95% CI: 0.062–0.380, p <0. 001) and middle-aged adults (40–59 years) had lower odds by 61.7% (AOR = 0.383, 95% CI: 0.178–0.824, p =0. 014). The level of education was also significantly associated. Respondents who had no formal education were 4.51 times more likely to have ED than respondents who had a diploma/skills certificate (AOR = 4.511, 95% CI: 1.309–15.542, p =0.017). Conversely, the odds of developing ED were 57.6% lower among those with a degree, master's, or PhD (AOR = 0.424, 95% CI: 0.200–0.899, p = 0.025). The final model suggests a non-significant association of ED with ethnicity and employment status.

Table 4.8

Multiple Logistic Regression Analysis of Sociodemographic Factors Associated with ED (n = 374)

Variable	Multiple Logistic Regression			
	Beta	Wald (df)	Adjusted OR (95% CI)	p-value
Age Group (Years)				
Young Adult (25–39)	-1.87	16.43 (1)	0.15 (0.06, 0.4)	**0.000***
Middle Adult (40–59)	-0.96	6.02 (1)	0.383 (0.18, 0.82)	**0.014***
Education				
No school	1.51	5.70 (1)	4.511 (1.31, 15.54)	**0.017***
Degree/Master/PhD		5.01 (1)	0.424 (0.20, 0.90)	**0.025***
Ethnicity				
India	0.41	1.48 (1)	1.515 (0.78, 2.96)	0.224
Chinese	0.75	2.57 (1)	2.11 (0.85, 5.25)	0.109
Occupation				
Unemployed/ Retired	0.52	1.80 (1)	1.68 (0.79, 3.60)	0.181

Note. AOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref. = Reference group. $p < 0.05$ was considered statistically significant (*).

4.6.2 Regression Analysis of Clinical Factors Associated with ED

Table 4.9 provides the results of the simple logistic regression to assess the unadjusted associations between the clinical variables and the occurrence of erectile dysfunction (ED) among the sample. For the analysis, the dependent variable was dichotomized into two categories: participants with no erectile difficulties and those with mild ED were classified in the “No ED” group, and those with mild to moderate, moderate, or severe ED were classified into the "ED" group. This categorisation approach aligns with that of other researchers. (Rezali et al., 2023) who have found it appropriate to group clinically consequential ED cases for analysis.

The clinical variables were assessed separately to examine their association with ED, allowing for the crude (unadjusted) association to be observed. This analysis followed recommendations from Hosmer (2013), where only the clinical variables with a p-value less than 0.25 in the simple logistic regression were considered to be included in the multiple logistic regression model, which allows for consideration of potentially important variables that may reach statistical significance when adjusting for confounders in the multivariable analysis.

Several significant findings from the analysis deserve notice. The duration of diabetes mellitus was statistically significant, with a beta estimate of 0.183 and a Wald statistic value of 35.320 (df = 1). The crude odds ratio (OR) of 1.201 (95% CI: 1.131–

1.276) indicates that for each additional year of diabetes mellitus complications, the odds of ED increase by 20% (all else equal). This supports current thinking that continued hyperglycaemia produces increasingly harmful vascular and neuro-pathological changes that have a positive association with erectile function.

The BMI groupings yielded results different from those of the normal weight (referent) group. None of the BMI groupings were statistically significant, but the obesity class II (Obese 2) group yielded a crude OR of 3.214 (95% CI: 0.814–12.697) and a p-value of 0.096. Although it is suggested that the group had an increased risk of ED (albeit insignificant), this study could not display that relationship. The estimate for obesity class III (Obese 3) was unstable due to a small sample size, which also explains the unreasonably high OR.

Glycaemic control (represented by HbA1C) is of interest. Those with higher HbA1C had higher odds of reporting ED than those in the normal range (OR = 1.831, 95% CI: 1.156–2.902, p = 0.010). This finding supports the argument that poor glycaemic control is associated with endothelial dysfunction and impaired nitric oxide biosynthesis, both of which are relevant to the pathology of ED. Hypertension was highly congested in the ED. Hypertensive subjects had more than twice the odds of ED compared to normotensive subjects (OR = 2.387, 95% CI: 1.540-3.698, p < 0.001). Comorbid non-communicable diseases (NCD) also had extremely high odds of ED (OR = 5.273, 95 %CI: 2.811 - 9.891, p < 0.001), demonstrating the additively significant effects of multimorbidity on sexual health.

Lifestyle factors were also elucidated. Smoking status (p = 0.205) was not significant; however, it had a crude OR of 1.331, indicating smoking may be associated with an increased risk of ED. Alcohol consumption was marginally non-significant (p = 0.056) and had an OR of 2.050, identifying those who consumed alcohol had roughly twice the odds of ED when compared to non-drinkers.

Physical activity showed a clear inverse odds relationship, with "Not Active" as the reference group; successively higher activity levels were associated with lower odds of ED. For example, participants designated Active had an OR of 0.029 (95% CI: 0.004 - 0.226, p = 0.001) and Very Active participants had an OR of 0.036 (95% CI: 0.004 - 0.349, p = 0.004). This suggests that the more physical activity, the more protective effects for erectile function, as is consistent with evidence indicating exercise is

protective of endothelial health and reduces the risk factors for cardiovascular disease.

Treatment history for ED was also considered, as participants who reported previous treatments had a higher crude OR of 6.655 (95% CI: 0.855-51.773), although this did not reach significance yet (p = 0.070). The wide confidence intervals reflect the small number of participants in this subgroup, indicating a less precise estimate.

It is also important to note that "No Answer" in the database represented missing or unrecorded responses and may affect the stability of some estimates. Overall, the simple logistic regression findings highlight essential information about clinical factors that may be associated with ED and inform the adjusted analysis using the multiple logistic regression model.

Table 4.9:

Simple Logistic Regression Analysis of Clinical Factors Associated with ED (n = 374)

Variable	Simple logistic regression			
	Beta	Wald (DF)	Crude OR (95% CI)	p-value
Duration (years)	0.183	35.320 (1)	1.201 (1.131, 1.276)	**0.000***
BMI				
No Answer	0.570	0.751 (1)	1.768 (0.487, 6.413)	0.386
Underweight	0.251	0.040 (1)	1.286 (0.108, 15.237)	0.842
Normal	Ref.	Ref	1.00	Ref
Pre Obese	-0.105	0.091 (1)	0.900 (0.453, 1.787)	0.763
Obese 1	0.341	0.956 (1)	1.406 (0.710, 2.786)	0.328
Obese 2	1.168	2.775 (1)	3.214 (0.814, 12.697)	**0.096***
Obese 3	20.761	0.000 (1)	1038519556 (0)	0.999
HbA1C				
No Answer	0.287	0.614 (1)	1.332 (0.650, 2.732)	0.433
Normal Range	Ref.	Ref	1.00	Ref
High	0.605	6.634 (1)	1.831 (1.156, 2.902)	**0.010***
Hypertension				
No			1	
Yes	0.870	15.163 (1)	2.387 (1.540, 3.698)	**0.000***
NCD				
No	Ref.	Ref	1.00	Ref
Yes	1.663	26.829 (1)	5.273 (2.811, 9.891)	**0.000***
Smoking				
No	Ref.	Ref	1.00	Ref
Yes	0.286	1.609 (1)	1.331 (0.856, 2.072)	**0.205***
Alcohol				
No	Ref.	Ref	1.00	Ref
Yes	0.718	3.654 (1)	2.050 (0.982, 4.278)	**0.056***
Exercise				
No Answer	-1.792	1.401 (1)	0.167 (0.009, 3.239)	**0.237***
Not Active	Ref.	Ref	1.00	Ref
Slightly Active	-1.811	2.882 (1)	0.163 (0.020, 1.323)	**0.090***
Moderately Active	-2.393	5.365 (1)	0.091 (0.012, 0.692)	**0.021***
Active	-3.535	11.460 (1)	0.029 (0.004, 0.226)	**0.001***
Very Active	-3.332	8.218 (1)	0.036 (0.004, 0.349)	**0.004***
Treatment ED				

No Answer	0.797	0.503 (1)	2.218 (0.245, 20.061)	0.478
Yes	1.895	3.279 (1)	6.655 (0.855, 51.773)	**0.070***
No	Ref.	Ref	1.00	Ref

Note. OR = Odds Ratio; CI = Confidence Interval; Ref. = Reference group.
p <0 .05 was considered statistically significant (*).
The obese Class III shows an unstable estimate due to a tiny sample size.
"No Answer" indicates missing or unrecorded responses in the dataset.

Table 4.10 shows the results from the multiple logistic regression, which included all the clinical variables with p-values less than 0.25 in the simple logistic regression. These clinical variables were duration of diabetes mellitus, obesity class II, HbA1c, hypertension, existence of a second chronic disease (NCD), smoking status, alcohol use, levels of physical activity, and prior treatment for ED.

Before interpreting the results, model diagnostics were conducted to verify the underlying assumptions and ensure the model fit was accurate. No evidence of multicollinearity was observed, indicating that the independent variables were not highly correlated. The Hosmer-Lemeshow goodness-of-fit test also yielded a non-significant p-value ($p = 0.248$), indicating adequate model fit to the data. Variables had outliers or null values for diabetes mellitus duration; the median was assigned to these values to mitigate bias that could distort the model. The variable for treatment of ED approached statistical significance ($p = 0.053$). However, it was not considered impactful in the final interpretation, as it did not fall within the accepted significance cutoff value ($p < 0.05$). In the final multivariable model, three clinical variables were generally statistically significant for the association with ED.

The first variable, duration of diabetes mellitus, was significantly associated with ED. For each year spent living with diabetes mellitus, the odds of experiencing ED increased by 17.9% (AOR = 1.179; 95% CI: 1.103–1.261; $p = 0.001$). This finding supports longstanding medical knowledge that the sustained effects of chronic hyperglycaemia can cause progressive vascular and neurological damage, two of the main physiologic pathways in the development of ED.

The presence of other non-communicable disease (NCD) comorbidities was also significantly correlated with an elevated risk of ED. Respondents with NCD comorbidity were 2.59 times more likely to experience ED compared to those without NCDs (AOR = 2.590; 95% CI: 1.248–5.374; $p = 0.011$), indicating the cumulative effect of chronic health problems on male sexual function and illustrating the need for

complete management for men with DM and comorbidities.

Physical activity was likewise noted as a strong protective variable against ED. Relative to inactive individuals, those participating in moderate amounts of activity were 91.7% less likely to experience ED (AOR = 0.083; 95% CI: 0.010–0.685; p = 0.021). The protective effects were pronounced, including for those categorized as "Active," who were less likely to be diagnosed with ED by 96.9% (AOR = 0.031; 95% CI: 0.004–0.261; p = 0.001), and "Very Active" males in the study were found to have 93.1% lower odds of a diagnosis (AOR = 0.069; 95% CI: 0.006–0.755; p = 0.029). The consistency of the measures above suggests that regular physical activity may help maintain vascular health, improve endothelial function, and reduce the risk of ED in men with DM.

In comparison, other clinical characteristics, such as HbA1c testing referring to high levels, hypertension, smoking status, alcohol consumption, and obesity class II, were not significantly associated with ED in the final adjusted model. While a few of these variables displayed a trend in the expected direction, each was ultimately found not to be contingent on other factors, suggesting their influence was not as strong as that of other predictors in the model, or was potentially mediated or confounded by different variables.

Finally, while prior treatment for ED had a relatively large odds ratio (AOR = 8.170; 95% CI: 0.974–68.571) and was nearly statistically significant (p = 0.053), the large confidence interval and marginal p-value provide little precision in this estimate. The lack of precision may reflect the second-lowest number of individuals in the treatment reviewed, thereby limiting the power of the analysis, the reliability of the information presented, and the minimal impact this variable had on the interpretations of the resulting study indications.

The multiple logistic regression analysis identified three clinical predictors of ED in this population: diabetes mellitus duration, presence of comorbid NCDs, and physical activity level. Therefore, the implications of these findings regarding management strategies should focus on promoting early and sustained diabetes mellitus management, proper management of comorbidities, and encouraging physical activity as essential to preventing or reducing ED visits for males living with diabetes mellitus.

Table 4.10

Multiple Logistic Regression Analysis of Clinical Factors Associated with ED (n = 374)

Variable	Multiple logistic regression			
	Beta	Wald (df)	Adjusted OR (95% CI)	p-value
Duration (years)	0.165	23.376 (1)	1.179 (1.103, 1.261)	**0.000***
BMI				
Obese 2	1.029	2.020 (1)	2.798 (0.677, 11.561)	0.155
HbA1C				
High	-0.021	0.006 (1)	0.979 (0.584, 1.643)	0.936
Hypertension				
Yes	0.388	2.077 (1)	1.475 (0.869, 2.501)	0.150
NCD				
Yes	0.952	6.531 (1)	2.590 (1.248, 5.374)	**0.011***
Smoking				
Yes	0.281	1.057 (1)	1.324 (0.775, 2.260)	0.304
Alcohol				
Yes	-1.06	0.055 (1)	0.9 (0.374, 2.167)	0.814
Exercise				
No Answer	-1.067	0.463 (1)	0.344 (0.016, 7.432)	0.496
Slightly Active	-2.256	4.067 (1)	0.105 (0.012, 0.939)	0.044
Moderately Active	-2.494	5.340 (1)	0.083 (0.010, 0.685)	**0.021***
Active	-3.485	10.171 (1)	0.031 (0.004, 0.261)	**0.001***
Very Active	-2.676	4.796 (1)	0.069 (0.006, 0.755)	**0.029***
Treatment ED				
Yes	2.101	3.745 (1)	8.170 (0.974, 68.571)	0.053

Note: AOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref. = Reference group.
$p < 0.05$ was considered statistically significant (*).
Treatment for ED was not retained in the interpretation as the p-value was borderline ($p = 0.053$).

4.7 Differences in Quality-of-Life Domains Across Levels of Erectile Dysfunction (ED)

In Table 4.11, the results of a one-way ANOVA comparison of mean quality-of-life (QoL) scores by erectile dysfunction (ED) severity levels for the WHOQoL-BREF domains are presented, indicating statistically significant differences between groups in all domains. This reveals a consistent inverse relationship between ED severity and QoL scores. That is, the more severe the ED symptoms, the lower the reported QoL. The presence of a pattern highlights that ED is negatively associated with multiple aspects of a person's life, not only physically, but psychologically, socially, and environmentally.

In the physical health domain, participants with severe ED had the lowest mean scores (3.16 ± 0.50), followed by those with moderate ED, mild-moderate ED, and mild ED, respectively, with the highest scores for participants with no ED (3.60 ± 0.42). The

ANOVA result ($F(4, 369) = 13.49$, $p < 0.001$) confirmed the presence of statistically significant differences across groups. In contrast, the post-hoc analysis confirmed that males with severe ED had mean physical health scores lower than all other categories of ED ($p < 0.001$). At the same time, the difference between mild ED and no ED was not statistically significant ($p = 0.05$). This indicates that physical well-being is noticeably impaired only at moderate-severe ED levels but relatively preserved in those with mild symptoms. Within the psychological domain, the mean scores ranged from 3.13 ± 0.52 in the severe ED group to 3.69 ± 0.47 among males without ED, $F(4, 369) = 14.94$, $p < 0.001$. Severe ED was associated with significantly poorer psychological health than all groups, except for mild ED versus no ED ($p = 0.683$). This suggests that severe ED involves a significant psychological burden, possibly impacting self-esteem, mood, and emotional stability, while milder forms of ED may not appreciably affect psychological well-being.

In the social relationship domain, the mean score difference was the largest among all domains, with those with severe ED reporting a mean score of 3.19 ± 0.73, compared to a mean score of 4.09 ± 0.67 for males without ED ($F(4, 369) = 24.48$, $p < 0.001$). Post-hoc analysis confirmed that severe ED was significantly lower than all other ED categories, $p < 0.001$, except mild ED versus no ED ($p = 0.924$). The significant reduction of social domain scores for severe ED highlights the impact that sexual health problems have in the context of interpersonal relationships, intimacy, and perceived social support.

In the environmental domain, mean scores ranged from 3.33 ± 0.71 among males with severe ED to 4.04 ± 0.63 among males without ED, $F(4, 369) = 16.07$, $p < 0.001$. Results from post-hoc showing only the severe, moderate, and mild-to-moderate ED groups had significantly lower environmental scores than no ED ($p < 0.001$) with no difference between mild ED and no ED ($p = 0.915$); that is, in terms of perceived ability, and possibly numerous contributing factors, mild ED does not affect an individual's understanding of their physical space, access to health services, or feeling of safety or comfort quite like more advanced stages of ED.

A similar trend was observed in the overall QoL and the general health domain of the WHOQoL, with participants with severe ED reporting a mean score of 3.23 ± 0.71, compared to 4.14 ± 0.65 in those without ED ($F(4, 369) = 26.30$, $p < 0.001$). Post-

hoc comparisons showed that at the overall level, the severe ED, moderate ED, and mild-to-moderate ED groups were significantly lower than the no ED group ($p < 0.01$), while the mild ED and the no ED were statistically equal ($p = 0.992$); that is when perceived overall health and life satisfaction was decreased overall, it was in the presence of moderate and severe ED, but did not seem overly affected by mild ED.

Finally, the same patterns were observed in the WHOQoL composite scores, which ranged from a mean of 3.85 ± 0.47 in the no ED group to 3.21 ± 0.56 in the severe group. ($F(4,369) = 22.06$, $p < 0.001$)Post-hoc testing revealed that the severe ED group scores were significantly lower than those of the mild ED and no ED groups ($p < 0.001$), indicating an overall decline in perceived quality of life at later stages of ED. Accordingly, the results in Table 4.11 confirm that the severity of ED is highly correlated with the quality of life, lower in all measured domains, but especially in the social domain and the overall QoL domain. These findings suggest that ED is not merely connected to sexual health, but that ED is multidimensional and affects, and is affected by, sound physical ability, higher levels of psychological resilience, social engagement, and satisfaction with the immediate living environment and overall well-being. The consistency of the association across domains emphasizes the significance of early detection and comprehensive management of ED, and supporting interventions to help maintain quality of life for men with DM and ED.

Table 4.11

Differences in Quality-of-Life Domains Across Levels of ED (n=374)

Domains	Level of ED, mean (SD)					Mean Square	df	F	p-value
	Severe	Moderate	Mild to moderate	Mild ED	Normal (No ED)				
Physical	3.16 (0.50)	3.31 (0.40)	3.38 (0.38)	3.59 (0.39)	3.60 (0.42)	2.36	4	13.49	**<0.001**
Phycological	3.13 (0.52)	3.21 (0.43)	3.29 (0.41)	3.53 (0.47)	3.69 (0.47)	3.16	4	14.94	**<0.001**
Social	3.19 (0.73)	3.40 (0.58)	3.49 (0.55)	3.94 (0.55)	4.09 (0.67)	9.08	4	24.48	**<0.001**
Environment	3.33 (0.71)	3.48 (0.52)	3.56 (0.48)	3.89 (0.56)	4.04 (0.63)	5.33	4	16.07	**<0.001**
Overall QoL and General Health	3.23 (0.71)	3.42 (0.57)	3.58 (0.58)	4.03 (0.57)	4.14 (0.65)	9.85	4	26.30	**<0.001**

Mean WHOQoL	3.21 (0.56)	3.36 (0.41)	3.44 (0.40)	3.74 (0.43)	3.85 (0.47)	4.47	4	22.06	**<0.001**

Post-hoc Tamhane

- Physical: Severe ED had significantly lower physical QoL scores than all other ED levels ($p < 0.001$), except between mild ED and normal, which was not significant ($p > 0.05$).
- Psychological: Severe ED had significantly lower psychological QoL scores than all other levels ($p < 0.001$), except between mild ED and normal, which was not significant ($p = 0.683$).
- Social: Severe ED had significantly lower social QoL scores than all other levels ($p < 0.001$), except between mild ED and normal, which was not significant ($p = 0.924$).
- Environment: Severe, moderate, and mild-to-moderate ED showed significantly lower environment QoL scores compared to those without ED ($p < 0.001$). No significant difference was observed between mild ED and no ED ($p = 0.915$).
- Overall QoL and General Health: males with severe, moderate, and mild-to-moderate ED had significantly lower overall QoL and general health scores than those without ED ($p < 0.001$). There was no significant difference between the mild ED and no ED groups ($p = 0.992$).
- WHOQoL: Post-hoc showed severe ED had significantly lower QoL than mild and normal ($p < 0.001$).

4.8 Summary

Chapter 4 presents the study's findings, based on the predetermined objectives. The analysis included 374 male respondents diagnosed with diabetes mellitus. The respondents were middle-aged individuals with an average age of 51.69 years, and nearly half were classified as Obese Class I according to body mass index (BMI). Clinically, the majority were hyperglycaemic (52.9% with an HbA1c level >6.5%), and 61.0% had a diagnosis of hypertension. Among those surveyed, the proportion with erectile dysfunction (ED) was very high at 74.6%. Of the individuals with ED, 21.3% had mild ED, 32.8% had moderate ED, and 20.5% had severe ED.

Several factors were significantly associated with the severity of ED. Increasing age, especially ≥60 years, was associated with more severe ED. Increased ED severity was associated with higher educational attainment (12 years or more) and unemployment status. Clinically, longer diabetes mellitus duration, poor glycaemic control (HbA1c level ≥8.0%), and current smoking status were significantly associated with more severe forms of ED. These results indicate that socio-demographic and clinical factors have an important role in the severity of erectile dysfunction among men with DM.

Quality of life (QoL), assessed using the WHOQoL-BREF instrument, achieved an overall moderate level of well-being ($M = 3.49$, $SD = 0.50$). Among the four

domains, the general health and overall QoL domains had the highest scores, and the physical and psychological domains had the lowest scores. There were significant differences in quality of life (QoL) by severity category, as shown in a one-way ANOVA ($p < .001$). Individuals with the most severe ED reported lower levels of quality of life related to physical, emotional/psychological, social, and environmental aspects of their lives. Therefore, as ED severity increases, the overall well-being of men with

CHAPTER 5
DISCUSSION

5.1 Introduction

Diabetes mellitus is associated with a range of complications, including erectile dysfunction (ED), which is common among men with DM and may significantly impair quality of life (QoL). The chapter presents a detailed discussion of the study's results in comparison to previous literature, thereby identifying similarities and inconsistencies in reported trends. The debate is organized based on the study's three primary objectives: (1) investigating the prevalence of ED among diabetes mellitus men with DM, (2) identifying the impact of socio-demographic and clinical factors, and (3) assessing its association with QoL. In addition, this chapter discusses the clinical and policy relevance of these findings, potential limitations of the study, and directions for future research.

5.2 Prevalence and Severity of Erectile Dysfunction (ED)

In the current study, a clinically significant prevalence of erectile dysfunction (ED) was found among men with DM in Kuala Lumpur, with a percentage of 65.5%, when ED was defined as mild-to-moderate, moderate, or severe based on the International Index of Erectile Function-15 (IIEF-15) scores. "No ED" was classified as a normal erectile function to mild ED, while mild-to-moderate, moderate, or severe ED was classified as ED. In this regard, the approach taken in this study is aligned with past studies that often include mild ED with normal erectile function for analytical purposes; mild ED has a less reliable influence on health outcomes than other levels of ED and is less likely to be clinically urgent (Rezali et al., 2023). The finding that almost two-thirds of the population in the study reflected clinically significant ED suggests that there is a considerable health burden in this patient population, and there is a need for sexual health screening in diabetes mellitus care.

Several methods of mitigating the high levels of erectile dysfunction (ED) found in this population could be implemented at the primary care level. The use of short, standardized screening tools to identify ED during regular visits to evaluate and manage

diabetes mellitus would be one such method; educational programs that target both patients and physicians concerning sexual health would also be beneficial; and providing early referral systems for patients identified by ED screening to be evaluated by a provider capable of managing the patient's ED would likely be effective. Also, strengthening collaboration between professionals working in primary care environments could help individuals with ED meet all their physical, emotional, and other needs, especially if they have ED caused by psychological, vascular, or neuropathic complications related to diabetes mellitus.

There were no urologists directly participating in either the implementation or analysis of this study, as it was a self-administered questionnaire and did not involve clinical assessments or evaluations by specialists. Nevertheless, respondents who indicated they had severe ED symptoms or expressed concerns about their sexual health during data collection were counselled, consistent with standard ethical practices in collecting data, to speak with their attending medical officer or family medicine specialist at the respective clinic about their concerns. The physician or family medicine specialist can implement initial management and/or refer the individual to urology or men's health services, depending upon their clinical judgment.

Although formal referral pathways were not part of the study's methodology, the findings highlight the need for strengthening collaborative practices between primary care physicians and specialist services. This would ensure that patients who screen positive for clinically significant ED can receive comprehensive assessment and management, thereby addressing the broader physical and psychosocial impact that ED has on quality of life.

The prevalence rate found in this study is in the mid-range of prevalence rates reported in the literature, which have been reported between 28.1% and 94.7% in different populations, demonstrating the variability across studies (Yazid et al., 2025). The differences in prevalence are the result of many varied factors related to ED in diabetes mellitus, including the type of diabetes mellitus, age profile, glycaemic control, comorbidities, cultural attitudes, availability of healthcare, as well as differing definitions and methods of measuring ED.

Alternatively, some studies reported significantly higher prevalence rates regionally and globally. For example, Ugwumba et al. (2018), in Nigeria, reported an

astonishingly high 94.7% rate among males with type 2 diabetes mellitus. This rate is likely impacted by late diagnoses, limited access to early intervention, and perhaps unrecognized comorbidities, which are in effect exacerbations of existing vascular or neurologic complications. Defeudis et al. (2023) reported an 86.5% prevalence in Italy, which illustrates that even in high-income settings, there were high rates of ED present in men with DM, presumably linked to continuing microvascular and macrovascular injury related to diabetes. Bekele et al. (2022) also reported a high prevalence in Ethiopia, at 82.1%. This suggests men with DM may be faced with ED as a common problem, regardless of resource-constrained or resource-rich settings. However, the causes of these relationships will differ.

Conversely, there are some populations with much lower prevalence. For example, Hylmarova et al. (2020) in the Czech Republic reported an ED prevalence of 28.1%, which is less than half of what was reported in this investigation. It will be essential to discover what moderators lower this prevalence. In Hylmarova et al. (2020) study, a younger average age of the sample, better overall glycaemic control, or different health-seeking behaviours might be at play. Other examples such as Thongtang et al. (2020) in Thailand also highlighted that the prevalence of 71.5% males with type 2 diabetes with ED. In contrast, males with type 1 diabetes mellitus had a lower prevalence rate, and this supported the reasoning that type 1 diabetes has a lower risk for erectile dysfunction than type 2 diabetes mellitus due to different pathophysiology, especially in the younger population. Type 1 diabetic men (compared to women) generally have fewer years of diabetes. Their type 1 diabetes mellitus typically begins earlier in life as well. In addition, the development of type 1 diabetes mellitus results from an immune-mediated destruction of the insulin-producing beta cells in the pancreas, leading to a rapid onset of hyperglycaemia; however, the accumulation of vascular and neural damage requires additional time to develop. Therefore, many individuals with type 1 diabetes mellitus may not have developed the long-standing endothelial dysfunction, autonomic neuropathy, or hormonal alterations that can lead to sexual dysfunction, including impotence.

Studies with intermediate prevalence, like this study, have also been reported. Silva et al. (2022) noted a prevalence of 79.2% in Sri Lankan men with DM mellitus, which is higher than that of this study but of a similar magnitude. Mushtaq et al. (2018), working in Pakistan, reported a prevalence of 62.5%, which is more closely aligned

with our prevalence of 65.5%. This suggests that South and Southeast Asian populations may experience similar risk trajectories, possibly connected to genetic predisposition, dietary habits, and culture-related sexual health disclosure. Barnard-Kelly et al. (2019) reported a prevalence rate of 66% in the UK, which is comparable to the findings in this study, supporting the notion that ED is common among men with DM mellitus, regardless of whether the country is high-income or middle-income.

Interestingly, Jombo et al. (2020) reported a prevalence rate of 50.2% in Nigeria, which is lower than the rate reported by Ugwumba et al. (2018), despite both studies being conducted in the same country. This inconsistency may highlight differences in sample characteristics. Jombo et al.'s (2020) study may include participants who were more recently diagnosed or had better metabolic control. In contrast, Ugwumba et al.'s (2018) study may involve patients who have lived with diabetes mellitus for a more extended period or suffered more severe complications. Such distinctions highlight the importance of context in interpreting prevalence information related to the characteristics of a group.

Several factors must be considered in determining why the present study's prevalence falls within the middle of the range found for diabetes mellitus. First and foremost, age is a crucial factor. Ageing is a known risk factor for ED due to physiological decline in vascular and endocrine function and increased disease burden over time (Silva et al., 2022; Ugwumba et al., 2018). Though the present study included younger adults (25 - 39 years) who were significantly less likely to have ED, most were middle-aged and older; this impacted the overall prevalence as a group.

Second, diabetes mellitus type and disease duration are two important factors to consider. In the present study, as with other studies, type 2 diabetes mellitus has a stronger association with ED than type 1 diabetes mellitus because of its insidious onset, long period of undetected hyperglycaemia, and greater incidence of associated metabolic syndrome (Thongtang et al., 2020; Tucker et al., 2023). The fact that the participants in the present study were from an urban Malaysian population, where type 2 diabetes mellitus is prevalent, may help explain the differences in overall prevalence (Cheah et al., 2019; Goh et al., 2020).

Third, glycaemic control is another modifiable factor, albeit one that can be expected to be poorly managed. Poor glycaemic control directly enhances endothelial

dysfunction, limits nitric oxide production, and contributes to neuropathic damage - these mechanisms play an essential role in the development of ED (Giugliano et al., 2021; Maiorino et al., 2017; Hackett, 2019). Since glycaemic control varies in studies, differing levels of glycaemic control may alter overall ED prevalence rates between studies. It is plausible that in settings where the patient has robust primary care and can maintain tighter glycaemic control, the prognosis appears to be better for the patient in terms of maintaining erectile function.

Fourth, various methodological differences should be considered, in particular the tool used to measure ED and the cut-off score used in the classification of a given study. The present study measured ED utilizing the IIEF-15, allowing for the examination of the categories of ED severity. The differences that exist between studies regarding the administration, tabulation, or classification of the IIEF could also contribute to variations in prevalence. For example, some studies utilized the shorter IIEF-5 instrument. By relying on the IIEF-5, there is a potential for slightly overestimating or underestimating prevalence, depending on the cut-off score (Rosen et al., 1999; Rhoden et al., 2002). Further, differences in personal reflection on sexual dysfunction may also be impacted by cultural differences (to varying degrees) related to stigma or embarrassment, or differing perceptions of sexual health, with even idiosyncratic differences in societies where sexual health is not as socially accepted or led by social norms.

In addition to the prevalence of erectile dysfunction (ED) in total, this research categorized the degree of ED based on the responses received. The majority of the sample identified with mild to moderate degrees of ED; however, a smaller number of participants identified with severe ED. The results do not align with those found by Bellad & Sahu (2019); they reported that 67.79% of diabetes mellitus patients did not experience ED; therefore, only a very low percentage of the sample experienced any ED, with 9.62% being mild, 12.98% being mild to moderate, 6.25% being moderate, and 3.37% being severe. When compared to the current study, the distribution of ED severity in Bellad & Sahu's sample was significantly lower than that in the current study for each category of ED severity. These discrepancies can be attributed to the variability in population characteristics, including glycaemic control, diabetes mellitus duration, and the metabolic burden of the sample, and it is possible that patients in the Bellad & Sahu study had shorter durations of diabetes mellitus, were younger, or had better access

to diabetes mellitus management services that would delay the onset of neuropathy and vascular changes associated with ED.

Stigma and/or discomfort with discussing sexual health issues may result in an underreporting of sexual difficulties due to cultural factors and thus result in fewer participants being classified within moderate or severe ED categories. Variability in clinical thresholds or scoring practices for classifying ED severity may further explain the different findings between studies. Conversely, the severity of ED reported in the current study demonstrates more similarity with the findings of Ugwumba et al. (2018), who reported that 62.5% of male diabetics in Nigeria experienced moderate to severe ED. These findings suggest that, in populations experiencing chronic hyperglycaemia, poor metabolic control, or limited access to preventive healthcare, more severe forms of ED will develop. Overall, the differences in clinical, cultural, and methodological approaches across studies illustrate that both biological mechanisms and the health system and patient characteristics influence the degree of ED.

In contrast, the prevalence of ED among men with DM attending outpatient treatment in Johor Bahru, Malaysia, was found to be 81.5% (Nordin et al., 2019), which is similar to the findings of this study. Conversely, the prevalence of severe ED was 18.8%, mild to moderate ED was 31.3%, moderate ED was 15% and mild ED was 19.7% in Pakistan (Hameed et al., 2023). In South Asia, in India, 79.8% of men with DM were found to have ED, with 49.43% having mild to moderate ED (Dsouza & Rahman, 2023). In Europe, in Italy, 86.5% of diabetes mellitus patients suffered from ED, as 30.8% of them were mildly ED and 28.8% were mildly to moderately ED (Defeudis et al., 2023). These findings suggest that the prevalence and severity of ED can vary between study populations and geographic areas, potentially influenced by differences in lifestyle behaviours, genetic factors, and access to healthcare services. Variations occur in these populations because of the different characteristics of each population, which impact both the development of ED and the reporting of it. The lifestyle habits of a population can have differing effects on vascular and metabolic risk depending on the country. A genetic predisposition to diabetes also varies geographically. Healthcare access impacts when diabetic complications that lead to ED will develop. Cultural norms and attitudes toward masculinity and sexual conversations also impact reporting rates for ED, with some cultural environments creating a barrier for men to report ED for fear of being stigmatized. As a result, all of these factors

together account for the wide variation in ED prevalence seen across different settings.

The implications of such high prevalence are significant. ED is not a sexual health issue alone; it is an indicator of quality of life, mental health, and relationship quality. As evidenced in the work of Barnard-Kelly et al. (2019), the psychosocial effects of ED also include lower self-esteem, symptoms of depression, and limited dyadic relationship quality, which potentially influences one's self-management and adherence to treatment. With the epidemiological links between ED and diabetes mellitus self-management, any perception of concern about ED in this population should be viewed as a public health issue, and the problem then needs to be addressed using a multidirectional approach that involves endocrinologists, primary care, mental health, and sexual health practitioners.

5.3 Quality of Life (QoL) Among Patients with Erectile Dysfunction (ED)

In this study, it was found that male patients with diabetes mellitus and ED had an average total WHOQoL score of 3.49 (SD = 0.50), indicating a moderate overall quality of life. This moderate score meant that there are favourable life circumstances for respondents in some areas, such as their health care and social support, benefiting their QoL. Still, it was diminished due to the physical and mental challenges faced with both diabetes mellitus and erectile dysfunction diagnoses. This was consistent with Thongtang et al. (2020) in Thailand, who reported moderate overall QoL in males with type 2 diabetes mellitus, and Barnard-Kelly et al. (2019) in the United Kingdom, who stated that sexual health issues, particularly erectile dysfunction, can detrimentally affect self-esteem, satisfaction in relationships, and wider psychosocial well-being of men.

In comparison, in the current context of Kuala Lumpur, the moderate total QoL might represent a balance between general conditions of urban living, such as comparatively easy access to medical services, information, and transportation, and the chronic disease health burden. Comparable to Bekele et al. (2022) in Ethiopia, these findings suggest that even though the social and environmental supports may be relatively strong, the physical and psychological impact of ED remains the most significant factor affecting higher QoL scores. Additionally, existing research from Silva et al. (2022) and Ugwumba et al. (2018) has found strong associations between

longer diabetes mellitus duration, lack of glycaemic control, and diabetes mellitus complications (e.g., neuropathy, retinopathy) and poorer QoL. These considerations are relevant to this sample.

5.3.1 Physical Domain

In the physical health domain, which the WHOQoL encompasses, including pain, energy, mobility, sleep, and the ability to perform daily activities, more than half of these respondents reported moderate physical functioning. Many indicated that they suffered pain at a severity level that impeded work and daily life sufficiently to require medical treatment to maintain activity. The majority had adequate energy for less than half of their needs; tiredness emerged as the most often mentioned limiting factor.

These findings echo those from Gobena et al. (2023), who report that patients with both diabetes mellitus and ED typically experience greater declines in stamina and increased dependency on medical treatment than controls. Similarly, in Pakistan, Hameed et al. (2023) found that severe ED was associated with a greater likelihood of experiencing severe difficulty with physical activities and personal care matters, providing direct evidence of diminished mobility and capacity for physical activities. Consistent with this, Awang et al. (2022) reported that 78.3% of patients with diabetes mellitus and ED had reduced physical function, particularly in activities requiring sustained energy.

Furthermore, Bekele et al. (2022) documented that comorbidities, such as hypertension and cardiovascular disease, were associated with greater accelerated declines in physical activity capacity within this group. Participants with moderate-to-severe ED in this study were likely to have reported lower scores in the psychological domain of the survey due to the cumulative physiological burden of diabetes mellitus and ED, coupled with decreased activity levels resulting from lower motivation, all of which contributed to a moderate overall domain score.

5.3.2 Psychological Domain

The psychological domain was rated the lowest of all four domains in this study, assessed primarily with measures of self-esteem, body image, positive feelings, concentration, and absence of negative emotions. Nearly half of the participants reported moderate to low satisfaction with this domain. There was also a relatively high prevalence of people indicating they regularly experienced negative feelings.

This finding is consistent with Barnard-Kelly et al. (2019), who found in a UK sample of men with DM and ED that fewer than half experienced a loss of self-esteem, 62% experienced relationship strain, 41% felt less physically attractive, and 46% felt lonely. Similarly, these findings correspond with Kalikuljaman et al. (2023), who revealed that people with diabetes mellitus and ED were twice as likely to be depressed compared to those without ED, entirely linked to dissatisfaction with sexual function and the impact on relationships and social life.

The ongoing prevalence of these psychological challenges is reiterated in a study by Jombo et al. (2020), who reported psychological distress due to sexual dysfunction and social stigma. Hylmarova et al. (2020) also reported evidence of sustained low sexual satisfaction and psychological issues in males with type 1 diabetes mellitus and ED. While cultural norms and family ties can provide some protective social support in Malaysia, Silva et al. (2022) found that most ED patients did not disclose to health care providers despite acknowledging the negative psychosocial impact, lending evidence to this observation of under-addressed psychological distress. This could perpetuate a cycle of stigma, emotional weight, and quality of life reduction, lowering the total WHOQoL score even though respondents with ED had relatively higher scores in other domains.

5.3.3 Social Domain

This study generally found positive scores in the social relationship domain, with most respondents expressing satisfaction with their relationships, perceiving their level of social support, and reporting their sexual activity. These studies may illustrate the most substantial family ties and community support structures in Malaysia, where the collective effort and support from extended family and community can provide both

emotional and instrumental support to individuals with chronic illnesses.

The findings are consistent with those of Fang et al. (2023), who found that both higher socioeconomic status and income status were positively correlated with improved erectile function and socially supportive perceptions of their social life. Similarly, Thongtang et al. (2020) reported that a higher level of education was associated with better social relationships among males with type 2 diabetes mellitus.

While the study confirmed that positive social scores did not equate to the absence of difficulties that may affect intimacy, in line with Bekele et al. (2022), who reported that 48.2% of males with ED could not have penetrative sex and 39.7% never had satisfactory sexual intercourse in their lifetime, some of these respondents were dissatisfied with their sexual life. Malik et al. (2021) noted similarly that men with DM and ED often faced relationship dissatisfaction due to unmet sexual needs, which can contribute to strain and emotional distress in interpersonal relationships. These unresolved issues can diminish and negate the positive effect that strong social support could have, limiting this domain's contribution to total QoL.

In addition to possible physiological causes of lower social quality of life, other factors may also contribute to these findings. Social and cultural influences may contribute to the low scores in the social area of quality of life for men with erectile dysfunction (ED) in Malaysia. Specifically, cultural values regarding masculinity, intimacy, and modesty create an environment in which men are less likely to discuss sexual issues openly and are therefore less likely to address concerns related to sexual function (Kalikuljaman et al., 2023; Che Man et al., 2023). The stigma associated with having trouble obtaining erections creates feelings of shame and inadequacy (Defeudis et al., 2023), which may decrease men's desire to engage in conversations with their partners, peers, or healthcare providers to obtain support for their concerns related to sexual function. Cultural expectations for males' identities and sexual performance may exacerbate feelings of loneliness and isolation, inhibit interpersonal communication, and thereby result in lower social areas of quality of life for men with ED than those without ED. Additionally, this study's findings suggest that men with more severe ED have significantly poorer social functioning.

5.3.4 Environmental Domain

The environmental domain was rated among the highest dimensions of this study. Respondents were generally satisfied with their feelings of safety, housing, access to healthcare, transportation, and health information. The urban infrastructure of Kuala Lumpur played an integral part in this rating, as it offered better access to more advanced health services than rural areas.

The results were consistent with those of Thongtang et al. (2020), who noted that urban diabetes mellitus populations in Thailand rated their environmental conditions highly. However, Fang et al. (2023) demonstrated that SES imposes certain limitations on economically disadvantaged groups seeking care and having adequate living environments - it is presumed that the lower the SES, the worse the living/health conditions.

This study found that while the environmental domain provided an important buffer against the adverse effects of the other domains, it did not eliminate the impact of declines in physical and psychological well-being. No doubt, the positive influence of the environmental domain on a moderate total QoL score is apparent; however, environmental protective factors only extend so far when medical and emotional stressors remain unaddressed.

5.3.5 Total QoL and General Health Perceptions

The general health perception domain in WHOQoL measures participants' self-assessed health and life satisfaction. Most participants reported moderately positive perceptions, suggesting these individuals exhibited a level of resilience and adapted to chronic illness, even while continuing to manage the triggers of emotional disturbance. The biopsychosocial-ecological model presented here is consistent with Ugwumba et al. (2018), who found that, while ED negatively influenced well-being, many patients found a sense of life satisfaction through coping and support in their environments.

That said, the moderating role of resilience has its limits. Jombo et al. (2020) noted that depressive symptoms and long duration of diabetes mellitus had independent weighted contributions to the global health perception and the perceived general health. Their findings showed this to be true even with a reasonable degree of continuity in social and environmental determinants of health. In this dataset, males with longer

disease histories and/or greater ED severity reported lower scores in this domain, which reduced the total QoL score; this was despite positive ratings in other social and environmental domains.

5.3.6 Integrative Synthesis Across Domains

When considered interactively, the total WHOQoL score of 3.49 reflects a balance between strong environmental and social supports and apparent limitations imposed by diminished physical and psychological well-being. The global health perception domain of the WHOQoL reflects this balance. Although many men can adapt to the limitations of diabetes mellitus and ED, ongoing limitations in physical functioning and mental health do not allow for a high level of overall QoL.

These findings align with the examples of Bekele et al. (2022), Silva et al. (2022), and Barnard-Kelly et al. (2019), who emphasize that a holistic management plan that addresses physical symptoms, offers psychological support, and simultaneously enhances social intimacy. The community of Kuala Lumpur has pre-existing environmental resources, particularly in urban areas, which offer environmental strengths.

From a clinical and public health perspective, these results suggest the potential for interventions that aim to improve physical stamina, reduce pain or pain awareness, and, most importantly, the provision of constructive psychological support with attention to self-efficacy, as well as relationship support and efforts to reduce the stigma of living with diabetes mellitus. Indeed, environmental supports, such as access to healthcare, should be fully utilized to facilitate these interventions optimally, thereby realizing that what is already available in Kuala Lumpur comprehensively enhances each domain of QoL.

5.4 Association of Sociodemographic Factors on Erectile Dysfunction (ED)

This research showed that socio-demographic factors are critical in the development of erectile dysfunction (ED) among male patients with diabetes mellitus in Kuala Lumpur. Of the socio-demographic variables examined, age and educational level were retained in the final multiple logistic regression model, while employment status and ethnicity reports were not significant after adjustment. The results suggest

that ED is multifactorial, with socio-demographic determinants mediating a complex interplay of biological and clinical processes that can adversely affect sexual health outcomes. The socio-demographic factors are likely to increase the risk of ED in relational processes that likely involve health behaviours, access to healthcare resources, control over metabolic issues, and the cumulative burden associated with comorbid conditions.

5.4.1 Ages

The study analysis showed a strong and statistically significant relationship connecting age to the probability of developing ED, and the younger age group, aged 25-39 years, was at relatively lower risk of ED compared to older males aged 60 to 84 years, indicating that age was a strong independent predictor in the multivariate analysis. Evidence from Omar et al. (2022) and Ghanem et al. (2021) also reported similar findings of ED and increasing risks as males age, as the risks of vascular and neurological impairment contributing to ED were reported to increase with advancing age. As males advance in age, the ability to achieve sexual function declines due to the premature endothelial loss taking place. This loses nitric oxide bioavailability and causes arterial stiffness, compromising penile blood flow for erection. Related to this, another complication is the neurovascular side of function that neurologic changes can induce age-related neuropathy, which can impact the neurovascular process of either aiming for or maintaining an erection at a functional or occasionally functional level.

These age-related complications associated with diabetes mellitus are compounded by chronic hyperglycaemia that accelerates atherosclerosis, accelerates microvascular damage, complicates peripheral neuropathy, and may disadvantage a male who is older living with diabetes mellitus with an ED event. The cumulative effects of these pathophysiological processes lead to a higher prevalence of ED in older male populations. Abeway et al. (2020) reported that age was also independently related to ED in a study of Ethiopian men with DM mellitus. Older males had over five times the odds of having ED than younger males (AOR = 5.5, 95% CI: 2.06-14.744).

The biological mechanisms discussed cannot account for the correlation alone. Age is associated with other risk factors, such as longer duration of diabetes mellitus, the burden of comorbidities, and lower levels of physical activity, that may compound

the impact of erectile difficulties. Psychological and relational factors are other factors contributing to the association; older males may experience less desire, less sexual confidence, or partner-related change that may systemically affect erectile function. These findings therefore support a life-course perspective on ED prevention and treatment. This means that in an ideal setting, earlier management to control diabetes mellitus and maintain cardiovascular fitness may eventually delay or improve the impact of age on men's sexual health.

5.4.2 Education Level

Education emerged as another important socio-demographic factor in this study. For example, males with no education were 4.5 times more likely to report experiencing ED compared to males with a skills certificate or diploma. On the other end of the scale, males with the highest level of education, a bachelor's degree, master's degree, or PhD, had a 57.6% lower likelihood of experiencing ED. The inverse relationship between educational attainment and ED risk can be explained through several pathways.

More education is generally associated with higher health literacy, which enables individuals to understand glycaemic control, engage in healthier lifestyle habits, and follow healthcare directions from providers. More educated individuals also tend to have greater access to health resources, higher incomes, and better job opportunities, which may help them manage chronic conditions, such as diabetes mellitus, more effectively. In contrast, lower educational attainment may be associated with lower levels of ED awareness as a health condition, delayed health-seeking behaviour, and a decreased ability to engage in preventive health behaviours.

These findings are similar to those of Bahar et al. (2020), who found that ED was significantly more prevalent in their study population who held a professional degree and had no high school completion ($p = 0.002$), and those who were retired ($p < 0.001$). However, this study differed from Omar et al. (2022), who stated that secondary level education was not a predictor of ED using logistic regression (OR = 0.63, $p = 0.133$). These differences may be attributed to variations in population characteristics, access to healthcare services, social and cultural awareness related to sexual health, and differences across various socioeconomic contexts.

The findings of this study demonstrate the importance of integrating health education programmes into diabetes mellitus care, especially for less educated individuals. Interventions that are culturally relevant, linguistically appropriate, and tailored to patients' literacy levels may help close knowledge gaps about the condition and promote timely treatment for ED.

5.4.3 Employment Status and Ethnicity

In the final adjusted model, employment status and ethnicity were not significantly associated with ED, although some differences emerged in the univariate analyses. There may be additional confounders that mitigated their distinct associations. For example, employment status may have interacted with several other determinants (i.e., income status, access to care, dimensions of occupational stress, occupational lifestyle decisions) that were not captured in the study. Ethnic differences in ED risk may also be associated with genetic disposition, as well as cultural norms related to dietary decisions and health service utilization, which are moderated by broader socioeconomic conditions.

These findings differ from those presented by Milama et al. (2022), who identified duration of diabetes mellitus, micro- and macroangiopathic complications, and hyperuricemia as independent risk factors for ED in their multivariate analysis ($p < 0.05$). However, it is similar to the findings of Omar et al. (2022), who also found that no significant association existed between unemployment and ED (OR = 0.76, $p = 0.347$). The influence of employment status on ED is likely context-sensitive, as it relies heavily on stability in income, health benefits, and workplace health policies rather than on employment status alone.

The absence of significance for independent ethnicity also illustrates the relatively similar access to healthcare in Kuala Lumpur, where all groups were afforded similar medical resources through public health access. Minor cultural and behavioural differences still exist in how ED is perceived, reported, and managed across the groups, and these can be further explored qualitatively.

In the final model, neither ethnicity nor employment status was independently associated with ED. Despite differences in the univariate, these relations did not persist

after adjustment. This might be due to confounded factors, including lifestyle behaviours, generalizable health status, or access to care services that this study has not controlled for. This study's results differ from those of Milama et al. (2022), who found that in multivariate analysis, duration of diabetes mellitus, micro- and macroangiopathic complications, and hyperuricemia were independent risk factors for ED ($p < 0.05$). The current study aligns with Omar et al. (2022) regarding employment status, which reported no significant association between unemployment status and ED (OR = 0.76, $p = 0.347$).

5.5 Association of Clinical Factors on Erectile Dysfunction (ED)

The study analyzed a variety of clinical attributes to identify those with an independent association with ED in men with DM in Kuala Lumpur. A multiple logistic regression analysis was conducted using variables from the univariate model with p-values less than 0.25 as the basis for inclusion in the multivariate model, including duration of diabetes mellitus, BMI, HbA1c, hypertension, number of NCDs, smoking, alcohol consumption, physical activity, and treatment of ED. The model appeared to fit well, with no evidence of multicollinearity, and a nonsignificant Hosmer-Lemeshow test result ($p = 0.248$) indicated an adequate fit.

After adjustment, three variables remained statistically significant: duration of diabetes mellitus, NCDs, and the level of physical activity. Other variables that were clinically important in the univariate analyses lost significance in the final model, likely indicating the importance of the significant variables, which had a noted and overshadowing effect through interaction effects from the significant predictors. The findings of this study highlight the multifactorial nature of ED in men with DM, in which the signs, symptoms, or trajectories of metabolic, vascular, and behavioural activity are part of an important constellation of biological and environmental influences. Therefore, effective diabetes mellitus prevention and management strategies must consider these findings to facilitate successful glycaemic control, disease management, physical activity, and regular preventive health behaviour.

5.5.1 Duration of Diabetes Mellitus

Understanding the significant relationship between the duration of diabetes mellitus and erectile dysfunction seen in the results of this study can be attributed to the continuous accumulation of diabetes-related physiological changes that occur from prolonged exposure to hyperglycaemia in diabetic subjects. The chronic presence of high blood glucose levels ultimately contributes to endothelial dysfunction and a decrease in the body's ability to produce nitric oxide; both changes have been documented in the literature and have been shown to cause microvascular impairments. This was demonstrated in the results of this study, as well as those of Mushtaq et al. (2018) and Nutalapati et al. (2020). These researchers stated that as diabetes progresses, the increased probability of developing diabetes-related neuropathy and vascular complications will continue to affect the erectile process negatively.

The overall effects of diabetes mellitus on the erectile process are similar to those previously described in studies demonstrating an increase in the risk of developing ED with each passing year of exposure to the disease. Shiferaw et al. (2020) specifically stated that the risk of developing ED has an incremental or stepwise progression with each additional year of diabetes mellitus duration. Similarly, Fan et al. (2021) found that prolonged diabetes mellitus duration ($\geq$49 months) was a reliable indicator of ED in clinical settings, thereby emphasizing the temporal aspect of this risk factor once again. Additionally, Mekonnen et al. (2021) found that patients with long-standing diabetes had a higher likelihood of developing ED, indicating the continued decline in vascular/neural function with increasing diabetes mellitus duration.

The current results support findings from larger-scale epidemiological studies, which document the progressive weakening of neurovascular structures critical for erection generation with long-term exposure to diabetes mellitus. Like the present study, Defeudis et al. (2022), Asaduzzaman et al. (2020), and Nisahan et al. (2019) reported that males with longer duration of diabetes mellitus exhibit increased prevalence and severity of ED secondary to the cumulative effects of metabolic dysregulation and endothelial injury. Additionally, Salama et al. (2020) emphasized that males with long-standing diabetes mellitus represent a high-risk group for the development of ED due to the increased likelihood of microvascular and neuropathic complications occurring with prolonged exposure to the disease.

Collectively, the studies reviewed herein provide evidence that the length of time a male has had diabetes mellitus is not simply a confounding variable but a significant and cumulative risk factor for the development of ED. Chronic hyperglycaemia has been shown to contribute to the gradual vascular stiffening, decreased neurovascular signalling, and diminished penile blood flow necessary for achieving an erection. Thus, it is important to identify diabetes mellitus at an early stage and achieve sustained glycaemic control to delay or prevent the development of ED in men with DM, as has been suggested by previous studies.

5.5.2 Non-communicable Disease

The association of other comorbidities would significantly increase the likelihood of ED, consistent with having other chronic conditions; hypertension, cardiovascular disease, and kidney disease were also significantly associated with a higher risk for ED. Our study found that males with at least one other chronic condition had odds that were 2.59 times higher than those without comorbidities. The strong association can be explained by a common pathophysiological mechanism across these chronic diseases, including systemic inflammation, endothelial dysfunction, atherosclerosis, and impaired microcirculation, which can negatively affect erectile function.

The current findings are concordant with the findings of Silva et al. (2020) and (2022), who found that nephropathy, retinopathy, and neuropathy are all contributory factors in the pathophysiology of ED in men with DM. Nutalapati et al. (2020) found that hypertension, peripheral artery disease, and testosterone deficiency were all independent predictors of ED ($p < 0.05$) in their study of ED in men with DM. Bekele et al. (2022) also noted a strong relationship between ED and comorbidity (AOR = 0.32 [95% CI: 0.15-0.71]). The same findings across studies highlight the importance of an all-inclusive chronic disease management approach that includes ED as an essential clinical component of the overall burden of disease in men with DM.

5.5.3 Physical Activity Level

The current study found that males classified as active, very active, or even a little active had a considerably reduced risk of ED compared to those classified as inactive. Specifically, being physically active was associated with a 96.9% lower risk of ED (AOR = 0.031, p = 0.001). The health benefits of physical activity are well established, including enhanced endothelial function, improved cardiovascular health, increased blood flow, and reduced systemic inflammation. The physiological benefits of physical activity directly relate to maintaining erectile health.

This result parallels Silva et al. (2017), who similarly found that physical activity positively influences vascular health, psychological health, reduces stress, and overall quality of life, all of which are factors conducive to sexual health. A similar study by Minami et al. (2018) concluded that modest increases in physical activity were significantly and independently associated with moderate-to-severe ED (AOR = 0.42, 95% CI: 0.21-0.85) and severe ED (AOR = 0.38, 95% CI: 0.19-0.73). These results support the contention that even minor improvements in physical activity levels may have tremendous benefits for the prevalence and severity of ED in men with DM.

5.5.4 Other Clinical Factors

Historically, other clinical variables evaluated in this study, including HbA1c level, BMI, hypertension, smoking status, and alcohol consumption, had no statistically significant association with ED in the final adjusted model. The lack of significance in these associations may be related to several factors, including the smaller sample size, varying levels of disease control among participants, or unknown confounding factors.

While the current study analysed factors that were not independent predictors, these clinical factors may not eliminate future risk factors for ED. For example, Nutalapati et al. (2020) found that a higher HbA1c level was strongly associated with ED in a multi-centre study of 720 individuals in a South Indian tertiary hospital with type 2 diabetes mellitus ($p < 0.05$). Singh et al. (2022) reported no association between BMI and ED, and our study results were consistent with this finding, showing no clinically meaningful relationship. Huang et al. reported similar results, finding no meaningful relationship between BMI and ED risk. Again, while these variables did not

rank as independent predictors in the current analysis, they may track risk for ED over time. Still, their impact is likely independent of stronger predictors of diabetes mellitus duration and comorbidity.

5.6 Quality of Life by Domain and Its Differences with Erectile Dysfunction

Quality of life (QoL) is a multidimensional construct representing an individual's subjective assessment of their well-being, encompassing physical, psychological, social, and environmental domains, as well as a more general opinion about life satisfaction and health status (Schweyer, 2017). In the case of men with DM, erectile dysfunction (ED) can influence several other areas beyond sexual function, such as emotional and psycho-emotional stability, social engagement or participation, and physical performance. ED can affect a male's self-esteem, limit physical function, lead to avoidance of activities or work situations, impact interactions with significant others, or restrict leisure activities, all of which affect QoL.

For this study, QoL was assessed using the WHOQoL-BREF, which evaluated in terms of domains of physical health, psychological health, social relationships, and environment, in addition to an overall assessment of QoL and general health (The WHOQOL Group, 2021). In the analytical approach, the comparison of mean scores for each domain by degree of ED severity was reported statistically under the findings section of the thesis. This discussion focuses on a qualitative interpretation of the patterns emerging from the data presented, as well as an examination of existing literature and evidence to explore possible explanations for the findings.

5.6.1 Physical Domain

In the physical domain, participants with more severe ED were regularly assessed to have lower QoL scores than participants with ED assessed as none. Significantly, this finding extends beyond loss of sexual function; this finding suggests other potential losses of physical capability. Males with severe ED commonly reported lower levels of energy on a day-to-day basis, lower perceived general quality of sleep, higher levels of fatigue, and limitations to their work/play. Many of them reported difficulties related to mobility and limitations in performing strenuous physical

activities.

These findings are consistent with Minami et al. (2018), who found that males with moderate/vigorous physical activity were less likely to have severe ED compared to sedentary men; they suggested physical activity in males with ED might have beneficial effects of improved endothelial function, blood perfusion, ideal blood pressure, and lower systemic inflammation that resulted in health benefits for sexual function and health-related physical activity.

Nevertheless, not all studies are in agreement; for example, Bekele et al. (2022) found no significant association between ED and physical functioning. Differences in sample demographics, diabetes mellitus control, and measurement may contribute to these disparities. Despite the conflicting results, most literature suggests that ED and physical limitations typically co-occur and perpetuate a negative cycle; ED places an additional burden on men, which affects exercise participation due to embarrassment, distress, and other psychological factors, perpetuating diminished physical health. From a clinical perspective, these findings highlight the need for ED management to be more holistic; ED interventions should solve both the sexual function barriers while promoting healthy living behaviours. Structured exercise programmes specifically developed for men with DM and ED can improve vascular health and positively affect weight management and overall QoL.

5.6.2 Psychological Domain

The psychological domain was one of the domains most impacted by the severity of ED. Those with severe ED often reported lower self-esteem, feelings of inadequacy, depressive symptoms, and anxiety. Many believed they were less sexually appealing or could not meet what was expected of them in intimate relationships, which affected their self-image and satisfaction with life.

Kalikuljaman et al. (2023) found that depression and anxiety were greater in men with DM who experienced ED than in those who did not experience ED. Similarly, Barnard-Kelly et al. (2019) found that about half of their diabetes mellitus population with ED reported a sense of loss of self-worth, while a substantial proportion also reported feelings of loneliness and decreased overall self-efficacy. This psychological

burden may not only be linked to ED, but it may also be part of a cycle that perpetuates ED.

The association of psychological distress and ED is recognised in the literature. Emotional stress stimulates the sympathetic nervous system, and this could impair erectile function through vasoconstriction and insufficient blood flow to the penis. This psychogenic pathway could maintain the cycle of ED even when significant organic impairment is absent, and, as a result, attempts to break the cycle are difficult without a degree of multimodal intervention. As a result, effective management will require some form of psychological support. Cognitive behavioural therapy (CBT), couples counselling, and support groups can help males adjust to their condition, reinterpret negative self-beliefs, and help with emotional distress. Having the partner involved in therapy can help both partners develop a mutual understanding, improve communication, and build lasting emotional support, all of which are essential for enhancing psychological well-being and sexual health.

5.6.3 Social Domain

The social domain illustrated the broad ramifications of ED on interpersonal relationships and community involvement. Specifically, about ED severity, males with severe ED were more likely to reduce their social participation, socially withdraw from intimate relationships, or avoid discussing their sexual issues with either their partner or a healthcare provider. Literature cited interpersonal friction and reduced marital satisfaction that negatively affected relationships, continuing to even result in breakdowns within the relationship due to persistent ED.

Malik et al. (2021) reported that more than half of their reports of men with DM and ED were dissatisfied with their sexual lives, which impacted their broader social relationships. Hadisuyatmana et al. (2023) found that males with ED often withdrew from social activities due to emotional distress. Almigbal and Schattner (2018) found that many males avoided seeking medical advice for ED because they felt embarrassed or were unsure if ED was an acceptable topic as a private matter or just part of the ageing process.

The consequences go beyond intimate relationships. There are compounded

consequences of social support. The lack of social support can increase psychological distress, which can lead males to withdraw further, compounding the effects of psychological distress. At the same time, social support has been identified as a buffer against the adverse health effects of all chronic diseases. To advance and address the social consequences of ED, intervention should involve more than the patient, as ED impacts partners and social circles. Educating involved others, creating normality in conversation about sexual health in healthcare, and reducing stigma through awareness and education are critical to normalising ED conversations to manage ED impact on all relationships.

5.6.4 Environmental Domain

The environmental domain encompasses factors such as financial stability, accessibility of healthcare services, housing conditions, and the location of essential resources within the community. In our study of males with more severe ED, environmental factors appeared to play a role in lower scores in care. In some cases, males could not afford treatment; in others, they had to travel long distances; and in most cases, they lacked access to specialty services.

Fang et al. (2023) and Almigbal (2019) showed that men with DM and low socioeconomic status had hundreds of closures in ED treatment options, which negatively impacted QoL. Extended travel to treatment, social stigma, and the inability to take time off work to receive care were listed as barriers.

Thongtang et al. (2020) and Langer et al. (2019) found no statistically significant link between ED and environmental QoL, suggesting that some males have access to services. Therefore, their environmental challenges were mitigated when a medical care plan was revealed. Inconsistency between studies may be attributable to differences in healthcare system structures, alignment of public health policies, or the presence of community support. With consideration to improving environmental QoL for males experiencing ED, it is obvious that shifts in health policy must be focused on reducing those barriers. Subsidising the costs associated with treatment services, giving males access to community-based sexual health clinics, and commissioning educational campaigns in order to elevate the conversation around ED and create spaces where ED is facilitated and engaged to be included in better care.

5.6.5 Overall Quality of Life and General Health

Beyond the four main domains identified previously, ED has an apparent and adverse effect on men's overall perception of quality of life and health. Males suffering from more extreme ED are more likely to report being less satisfied with their lives, identify themselves as being less healthy, and share lower rates of hope for the future. This decline does not solely happen due to sexual symptoms but is a function of psychological, social, and physical determinants, which are evidenced to affect health.

This is in line with Langer et al. (2019), who identified the relationship between ED and overall QoL scores using the WHOQoL-BREF instrument. Similar findings were shared by Anataca (2024) and Anwar et al. (2017) using different instruments, the 36-Item Short Form Health Survey (SF-36) and the General Health Questionnaire-30 (GHQ-30). Each provides independent evidence of diminished QoL associated with ED, as identified across many different measurement instruments. Although Thongtang et al. (2020) did not find a statistically significant relationship, the broader literature supports this finding; ED is associated with diminished life satisfaction and perceived health, regardless of the measurement instrument used.

The global use of quality-of-life instruments, such as the Euro-Qol Five Dimensions (EQ-5D), SF-36, and WHOQOL, was highlighted by Nasim et al. (2018), specifically in Pakistan. The EQ-5D is a standardized instrument developed and implemented by the EuroQol Group to measure health-related quality of life, assessing five dimensions of health: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression (McCaffrey et al., 2016; Nasim et al., 2018). Meanwhile, SF Questionnaires, including SF-36 and SF-12, are used to assess health-related quality of life. These questionnaires are used to measure various aspects of physical and mental health, using multiple items that assess health-related quality of life (Nasim et al., 2018). The WHOQoL, developed by the World Health Organisation, measures subjective well-being and quality of life across different cultural settings, focusing on four domains: physical health, psychological health, social relationships, and environment (The WHOQoL Group, 2021). Together, these three questionnaires can provide standardised measures of the participants' subjective assessment of their health status and QoL. These questionnaires could be further valuable by comparing responses not only across participants but also across populations and settings. Given holistic care provision,

management of ED should encompass aspects beyond presenting symptoms, to broader determinants of well-being.

A range of management strategies should be implemented as multi-dimensional care and have medical treatment to restore erectile functionality, psychological help for emotional distress or trauma, social interventions to keep support systems and relationships stronger, and environmental changes to improve access to healthcare services. An integrated plan of care offers a greater opportunity to improve the QoL of men with DM experiencing ED. This approach incorporates broader elements of well-being while directly addressing the treatment of sexual dysfunction.

5.7 Implications for the Management of Erectile Dysfunction among men with DM

5.7.1 Lifestyle Interventions and Quality of Life

Studies show that moderate weight loss can significantly improve sexual health. For example, among obese males with type 2 diabetes mellitus, a 5% reduction in body weight has even been found to lead to healing of erectile dysfunction (ED) within 8 weeks (Minami et al., 2018). Another study completed by Region et al. (2021) reported that obese patients are at a high risk of developing ED due to key pathophysiological processes, such as oxidative stress, inflammation, and insulin and leptin resistance. Moreover, the severity of ED has been found to correspond with comorbid medical conditions, including obesity.

Lifestyle changes not only improve erectile function but also enhance sexual desire and diminish urinary symptoms. Experts agree that weight loss is a non-pharmacological therapy effective for restoring erectile function and cardiometabolic health (Hylmarova et al., 2020). This idea aligns with the action plan developed by the Ministry of Health Malaysia, which states that one of the cornerstones in managing diabetes mellitus patients is a 10% weight reduction within 6 months (Siew Peng et al., 2020).

Furthermore, adherence to a healthy dietary pattern, such as the Mediterranean diet, is associated with a lower risk of developing ED. Men with DM who follow the healthiest diets are found to have a 22% lower relative risk of ED compared to those

with less healthy eating habits (Jombo et al., 2020). This result was confirmed by a study by Bauer et al. (2020), which showed males younger than 60 years in the highest category of Mediterranean Diet score had the lowest relative risk of incident ED compared to males in the lowest category.

Thanks to these dietary changes, vascular function has improved, and glycaemic control also plays a crucial role in preventing and treating diabetes-related ED. For instance, a recent study by Defeudis et al. (2022) found that people with diabetes mellitus often suffer from ED because they overeat. A meta-analysis by Yang et al. (2025) again highlights the close connection between diet and ED. A low-fat diet or a Mediterranean style eating habit rich in vegetables and nuts may be suitable for managing ED.

The severity of ED has been found to decrease for people who took part in any physical activity at all, according to one well-known study, and later confirmed by another study. To cite the original findings, a meta-analysis shows that for males who are inactive or overweight in general, engaging in 160 minutes of aerobic exercise per week (preferably three hours and 20 minutes) over six months is enough to rid them of their erectile problems in every one of three subsequent years (Gerbild et al., 2018). Combining such exercise with dietary changes not only leads to a return to normal erectile capacity but also tends to aid in better control of blood glucose levels and reduce one's weight (Nutalapati et al., 2020).

Moreover, Shiferaw et al. (2020) reported that people with diabetes mellitus who do not take regular physical exercise are more likely to suffer from ED. Similarly, Duca et al. (2019) found that both grip and endurance exercises effectively improve erectile function. However, meta-analytical studies suggest that moderate-to-vigorous-intensity aerobic exercise is superior to all other kinds of boosting the quality of erection experienced during this experience.

In conclusion, lifestyle intervention strategies that include dietary changes, more physical activity, and weight management as basic methods should be advocated to improve the sexual function and mental state of diabetes mellitus. This is in line with what is advocated by public health authorities, where lifestyle modification can restore sexual health to people with diabetes mellitus.

5.7.2 Strengthening the Role of Nurses in Diabetes Clinics

Diabetes mellitus nurse educators and nurse practitioners are ideally situated to introduce sensitive topics like erectile dysfunction (ED) into regular clinic visits. This is because they are frequently the first contact for patients and thus have an opportunity to engage in conversations about sexual health, topic patients generally find hard to discuss. However, studies show ED issues are still underdiagnosed in diabetes mellitus treatment. Yin et al. (2023) wrote on sexual health as an important but under-communicated topic in diabetes mellitus, indicating a gap in communication between healthcare and patients.

Among diabetes mellitus patients in Kuala Lumpur, the study found that the prevalence of ED was 74.6%, with varying grades of mild to severe. Furthermore, older age, higher education level, longer diabetes mellitus duration, poor glycaemic control (HbA1c $\geq$ 8.0%), and current smoking was all found to be statistically significant correlates of more severe ED. These results emphasise the need for the unpredictable risk factors emerging in clinical care for a diabetes mellitus patient, like poor glycaemic management, smoking, and other lifestyle practices.

Despite the high prevalence of ED among patients with diabetes mellitus, there is a significant gap in nursing practice regarding appropriate ED management. Barriers to ED screening include a lack of confidence among nursing professionals to provide screening, possibly due to a lack of sexual health training. This finding is similar to previous studies where Tay et al. (2019) found that only 20.8% of nurses felt confident conducting ED screenings. This knowledge gap affects nurses' ability to diagnose ED early, resulting in the issue not being discussed in practice.

Furthermore, communication gaps among patients and nurses also compromise the holistic management of the ED. A study by Bilen et al. (2023) reported their findings that 90.2% of diabetes mellitus patients had never been asked by their healthcare providers about sexual problems, indicating a disturbing gap in sexual health screening practice among healthcare providers. This suggests that, although nurses are uniquely positioned to address the issue, their awareness and knowledge are limited, resulting in the issue being deprioritized in clinical practice.

To overcome this challenge, implementing structured sexual counselling

models like PLISSIT (Permission, Limited Information, Specific Suggestions, Intensive Therapy) goes a long way in addressing this issue. This model, refined from 1976 through 2020, provides a systematic set of four steps that allow nurses to cue patients to talk about sexual issues, give appropriate but limited information, offer specific suggestions, and refer for intensive (Annon, 1976; Rutte et al., 2015, 2020). To put this in context, the study conducted by Rutte et al. (2020) showed that the nurse-led PLISSIT intervention within primary care effectively promoted patient willingness to address sexual issues. Nurse confidence can improve the quality and consistency of interventions logged within PLISSIT, promoting a more systematic and patient-centred approach in each consultation.

Hence, healthcare institutions should empower nurses by providing structured training and continuous professional education on ED management. This training could include the introduction of PLISSIT-based interventions and their practical application in real-world clinical settings. Comprehensive education will prepare the nurses to manage the ED autonomously and effectively. This approach will enhance the quality of sexual healthcare for patients with diabetes mellitus and promote patient satisfaction and overall quality of life.

5.7.3 The Role of Health Clinics in Managing Erectile Dysfunction (ED) Among Diabetes Mellitus Patients

In 2025, the American Diabetes Association recommended that health clinics integrate routine ED (erectile dysfunction) screening into their diabetes care programs. Both will help in early detection and effective intervention. However, in this study, the prevalence of ED among men with DMwas 74.6%. Early diagnosis and care of these patients are therefore essential. Since ED can be part of traditional diabetes management, early identification offers the benefits of timely intervention and improved quality of life for patients. Integrating ED screening into diabetes management not only facilitates early identification but also enables timely intervention. This raises the quality of living for those involved.

For comprehensive diabetes mellitus care, a multidisciplinary approach is necessary, involving collaboration among endocrinologists, urologists, psychologists, and nursing staff (European Association of Urology, 2024). The clinic can refer patients

to specialists for comprehensive and continuous care if an ED is identified. Effective clinic protocols will include regular ED screening, especially in high-risk patients with poor glycaemic control (HbA1c 8.0%), long diabetes duration, and smokers (Minami et al., 2018). Evidence shows that a multidisciplinary approach can improve patient outcomes by addressing physical and psychological (as well as other) factors of the ED (Singh et al., 2022).

Furthermore, health clinics must ensure that ED treatments are affordable and easily obtainable, especially in low-income areas (Fang et al., 2023). Many patients encounter financial barriers when seeking treatment, which may result in the ED being underdiagnosed and undertreated. Therefore, implementing subsidized programs or offering generic drugs, such as general PDE-5 inhibitors, could remove some obstacles and encourage more patients to seek treatment (Andersson, 2018; Dhaliwal & Gupta, 2022).

In addition, non-pharmaceutical treatments like extracorporeal shock wave therapy (ESWT) should be considered, especially as part of a subsidised system, because ESWT has demonstrated its effectiveness in improving erectile function without causing significant complications (Kurosawa et al., 2023). Consequently, clinics should provide information on this type of treatment and engage stakeholders to ensure broader access to non-pharmaceutical treatments.

In conclusion, health clinics may also develop partnerships with government health programs to deliver more comprehensive care, including counselling and medications, to a greater number of patients. Such programmes can extend into poorer areas or wherever there are large populations of diabetes mellitus, giving both chronic and quality ED management. Consequently, high priority should be assigned to establishing new models by integrating regular ED screening into diabetes mellitus care, using a multidisciplinary approach, and providing affordable treatments for this disease. Adhering to these three strategic goals will help health clinics lighten the ED burden on men with DM and drastically improve their lives.

5.8 Application of the Health Belief Model (HBM) to Future Interventions

The results of this study revealed that a variety of socio-demographic and clinical factors, including age, education level, length of diabetes mellitus, presence of other chronic diseases, and level of activity, were associated with erectile dysfunction (ED) in men with DM. This association could be further explored with the Health Belief Model (HBM), which provided the theoretical framework for this study, especially the component related to perceived susceptibility, which focuses on the concept of the extent to which someone may think themselves to be at risk of developing a health condition (Rosenstock, 1974; Champion & Skinner, 2008).

The HBM includes six components that relate to each other: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy, which could be used to inform more comprehensive, evidence-based, and culturally relevant future interventions to raise awareness, promote early detection, and improve management of ED head men with DM in Malaysia.

5.8.1 Perceived Susceptibility

Perceived susceptibility is defined as the extent to which people feel they are at risk of developing ED. In this study, the risk of ED increased significantly in males aged 60-84 years compared with younger age groups (AOR = 0.154; $p < 0.001$ for the 25-39 years age group). The data also showed that lower educational attainment meant increased risk for ED. This suggests that some patients may be downplaying or unaware of their risk, particularly if they experience no signs and/or symptoms in the early stages.

As suggested by Bekele et al. (2022), education plays a crucial role in developing health literacy, which in turn leads to more accurate risk perceptions. Future interventions based on this research could draw on the local prevalence data (65.5%) established in this study to increase awareness of risk. Public health campaigns should not only impress upon males that ED is a common occurrence for men with DM, including those who may think of themselves as "not at risk".

Men who have erectile dysfunction (ED) may be less likely to seek treatment for several reasons, including a lack of perceived vulnerability to ED. Men with ED may think their symptoms are temporary or caused by aging; therefore, they will not

recognize their personal risk of developing serious health problems from these symptoms. A man's belief that he has a lower-than-average risk of developing health problems due to his symptoms will reduce his motivation to inform someone about his symptoms or to seek a physician's care. Furthermore, in Malaysia, where there is a general taboo on discussing sexual health issues, men may assume that their perceived vulnerability to developing ED is low because the condition is viewed as embarrassing or socially unacceptable to discuss. Therefore, a lack of perceived vulnerability to developing ED results in men reporting fewer cases of ED than exist, even if men report early signs of ED.

5.8.2 Perceived Severity

Perceived severity differs from perceived susceptibility in that it relates to how serious the individual thinks ED will be in affecting their life. This study previously noted that patients with severe ED had the lowest quality of life (QoL) scores across all WHOQoL-BREF domains, particularly in the social domain. This is further corroborated in Przydacz et al. (2023), where they highlight the adverse effects of ED on intimate relationships, emotional well-being, and self-confidence.

Therefore, future interventions should emphasise that ED is not simply a sexual performance issue, but is linked to mental health and relationship stability, and motivate patients to manage their diabetes mellitus better. Males should understand that treating ED symptoms might change the cycle of deteriorating QoL, mental distress, and poorer diabetes mellitus treatment adherence.

Men's low perceptions of the severity of their ED contribute to why they may delay seeking treatment. Some men acknowledge the fact that they have erection problems but perceive them to be less medically serious than other diabetes-related issues. Other men minimize the potential harm caused by their ED due to their embarrassment about it, their shame, their embarrassment, the stigma associated with it, or simply the fact that they believe that erectile dysfunction is a regular part of getting older. Men are less likely to seek treatment when the severity of their ED is viewed as less severe than a significant medical issue (which negatively impacts men's quality of life, their mental health, and their relationships) than a minor or personal issue. As a result of the lower perception of severity, there are delays in obtaining treatment, further decline in quality of life, and continued psychological suffering.

5.8.3 Perceived Benefits

Perceived benefits relate to the belief that taking a course of action would be advantageous. This is why patients who believe that treatment or a lifestyle change would benefit them might act. This study showed that higher levels of physical activity are significantly associated with a lower risk of ED. Alyafei (2020) and Andre et al. (2017) found that regular physical activity positively affects erectile function by improving vascular health and mental health.

Thus, future actions should emphasize the benefits of early detection and treatment of ED, through medical interventions, lifestyle modifications, or couples' counselling sessions. Providing evidence that greater glycaemic control and a physically active lifestyle can alleviate ED symptoms will give patients additional motivation to take preventive or corrective action.

5.8.4 Perceived Barriers

Perceived barriers are what prevent someone from doing something, whether physical, behavioral, social, or monetary. Malaysia has a significant cultural stigma on discussing sexual health, causing some patients potentially significant embarrassment (Hashim, 2023; Bilal-Salim, 2019) to discuss such conditions. Patients may also worry about treatment costs, potential medication side effects, or limited time to visit a clinic.

Addressing these barriers requires culture-sensitive communication with patients, maintaining a confidential relationship, and clearly conveying the evidence-based options that are safe and effective. Clinicians may promote their clinics as a place to go for men, have private consultation rooms, and help nurses and physicians feel comfortable initiating conversations about sexual health, regardless of their opinions on it.

5.8.5 Cues to Action

Cues to action, therefore, are the initiation to complete an action drawn from any symptoms, professionals, and/or media campaigns (Champion & Skinner, 2008). The findings of this study indicate that patients experiencing ED were more likely to acknowledge and recognise their symptoms. In contrast, other patients still did not seek

treatment for those symptoms. This also relates to Hashim (2023), where the author pointed out that culturally stigmatised ED symptoms, coupled with feelings of embarrassment, lead even the patients who recognise those symptoms not to seek help.

This leads to the consideration of extending interventions that emphasize triggers, such as routine ED screenings in diabetes mellitus clinics, providing culturally appropriate educational materials, and involving partners in biomedical ED consultations. Examples of potential cues to action include local epidemiological data on ED prevalence, relevant success stories from patients, and health messaging from social media campaigns. In a multicultural city such as Kuala Lumpur, these messages must be adapted to reflect the language and cultural values of the communities in general, for ease of understanding and acceptance (Bilal-Salim, 2019).

5.8.6 Self-efficacy

Self-efficacy is described as an individual's perceived confidence in their capacity to manage or overcome ED (Champion & Skinner, 2008). Self-efficacy was established in this study as a factor that may allow patients to express their perceived capabilities to manage their health, and this was associated with education. Additionally, physically active patients were perceived as having greater abilities to manage their health successfully. These findings are consistent with Alyafei (2020) and Andre et al. (2017), where both authors reported that structured physical activity interventions improve erectile function and enhance self-efficacy related to their health.

Thus, future interventions should focus on developing self-management skills that affect behaviours such as blood glucose monitoring, dietary planning, and engaging in appropriate exercise. Notably, ongoing support from healthcare teams or providers, such as nurses, doctors, or psychologists, could enhance or reinforce self-efficacy. Peer support groups or skill-based training modules offer patients opportunities to develop coping strategies and practical solutions, thereby enhancing their sense of control over their conditions.

5.8.7 Applying the Health Belief Model (HBM) to ED Management

Recent consideration of using HBM for intervention purposes presents an opportunity to develop a more comprehensive, holistic prevention and treatment plan for the ED, thereby increasing awareness of risk, heightening seriousness, promoting benefits, reducing barriers, establishing appropriate cues to action, and fostering self-efficacy. Based on findings of this study, using this theoretical framework may provide opportunities not just to increase early detection of ED, but also promote lifestyle changes that could support improved diabetes mellitus control and improved quality of life of males diagnosed with diabetes mellitus in Malaysia (Malavige & Levy, 2020; Bekele et al., 2022).

5.9 Strength of the Study

This research has several significant strengths that enhance its reliability and value in the context of diabetes mellitus care and sexual health. Firstly, the deep dive into the prevalence and severity of erectile dysfunction (ED) specifically among men with DM in Kuala Lumpur fills a significant gap in the literature. Given this high prevalence (74.6%), the survey provided important epidemiological data at the local level, aligning with recommendations from experienced doctors, as discussed below. This is particularly important, as most existing studies focus primarily on Western populations, leaving a significant gap in the East Asian context due to limited information on Southeast Asia.

Secondly, the study's substantial sample size enhances the reliability of its results. By surveying a diverse group of male patients with diabetes mellitus from various backgrounds, the study increases its representativeness and reduces the risk of sampling bias. This comprehensive sampling method ensures that the results are sufficiently free from specific errors to apply to similar locations in Malaysia and possibly elsewhere in Southeast Asia.

Another strength is the breadth of data collection across socio-demographic factors and clinical variables. The study not only examines traditional risk factors, such as age, duration of diabetes mellitus, and glycaemic control (HbA1c), but also considers lifestyle factors, including physical activity and smoking. By incorporating these

factors, the study presents a multidimensional perspective on ED among men with DM, which is essential for formulating comprehensive care and treatment strategies.

Additionally, the study utilized validated instruments for data collection, including the International Index of Erectile Function (IIEF-15). This is reputedly reliable and valid in assessing ED severity. Using standardised tools increases measurement precision and ensures results are comparable and anticipated across surveys with similar methodologies and on similar sites.

Furthermore, the study's cross-sectional design enabled simultaneous analysis of multiple variables. It provided a snapshot of links between socio-demographic, clinical, and lifestyle factors with ED. However, it does not imply causality; rather, it suggests associations warranting further exploration.

At the same time, it demonstrates methodological rigour by employing appropriate statistical analyses, including logistic regression, to establish that independent variables predict ED severity. Examining individual variables in this manner enables the control for confounding factors and presents the issue of ED among men with DM in far more nuanced terms.

Moreover, this study contributes to a very real increase in our field. By integrating quality-of-life evaluations, particularly those focusing on the physical, psychological, and social aspects, steps were taken, after which sudden positive results ensued. That patients with ED have an impact on their lives beyond simple physical symptoms underscores the importance of whole-person management.

Finally, the paper directly responds to clinical practice, making the gains evident. It offers practical guidance for primary and specialised care providers by identifying high-risk groups and stressing multidisciplinary approaches. Such a focus on practical uses helps make the research relevant to clinical practice and public health programmes.

In summary, the strengths of this study lie in its comprehensive approach, large sample, reliable measurement tools, rigorous statistical analysis, and practical relevance for clinicians and other researchers in these diagnoses. These attributes ensure that the study not only provides data beneficial for existing research and pioneering groundwork on which future work must build but also includes clinically managed cases of diabetes

mellitus in ED patients.

5.10 Limitation of the Study

Although this study provides valuable information about the epidemiology and covariates of erectile dysfunction (ED) among men with DM in Kuala Lumpur, it is not without limitations. First, the cross-sectional design of this study inherently limits causal inference regarding the relationship between the risk factor and the ED. Although important associations have been observed, including associations of poor glycaemic control (HbA1c $\geq$ 8.0%), older age, smoking status, and severity of ED, these findings do not help infer whether these are direct causal risk factors for ED or if ED itself may influence worse quality of life (QoL). Longitudinal designs should be employed in future studies to monitor the progression of ED over time and assess the long-term effects on QoL in patients with diabetes mellitus. This strategy would more clearly define causal pathways, the dynamics of ED, and factors that influence each other.

Second, the evaluation of the severity of ED, QoL, and lifestyle factors in this cohort relied on self-report measures, which are prone to recall and social desirability biases. Although validated and standardized instruments (such as the International Index of Erectile Function [IIEF-15] and WHOQoL-BREF-26) were utilized, underreporting or overreporting of symptoms cannot be entirely ruled out. Since these topics may be sensitive for respondents, data quality issues are particularly relevant in areas such as sexual health and psychological well-being. While steps were taken in the survey's design to ensure anonymity and encourage honest responses, self-reporting is inherently subjective and has limitations. Future studies incorporating subjective clinical assessments and self-reports would yield more comprehensive and objective data.

Third, the study was conducted in a single urban healthcare setting in Kuala Lumpur, which may not accurately represent the patient experience of those from rural or lower socioeconomic backgrounds. Compared to rural settings, urban patients often have better access to healthcare services and greater knowledge of sexual health issues. Therefore, this study's prevalence and management strategies may differ from those in rural populations, which will likely have different access to care pathways, healthcare infrastructures, and cultural dispositions to discussing ED. However, this limitation

highlights the need for comparative studies that include both urban and rural populations to yield a more balanced and comprehensive understanding of ED prevalence and risk factors.

Additionally, the population's cultural and ethnic diversity was not accounted for, which may affect people's attitudes toward ED and their presentation to healthcare. The individual ethnic group can determine the perception of sexual health, and this aspect may also affect the likelihood of reporting symptoms or seeking medical care. Further research should include a more ethnically diverse sample to capture differences in ED-related perceptions and practices.

Self-reported health status, based on previous self-reported blood glucose levels, should be verified by biochemical measurements in the present longitudinal study (e.g., actual values obtained from blood tests). In addition, including real-time biochemical data may improve the correlation between glycaemic control and ED severity.

Finally, although this study was specific to the clinical and socio-demographic correlates of ED, it did not investigate the psychosocial consequences in greater detail, especially regarding mental health and relational interactions. Future studies should incorporate qualitative methods, such as in-depth interviews or focus groups, to deepen understanding of how ED affects interpersonal relationships and emotional health, thereby complementing the quantitative data.

In summary, whilst providing significant contributions to understanding the prevalence of ED in men with DM in Kuala Lumpur, addressing the limitations noted in this study in future studies with more representative cohorts can lead to a better understanding and improve the generalisability of the findings. Future research could benefit from using longitudinal designs, more heterogeneous samples, and objective and subjective measures to increase the validity and generalisability of findings.

5.11 Recommendation for Future Research

The high prevalence of erectile dysfunction (ED) identified in this study highlights an urgent need for further long-term, methodologically rigorous research on ED and its management in men with DM. One of the keys recommendations is that longitudinal study designs be utilised in future research. Given the variability in

metabolic control and lifestyle factors in patients with chronic diseases such as diabetes mellitus, longitudinal studies are fundamental to assessing the longitudinal progression of ED. Tracking patients over extended periods enables researchers to gain a deeper understanding of the natural history of ED, as well as the timing, course, and effectiveness of interventions. This will also identify behavioural predictors and good variables as modifiable risks that can inform early prevention strategies.

Further research, in particular clinical studies, should also focus on the role of lifestyle changes in patients with erectile dysfunction, particularly in men with DM. The current evidence indicates that lifestyle changes, including increased physical activity, weight management, dietary improvements, and smoking cessation, may improve erectile function (Mesfin et al., 2023; Nutalapati et al., 2020; Ugwumba et al., 2018), but there is limited reporting on the sustainability of these improvements in the long term. Studies evaluating the efficacy of structured lifestyle intervention programmes as monotherapy and adjunct to pharmacological treatment would be helpful. Finally, an RCT comparing lifestyle interventions, in this case managed by clinical nutritionists, with pharmacological treatment could determine the best practice for ED management in patients with diabetes mellitus.

The respective psychosocial impact of ED among men with DM is also to be evaluated here. Since ED is commonly linked to psychological distress (e.g., depression, anxiety) and decreased self-esteem (Jaskulski et al., 2021), incorporating mental health support into diabetes mellitus management may enhance both sexual function and quality of life (Ezeude et al., 2020). Mental health support may improve ED outcomes when implemented alongside medical therapies (e.g., pharmaceutical interventions), as reflected in studies of psychosocial interventions (e.g., counselling and cognitive behavioural therapy [CBT]). The ideal study scope in practice can improve the clinical applications of such nurse-led counselling programmes by evaluating their effectiveness and identifying evidence-based models of inquiry (for example, the Permission, Limited Information, Specific Suggestions, and Intensive Therapy (PLISSIT) Model).

Moreover, future research should consider geographical and socio-demographic variations in ED prevalence and management. Although this study primarily targeted an urban-specific population in Kuala Lumpur, ED's prevalence and management

strategies may vary markedly for rural or underserved populations where healthcare accessibility is scarce. Thus, rural and underserved populations should be included in future studies to paint the complete epidemiological picture. Suppose the factors preventing these populations from utilizing healthcare services, such as cultural stigma around discussing sexual health or lower healthcare literacy, can be understood. In such cases, healthcare providers can develop targeted interventions. Qualitative studies investigating patient perceptions and barriers to seeking treatment in such settings could also provide valuable data for targeted public health strategies.

Additionally, potential treatment options outside of conventional pharmacotherapy should be evaluated. Non-pharmacological therapies like Extracorporeal Shock Wave Therapy (ESWT) can promote erectile function, although long-term effectiveness is debatable (Hayon et al., 2023; Kurosawa et al., 2023). However, further multicentre trials with larger cohorts are needed to confirm the effectiveness of these novel therapies, especially in heterogeneous populations. Comparative effectiveness studies are also employed to assess the role of combination therapies, whereby lifestyle interventions were combined with pharmacological and non-pharmacological interventions.

For future studies, it would be beneficial to investigate the management of ED in diabetes mellitus and to formulate detailed clinical guidelines based on studies in different racial groups. This can be achieved by combining data from longitudinal, interventional, and epidemiological studies that reflect the real world and a range of patient scenarios. National or international multicentre collaborations may provide well-defined protocols while inducing uniformity in ED practices across different healthcare systems.

In summary, future studies must also focus more on patient-reported outcomes to adequately characterise the subjective effect of ED on quality of life. Given that psychosocial well-being is also a key aspect of sexual function, similarly, tools such as the International Index of Erectile Function (IIEF-15) should be routinely administered to not only quantify erectile function but also gauge psychosocial well-being. Longitudinal data from these assessments may help understand how surgical enhancement of erectile function is associated with improved quality of life and patient satisfaction.

5.12 Enhancing Nursing Practice: Study's Contribution

This study has made a valuable contribution to nursing practice by providing empirical evidence on the prevalence, related factors, and quality of life (QoL) aspects of erectile dysfunction (ED) among male recipients of diabetes mellitus management in Kuala Lumpur. The findings represent not just an expansion of our academic understanding but also have real-world implications in nursing practice, public health practice, and culturally sensitive policymaking. For example, by framing ED within the multidimensionality of diabetes mellitus treatment, the study helps shift nurses' thinking toward a more comprehensive, patient-focused approach. Nursing professionals, as frontline providers, will play a crucial role in applying research findings to their practice and bridging the gap between research and clinical practice.

5.12.1 Advancing Knowledge and Awareness

The study builds on cancer nursing knowledge by identifying the prevalence of ED (65.5% of subjects) among men with DM and the socio-demographic and clinical factors statistically associated with ED in this cohort. This finding is consistent with the perceptions of Bekele et al. (2022) and Malavige and Levy (2020), who identified ED as a common yet often overlooked complication of diabetes care that requires ongoing attention. By simultaneously confirming the association between ED and advanced age, lower education level, and lower physical activity, the study also provides nurses with tools to identify which of their patients are at the most significant risk.

Recognising these patterns also reinforces the understanding that nurses anticipate the potential needs of different sub-groups, particularly younger males who may underestimate their risk and older patients who, because of compounded health burdens, may be overwhelmed. Furthermore, the knowledge base regarding the strong association between ED and low QoL, as presented by Przydacz et al. (2023), provides compelling justification for the nurse to incorporate sexual health education into diabetes mellitus management, thereby shifting from reactive, symptom-based management to preventive, proactive, and holistic management.

5.12.2 Individualised Patient Education and Support

The study's findings underscore the importance of providing a personalised education component when managing ED in men with DM. Because nurses continue to have the most patient contact and the unique training to view health care holistically, they are in an ideal position to provide this education. Individualised education and support involve tailoring health information to a patient's literacy level, culture, and motivation to change. For instance, patients with lower levels of education may respond better to education presented in a simplified way, with visuals and verbal prompts to reinforce thoughts about behaviour change. In contrast, patients with higher health literacy may contribute more to a self-management plan.

Aspects of the education can also be consigned to the psychological impact of ED, which may include guilt, diminished self-esteem, and difficulty in maintaining relations (Bilal-Salim, 2019). Given that nurses can employ a compassionate approach to communication, they can facilitate a safe space for patients to engage in difficult conversations without fear of judgment. Counselling can also include partners, which enhances joint problem-solving, as each partner grapples with an impotence that demonstrates the importance of the partner's involvement in the management process. These strategies are powerful not only for enhancing the latter emotional skills, but they will also likely improve adherence to treatment replenishment for diabetes mellitus and ED.

5.12.3 Advocating Holistic Care

The results of this study further reinforce the need for a holistic approach to diabetes mellitus care, one that includes sexual health as a component. ED should not be viewed as an issue on its own, but rather as one element among a multitude of diabetes mellitus complications. This is consistent with the World Health Organization's conceptualisation of health as encompassing physical, mental, and social well-being.

Advocating holistic care also necessitates that sexual health assessments be systematically integrated within diabetes mellitus care. Nurses can begin by performing single-point screening assessments in the ED during clinic visits using validated screening tools, such as the International Index of Erectile Function (IIEF).

Identification of ED early allows for potential medical treatments, lifestyle changes, or referral to specialist care.

Moreover, addressing ED has the potential to act as a motivator for better diabetes mellitus management. Past studies that describe lifestyle interventions aimed at improving erectile function (e.g., engaging in more physical activity) also report improved glycaemic control, reduced cardiovascular disease risk, and improved overall QoL (Alyafei, 2020; Silva et al., 2017). The multiple benefits of improving ED care underscore the importance of embedding ED management within the diabetes mellitus care pathway.

5.12.4 Facilitating Interdisciplinary Collaboration

The complexity of ED within diabetes mellitus care necessitates collaborative involvement across disciplines (endocrinology, urology, psychology, physiotherapy, and dietetics). As the coordinators or leaders of these complex care pathways, nurses are ideally situated to manage them. They can facilitate referrals promptly, maintain continuity of care, and monitor patient progress across service areas.

Evidence supports this collaborative effort, which can enhance outcomes in chronic disease management. For example, models of joint care (e.g., nurses and psychologists) aim to address both physiological and psychosocial concerns in managing ED, and evidence suggests that such collaboration can enhance treatment adherence and patient satisfaction (Bilal-Salim, 2019; Tay & Ng, 2022). Collaboration enables not only shared decision-making in treatment plans but also empowers patients to be active participants in their own health.

5.12.5 Promoting Stigma-Free Sexual Health Care

A significant barrier to ED is cultural stigma, which may inhibit males from seeking help or even acknowledging that they have a health concern (Hashim, 2023). The findings from this study highlight the critical role that nurses can play as advocacy champions to promote stigma-free care environments where sexual health is recognised as a legitimate aspect of health (e.g., by discussing sexual health as routinely as they discuss blood pressure and diabetes mellitus management).

Nurses may use non-judgmental language and emphasise strict maintenance of patient confidentiality to help normalise discussions, some of which are about ED, or lignified conditions, where ED touches on the management of other underlying disease(s). The institution (or service provider) policies should be supportive of the system adoption of sexual health as an aspect of health care by including training modules on sexual health in addressing culturally sensitive communication and patient-centred counselling. At the policy level, nurse-led advocacy may purposefully include sexual health in national diabetes mellitus management guidelines, advancing the availability and standard of care in the same manner as any other clinical condition requiring management.

5.12.6 Implications for Education and Policy

The study's findings have implications for nursing education and institutional policy. Curricular change in nursing programs should include course content on assessment, counselling skills regarding sexual health, and education on cultural considerations in the management of the ED. Simulation-based learning of sensitive topics better prepares nurses to engage in patient care if they have gained relevant practice.

From a policy perspective, institutions can implement protocols for screening for diabetes mellitus in EDs and ensure that resources are available for patients to access language- and culture-specific educational materials. The urban diversity of Kuala Lumpur is evidence that resources and information should also be available in a variety of formats and languages, with data linked to emerging technologies to reach younger patients who are more connected to modern technology.

5.13 Conclusion

This study aimed to investigate the prevalence rate of erectile dysfunction (ED), evaluate socio-demographic and clinical variables concerning the problems of ED, and assess the impact on the quality of life of men with DM in Kuala Lumpur. ED in the diabetes mellitus population is a disputed health problem because biological, psychological, social, and lifestyle factors mediate it. ED in men with DM may go beyond that of their sexual performance; it can seriously affect personal psychological

well-being, self-esteem, and relationships. Furthermore, the presence of ED and psychological distress in the context of a chronic disease such as diabetes mellitus may add to the existing distress and reduce the motivation and effectiveness of the patient to manage their diabetes mellitus effectively. A greater understanding of the magnitude and determinants of the problem is therefore essential in designing appropriate and lasting preventative and treatment approaches.

This study utilised a quantitative cross-sectional design to survey 374 male respondents with diabetes mellitus. The 100% response rate reflects both effective data collection and respondents' willingness to share information about sensitive health issues. The survey questionnaire developed for the study was adapted and pre-tested for reliability and validity. Data collection was conducted systematically, with the sensitive nature of the topic considered and confidentiality protocols in place. This way, respondents' experiences can be restated to provide accurate experiences of men with DM living in a diverse urban context such as Kuala Lumpur.

The study found a high prevalence of ED, with 65.5% of respondents reporting coping with ED. This result shows that more than 50% of sexually active participants experienced ED of varying severity. This rate is high and agrees with global observations that indicate that people with diabetes mellitus are at greater risk of sexual dysfunction because of physiological implications, including blood vessel function, nerve function, and hormone processes. Prevalence rates vary across countries; however, given the magnitude of this study's observed prevalence, ED is a significant public health issue in Malaysia.

Further analysis found that age and level of education were significant predictors of ED risk. Stronger associations were observed in those younger than 60 years, compared to those 60 years and older. This is understandable, as risk factors caused by regular age-related changes in vascular function, arterial elasticity, and lower testosterone levels, for example, mean that younger males have a substantially lower risk of ED. Higher levels of education were also related to a lower prevalence of ED. It could be related to higher health literacy, greater access to medical information, and a greater tendency towards healthier lifestyle practices. Other characteristics, such as ethnicity and employment, had some slight differences in the initial analysis but were not statistically significant in the multivariable model. This may indicate that their

importance may be indirect or mediated by other factors, including socioeconomic status and culture.

The relationship between quality of life and the presence of ED was evident. Individuals with moderate to severe ED had lower mean quality of life assessment scores across virtually every domain of quality-of-life measurement, including sexual function, psychological domain, social relationships domain, and general health perception. Erectile dysfunction (ED) affects many aspects of quality of life, not only physical health, but also emotional and social life factors. People who experience ED will often withdraw from physical intimacy, their self-confidence may decline, and these factors can contribute to feelings of isolation and a lack of social engagement. These interactions can work together over time to lead to depression, anxiety, and declining motivation to manage diabetes mellitus.

In considering the implications of these findings, the study provides several recommendations for clinical care, health policy, and professional education. Regarding clinical care, the study supports integrating ED screening and follow-up into routine diabetes mellitus management. Nurses can provide the best opportunity to initiate an assessment about ED, identify early signs of the condition, provide appropriate information and counselling, and provide a supportive and meaningful referral to an appropriate specialist. Healthcare professionals will require specialised training to discuss issues of sexual health with their patients in an open, sensitive, and destigmatising manner. Staff will need to understand the levels of privacy and confidentiality, as well as the appropriate approach to creating an environment in which patients feel comfortable expressing their concerns. This environment is essential to enable timely interventions if required.

From a policy perspective, the findings of the systematic review advocate for the recognition of sexual health issues in patient-centred comprehensive diabetes care. Advocacy for sexual health screening and providing culturally appropriate educational resources on diabetes and sexual health issues through public health policies is recommended, alongside ongoing education opportunities for healthcare professionals. Community awareness campaigns are needed to assist with the de-stigmatisation of sexual health issues and encourage patients to seek timely treatment. In terms of nursing education, this study provides an opportunity for programs to enhance curricula with

focused modules covering humanizing ED management in men with DM. These modules could cover communication skills, knowledge of sexual physiology, counselling approaches, and patient-centred intervention strategies. Providing future nurses with hands-on training will better prepare them to address a significant aspect of patient care that is often overlooked.

Several strengths of this study are acknowledged. The large sample size, along with the excellent response rate, increases the study's generalisability. Using validated instruments increased the precision of ED and quality-of-life assessments. Also, this study examined an urban, multi-ethnic population, which adds to the knowledge required to develop culturally relevant and contextually appropriate interventions.

However, certain limitations need to be outlined. The cross-sectional design of the study limits the ability to establish causation. The self-reported measures on ED and quality of life leave the possibility of recall bias, and/or participants may under-report ED, given the sensitive subject matter associated with ED. The absence of objective clinical information on blood glucose control markers or duration of illness made it difficult to examine the association between diabetes mellitus management and ED in greater depth.

Future studies could assess longitudinal study designs to evaluate changes in ED and capture the dynamic nature of risk factors. Intervention studies that utilize behavioural health theories could examine educational programs, counselling, and/or lifestyle changes, and investigate whether these strategies decrease the incidence of ED and/or improve the quality of life among men with DM. Including the patient's partner in intervention programs may optimise emotional support and the treatment process.

In conclusion, this study has made a significant contribution to understanding ED among men with DM in Malaysia. The study confirmed that ED is a critical and prevalent condition that significantly affects quality of life. Age and level of education were determinants of ED, whilst the effect on quality of life necessitated a holistic, integrated, and inclusive approach to management. The study's outcomes are expected to lead to changes in clinical practice, health policy, and professional education, and, over time, improvements in the physical, psychological, and social well-being of men with DM will be sustained and holistic.

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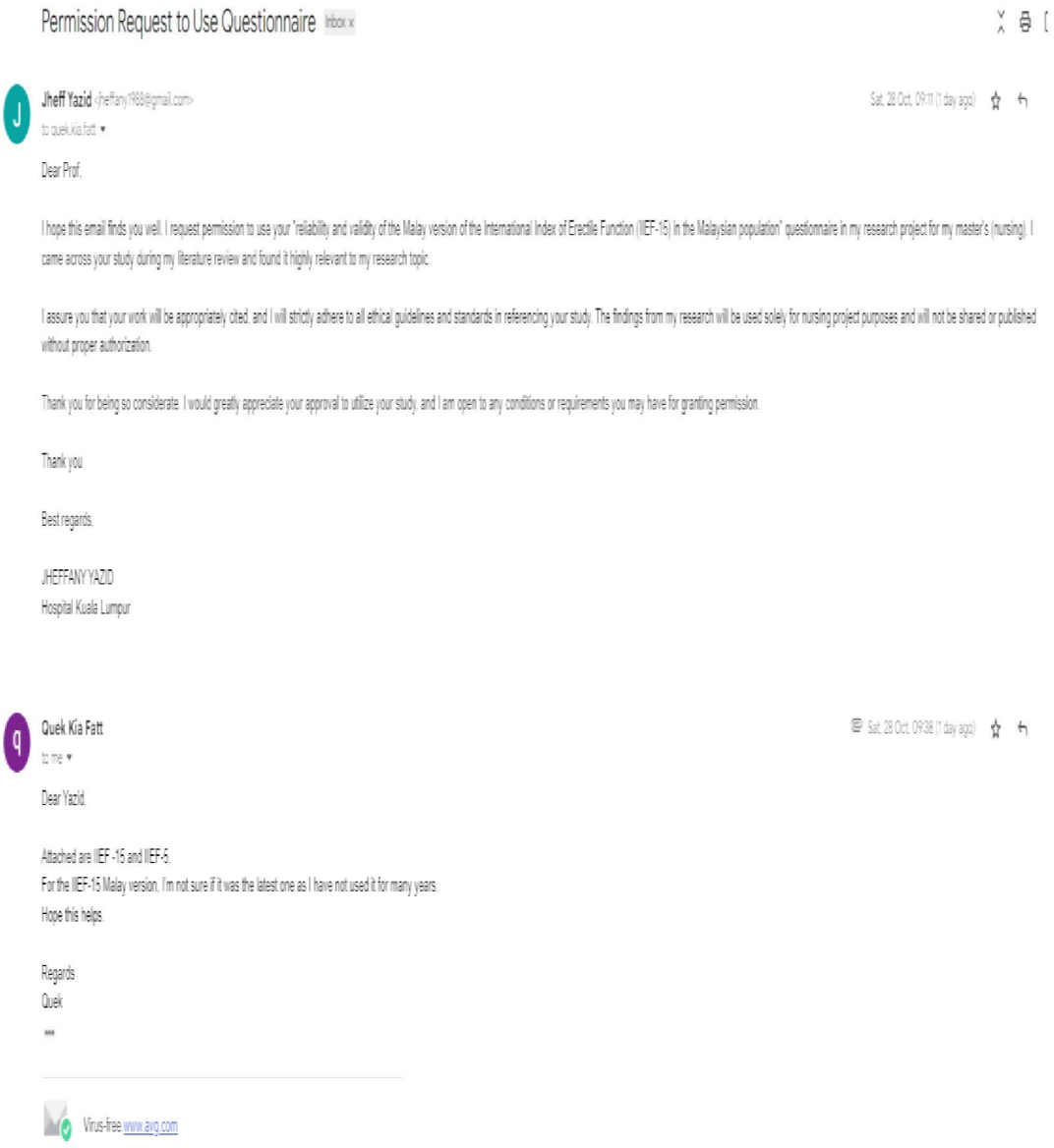
APPENDICES

APPENDIX 1

Permission to use Questionnaire - IIEF-15 items Malay Version



Permission Request to Use Questionnaire Inbox x

Jheff Yazid <jheffany1988@gmail.com> Sat, 28 Oct, 09:11 (1 day ago)
to quek.kia.fatt

Dear Prof.

I hope this email finds you well. I request permission to use your 'reliability and validity of the Malay version of the International Index of Erectile Function (IIEF-15) in the Malaysian population' questionnaire in my research project for my master's (nursing). I came across your study during my literature review and found it highly relevant to my research topic.

I assure you that your work will be appropriately cited, and I will strictly adhere to all ethical guidelines and standards in referencing your study. The findings from my research will be used solely for nursing project purposes and will not be shared or published without proper authorization.

Thank you for being so considerate. I would greatly appreciate your approval to utilize your study, and I am open to any conditions or requirements you may have for granting permission.

Thank you

Best regards,

JHEFFANY YAZID
Hospital Kuala Lumpur

Quek Kia Fatt Sat, 28 Oct, 09:38 (1 day ago)
to me

Dear Yazid,

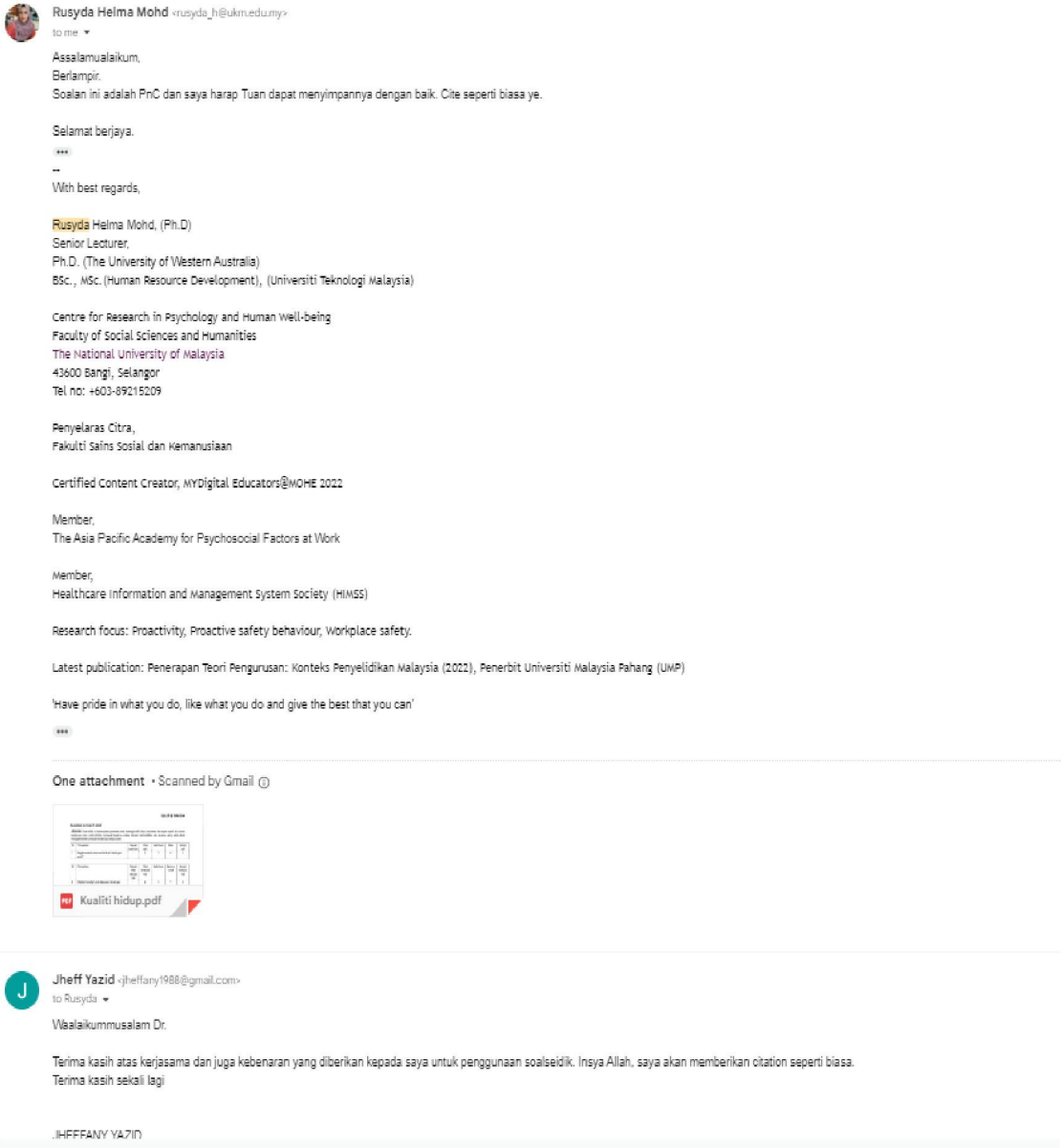
Attached are IIEF-15 and IIEF-5.
For the IIEF-15 Malay version, I'm not sure if it was the latest one as I have not used it for many years.
Hope this helps.

Regards
Quek

Virus-free www.avg.com

APPENDIX 2

Permission to use Questionnaire - WHOQoL Malay version



Rusyda Helma Mohd <rusyda_h@ukm.edu.my>
to me

Assalamualaikum,
Berlampir.
Soalan ini adalah PnC dan saya harap Tuan dapat menyimpannya dengan baik. Cite seperti biasa ye.

Selamat berjaya.

--
With best regards,

Rusyda Helma Mohd, (Ph.D)
Senior Lecturer,
Ph.D. (The University of Western Australia)
BSc., MSc. (Human Resource Development), (Universiti Teknologi Malaysia)

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'Have pride in what you do, like what you do and give the best that you can'

One attachment • Scanned by Gmail

Kualiti hidup.pdf

Jheff Yazid <jheffany1988@gmail.com>
to Rusyda

Waalaikummusalam Dr.

Terima kasih atas kerjasama dan juga kebenaran yang diberikan kepada saya untuk penggunaan soalseidik. Insya Allah, saya akan memberikan citation seperti biasa.
Terima kasih sekali lagi

JHEFFANY YAZID

APPENDIX 3

Questionnaire

BAHAGIAN A: DEMOGRAFI SOSIAL

Sila isi borang ini dengan maklumat anda.

1	Age (years) *(Umur (tahun))*	:	……. years *(tahun)*
2	Your weight and height? *(Ketinggian dan berat badan anda?)*	:	Weight *(Berat)* ……kg Height *(Tinggi)* ……cm
3	Education level: *(Tahap Pendidikan)*	:	☐ No school *(Tidak bersekolah)* ☐ Skills certificate/ Diploma *(Sijil Kemahiran/ Diploma)* ☐ Bachelor's degree *(Sarjana Muda)* ☐ Sarjana/PhD *(Master's/PhD)*
4	Ethnicity: *(Bangsa)*	:	☐ Malay *(Melayu)* ☐ India ☐ Others *(Specify)*: …… *Lain-lain (Nyatakan)*…… ☐ Chinese *(Cina)* ☐ Sabah/Sarawak Ethnic *(Etnik Sabah /Sarawak)*
5	Occupation: *(Pekerjaan)*	:	☐ Unemployed/ Retired *(Tidak bekerja/ Pencen)* ☐ Employed in Government/Private/ Self-employed sector *(Berkerja di sektor Kerajaan/swasta/sendiri)*
6	Duration of diabetes *(Tempoh mendapat penyakit diabetes)*	:	……. years *(tahun)*
7	What is your most recent HbA1c level? *(Apakah bacaan HbA1c anda yang terkini?)*	:	……. mmol/mol
8	Do you have high blood pressure? *(Adakah anda mempunyai tekanan darah tinggi?)*		☐ No *(Tidak)* ☐ Yes *(Ya)*
9	Do you have any other		☐ No *(Tidak)* ☐ Yes *(Ya)*

chronic diseases besides diabetes? *(Adakah anda mempunyai sebarang penyakit kronik selain daripada diabetes?)*

10 Are you a smoker? *(Adakah anda seorang perokok?)*

☐ No *(Tidak)* ☐ Yes *(Ya)*

11 Do you consume alcohol regularly? *(Adakah anda mengambil alkohol secara berkala?)*

☐ No *(Tidak)* ☐ Yes *(Ya)*

12 How active are you physically in your daily life? *(Sejauh mana anda aktif secara fizikal dalam kehidupan harian anda?)*

☐ Not active *(Tidak aktif)*

☐ Slightly active *(Sedikit aktif)*

☐ Moderately active *(Sederhana aktif)*

☐ Active *(Aktif)*

☐ Very active *(Sangat aktif)*

13 Do you take any medications that may affect erectile dysfunction? *(Adakah anda mengambil ubat-ubatan tertentu yang mungkin mempengaruhi masalah mati pucuk?)*

☐ No *(Tidak)* ☐ Yes *(Ya)*

BAHAGIAN B: International Index of Erectile Function (IIEF-15)

These questions ask about the effects that your erection problems have had on your sex life over the last four weeks. Please try to answer the questions as honestly and as clearly as you are able. Your answers will help your doctor to choose the most effective treatment suited to your condition. In answering the questions, the following definitions apply:

- sexual activity includes intercourse, caressing, foreplay & masturbation
- sexual intercourse is defined as sexual penetration of your partner
- Sexual stimulation includes situation such as foreplay, erotic pictures etc.
- ejaculation is the ejection of semen from the penis (or the feeling of this)
- orgasm is the fulfilment or climax following sexual stimulation or intercourse

Pertanyaan-pertanyaan ini mengenai kesan masalah ereksi anda terhadap kehidupan seks anda dalam tempoh empat minggu yang lepas. Sila cuba menjawab pertanyaan-pertanyaan ini dengan jujur dan sejelas yang anda mampu. Jawapan anda akan membantu doktor anda memilih rawatan yang paling berkesan untuk keadaan anda. Dalam menjawab pertanyaan-pertanyaan ini, definisi berikut adalah merujuk:

- *aktiviti seksual merangkumi persetubuhan, belaian, foreplay, dan masturbasi*
- *persetubuhan seksual ditakrifkan sebagai penembusan seksual ke dalam pasangan anda*
- *rangsangan seksual merangkumi situasi seperti foreplay, gambar erotik, dan lain-lain*
- *ejakulasi adalah ejakulasi air mani dari zakar (atau perasaan ini)*
- *orgasme adalah mencapai atau kemuncak yang mengikut rangsangan seksual atau persetubuhan*

No	Question	0	1	2	3	4	5
1	How often were you able to get an erection during sexual activity? *(Berapa kerap anda dapat mendapatkan ereksi semasa aktiviti seksual?)*	No sexual activity *(Tidak ada aktiviti seksual)*	Almost never or never *(Hampir tidak pernah atau tidak pernah)*	A few times (less than half the time) *<Beberapa kali (kurang dari separuh masa)>*	Sometimes (about half the time) *<Kadang-kadang (sekitar separuh masa)>*	Most times (more than half the time) *<Kebanyakan masa (lebih daripada separuh masa)>*	Almost always or always *(Hampir selalu atau selalu)*
2	When you had erections with sexual stimulation, how often were your erections hard enough	No sexual activity *(Tidak ada*	Almost never or never *(Hampir tidak*	A few times (less than half the time) *<Beberapa kali*	Sometimes (about half the time) *<Kadang-kadang*	Most times (more than half the time) *<Kebanyakan masa*	Almost always or always *(Hampir selalu atau*

No	Question	0	1	2	3	4	5
	for penetration? *(Bila anda mendapat ereksi dengan rangsangan seksual, seberapa kerap ereksi anda cukup keras untuk penetrasi?)*	*aktiviti seksual)*	*pernah atau tidak pernah)*	*(kurang dari separuh masa)>*	*(sekitar separuh masa)>*	*(lebih daripada separuh masa)>*	*selalu)*
3	When you attempted intercourse, how often were you able to penetrate (enter) your partner? *(Apabila anda mencuba untuk melakukan hubungan seks, seberapa kerap anda berjaya menembusi (memasuki) pasangan anda?)*	Did not attempt intercourse *(Tidak mencuba melakukan hubungan seks)*	Almost never or never *(Kurang atau hampir tidak pernah)*	A few times (less than half the time) <*Beberapa kali (kurang daripada separuh masa)>*	Sometimes (about half the time) <*Kadang-kadang (sekitar separuh masa)>*	Most times (more than half the time) *Kebanyakan masa (lebih daripada separuh masa)*	Almost always or always *(Hampir selalu atau selalu)*
4	During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner? *(Semasa hubungan seks, seberapa kerap anda dapat mengekalkan ereksi selepas anda telah memasuki pasangan anda?)*	Did not attempt intercourse *(Tidak mencuba melakukan hubungan seks)*	Almost never or never *(Kurang atau hampir tidak pernah)*	A few times (less than half the time) <*Beberapa kali (kurang daripada separuh masa)>*	Sometimes (about half the time) <*Kadang-kadang (sekitar separuh masa)>*	Most times (more than half the time) *Kebanyakan masa (lebih daripada separuh masa)*	Almost always or always *(Hampir selalu atau selalu)*
5	During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse? *(Semasa hubungan seks, seberapa sukar untuk mengekalkan ereksi sehingga tamat hubungan seks?)*	Did not attempt intercourse *(Tidak mencuba melakukan hubungan seks)*	Almost never or never *(Kurang atau hampir tidak pernah)*	A few times (less than half the time) <*Beberapa kali (kurang daripada separuh masa)>*	Sometimes (about half the time) <*Kadang-kadang (sekitar separuh masa)>*	Most times (more than half the time) *Kebanyakan masa (lebih daripada separuh masa)*	Almost always or always *(Hampir selalu atau selalu)*
6	How many times have you attempted sexual intercourse? *(Berapa kali anda telah cuba melakukan hubungan seksual?)*	No attempts *(Tiada percubaan)*	One to two attempts *(Satu hingga dua percubaan)*	Three to four attempts *(Tiga hingga empat percubaan)*	Five to six attempts *(Lima hingga enam percubaan)*	Seven to ten attempts *(Tujuh hingga sepuluh percubaan)*	Eleven or more attempts *(Sebelas atau lebih percubaan)*

No	Question	0	1	2	3	4	5
7	When you attempted sexual intercourse, how often was it satisfactory for you? *(Bila anda mencuba hubungan seksual, sejauh mana kepuasan anda?)*	Did not attempt intercourse *(Tidak mencuba melakukan hubungan seks)*	Almost never or never *(Kurang atau hampir tidak pernah)*	A few times (less than half the time) *<Beberapa kali (kurang daripada separuh masa)>*	Sometimes (about half the time) *<Kadang-kadang (sekitar separuh masa)>*	Most times (more than half the time) *[Kebanyakan masa (lebih daripada separuh masa)]*	Almost always or always *(Hampir selalu atau selalu)*
8	How much have you enjoyed sexual intercourse? *(Sejauh mana anda menikmati hubungan seksual?)*	No intercourse *(Tiada hubungan seks)*	No enjoyment at all *(Tiada keseronokan sama sekali)*	Not very enjoyable *(Tidak begitu menyeronokkan)*	Fairly enjoyable *(Menarik cukup seronok)*	Highly enjoyable *(Sangat menyeronokkan)*	Very highly enjoyable *(Sangat-sangat menyeronokkan)*
9	When you had sexual stimulation or intercourse, how often did you ejaculate? *(Bila anda mendapat rangsangan seksual atau melakukan hubungan seks, seberapa kerap anda mengalami ejakulasi?)*	No sexual stimulation or intercourse *(Tiada rangsangan seksual atau hubungan seks)*	Almost never or never *(Selalu atau hampir selalu)*	A few times (less than half the time) *[Beberapa kali (kurang daripada separuh masa)]*	Sometimes (about half the time) *[Kadang-kadang (sekitar separuh masa)]*	Most times (more than half the time) *[Kebanyakan masa (lebih daripada separuh masa)]*	Almost always or always *(Hampir selalu atau selalu)*
10	When you had sexual stimulation or intercourse, how often did you have the feeling of orgasm or climax? *(Bila anda menerima rangsangan seksual atau melakukan hubungan seks, seberapa kerap anda merasai orgasme atau klimaks?)*	[redacted]	Almost never or never *(Hampir tidak pernah atau tidak pernah)*	A few times (less than half the time) *[Beberapa kali (kurang dari separuh masa)]*	Sometimes (about half the time) *[Kadang-kadang (sekitar separuh masa)]*	Most times (more than half the time) *[Kebanyakan masa (lebih dari separuh masa)]*	Almost always or always *(Hampir selalu atau selalu)*
11	How often have you felt sexual desire? *(Berapa kerap anda merasa keinginan seksual?)*	[redacted]	Almost never or never *(Hampir tidak pernah atau tidak pernah)*	A few times (less than half the time) *[Beberapa kali (kurang dari separuh masa)]*	Sometimes (about half the time) *[Kadang-kadang (sekitar separuh masa)]*	Most times (more than half the time) *[Kebanyakan masa (lebih dari separuh masa)]*	Almost always or always *(Hampir selalu atau selalu)*

No	Question	0	1	2	3	4	5
12	How would you rate your level of sexual desire? *(Bagaimana anda menilai tahap keinginan seksual anda?)*		Very low or none at all *Sangat rendah atau tidak ada sama sekali*	Low *(Rendah)*	Moderate *(Sederhana)*	High *(Tinggi)*	Very high *(Sangat tinggi)*
13	How satisfied have you been with your overall sex life? *(Seberapa berpuas hatikah anda dengan kehidupan seks secara keseluruhan?)*		Very dissatisfied *(Sangat tidak berpuas hati)*	Moderately dissatisfied *(Cukup tidak berpuas hati)*	Equally satisfied & dissatisfied *(Sama-sama berpuas hati dan tidak berpuas hati)*	Moderately satisfied *(Cukup berpuas hati)*	Very satisfied *(Sangat berpuas hati)*
14	How satisfied have you been with your sexual relationship with your partner? *(Sejauh mana anda puas dengan hubungan seksual anda bersama pasangan?)*		Very dissatisfied *(Sangat tidak puas hati)*	Moderately dissatisfied *(Cukup tidak puas hati)*	Equally satisfied & dissatisfied *(Sama-sama puas dan tidak puas hati)*	Moderately satisfied *(Cukup puas hati)*	Very satisfied *(Sangat puas hati)*
15	How do you rate your confidence that you could get and keep an erection? *(Bagaimana anda menilai keyakinan anda bahawa anda dapat mendapatkan dan mengekalkan ereksi?)*		Very Low *(Sangat Rendah)*	Low *(Rendah)*	Moderate *(Sederhana)*	High *(Tinggi)*	Very high *(Sangat tinggi)*

BAHAGIAN C: KUALITI HIDUP (WHOQOL-BREF)

Please read the question, assess your feelings, for the last two weeks, and circle the number on the scale for each question that gives the best answer for you. *(Sila baca soalan, nilai perasaan anda, untuk dua minggu yang lepas, dan bulatkan nombor pada skala bagi setiap soalan yang memberikan jawapan terbaik untuk anda.)*

No	Question *(Soalan)*	Very poor *(Sangat tidak baik)*	Poor *(Tidak baik)*	Neither poor nor good *(Sederhana)*	Good *(Baik)*	Very good *(Sangat baik)*
1	How would you rate your quality of life? *(Bagaimanakah anda menilai kualiti kehidupan anda?)*	1	2	3	4	5

No	Question *(Soalan)*	Very dissatisfied *(Sangat Tidak berpuas hati)*	Fairly Dissatisfied *(Tidak berpuas hati)*	Neither satisfied nor dissatisfied *(Sederhana)*	Satisfied *(Berpuas hati)*	Very satisfied *(Sangat Berpuas hati)*
2	How satisfied are you with your health? *(Setakat manakah anda berpuas hati dengan kesihatan anda?)*	1	2	3	4	5

The following questions ask about how much you have experienced certain things in the last two weeks.
*(Soalan-soalan berikutnya bertanyakan tentang berapa banyakkah anda telah mengalami sesuatu perkara **dalam dua minggu yang lepas.)***

No	Question *(Soalan)*	Not at all *(Tiada Langsung)*	A Small amount *(Sedikit Sahaja)*	A Moderate amount *(Sederhana)*	A great deal *(Sangat Banyak)*	An Extreme amount *(Teramat banyak)*
3	To what extent do you feel that physical pain prevents you from doing what you need to do? *(Setakat manakah anda berasa kesakitan (fizikal) menghalang anda dari melakukan apa yang anda perlu lakukan?)*	1	2	3	4	5
4	How much do you need any medical treatment to function in your daily life? *(Berapa banyakkah rawatan perubatan yang anda perlu untuk berfungsi dalam kehidupan harian anda?)*	1	2	3	4	5

5	How much do you enjoy life? *(Berapa banyakkah anda menikmati keseronokan dalam hidup anda?)*	1	2	3	4	5
6	To what extent do you feel your life to be meaningful? *(Setakat manakah anda rasa hidup anda bermakna?)*	1	2	3	4	5
7	How well are you able to concentrate? *(Berapa baikkah anda dapat memberi tumpuan?)*	1	2	3	4	5
8	How safe do you feel in your daily life? *(Berapa selamatkah anda rasa dalam kehidupan seharian anda?)*	1	2	3	4	5
9	How healthy is your physical environment? *(Berapa sihatkah persekitaran fizikal anda?)*	1	2	3	4	5

The following questions ask about **how perfectly** you have experienced or been able to do something in the past two weeks *(Soalan-soalan berikutnya bertanyakan **bagaimana sempurnanya** anda mengalami atau berupaya melakukan sesuatu perkara dalam **dua minggu yang lepas.)***

No	Question *(Soalan)*	Not at all *(Tiada langsung)*	Slightly *(Sedikit Sahaja)*	Somewhat *(Sederhana)*	To a great extent *(Kebanyakkanya)*	Completely *(Sepenuhnya)*
10	Do you have enough energy for everyday life? *(Adakah anda mempunyai cukup tenaga untuk kehidupan harian anda?)*	1	2	3	4	5
11	Are you able to accept your bodily appearance? *(Adakah anda dapat menerima rupa dan bentuk tubuh anda?)*	1	2	3	4	5
12	Have you enough money to meet your needs? *(Adakah anda mempunyai wang yang cukup untuk memenuhi keperluan anda?)*	1	2	3	4	5
13	How available to you is the information you need in your daily life? *(Setakat manakah kemudahan bagi anda untuk mendapatkan maklumat yang diperlukan dalam kehidupan harian?)*	1	2	3	4	5
14	To what extent do you have the opportunity for leisure activities? *(Setakat manakah anda mendapat peluang untuk aktiviti riadah?)*	1	2	3	4	5

No	Question *(Soalan)*	Not at all *(Sangat Tidak baik)*	Slightly *(Tidak baik)*	Moderately *(Sederhana)*	Very *(Baik)*	Extremely *(Sangat baik)*
15	How well are you able to get around physically? *(Sebaik manakah keupayaan anda bergerak dari satu tempat ke satu tempat yang lain?)*	1	2	3	4	5

No	Question *(Soalan)*	Very Dissatisfied *(Sangat tidak berpuas hati)*	Fairly Dissatisfied Tidak *(berpuas hati)*	Neither Satified nor Dissatisfied *(Sederhana)*	Satisfied *(Berpuashati)*	Very satisfied *(Sangat Berpuas hati)*
16	How satisfied are you with your sleep? *(Adakah anda berpuas hati dengan tidur anda?).*	1	2	3	4	5
17	How satisfied are you with your ability to perform your daily living activities? *(Adakah anda berpuas hati dengan keupayaan anda melaksanakan aktiviti kehidupan harian anda?)*	1	2	3	4	5
18	How satisfied are you with your capacity for work? *(Adakah anda berpuas hati dengan keupayaan anda bekerja?)*	1	2	3	4	5
19	How satisfied are you with yourself? *(Adakah anda berpuas hati dengan diri anda?)*	1	2	3	4	5
20	How satisfied are you with your personal relationships? *(Adakah anda berpuas hati dengan perhubungan peribadi anda?)*	1	2	3	4	5
21	How satisfied are you with your sex life? *(Adakah anda berpuas hati dengan kehidupan seks anda?)*	1	2	3	4	5
22	How satisfied are you with the support you get from your friends? (*Adakah anda berpuas hati dengan sokongan yang anda dapati dari kawan-kawan anda?)*	1	2	3	4	5
23	How satisfied are you with the conditions of your living place? *(Adakah anda berpuas hati dengan keadaan tempat tinggal anda?)*	1	2	3	4	5
24	How satisfied are you with your access to health services? *(Adakah anda berpuas* hati *dengan kemudahan mendapatkan perkhidmatan kesihatan?)*	1	2	3	4	5
25	How satisfied are you with your transport? *(Adakah anda berpuas hati dengan pengangkutan anda?)*	1	2	3	4	5

.

The following question refers to **how often you have felt or experienced certain things in *the last two weeks*** *(Soalan berikut merujuk kepada kekerapan anda merasa atau* ***mengalami sesuatu emosi sepanjang dua minggu yang lepas.)***

No	Question *(Soalan)*	Never *(Tidak pernah)*	Infrequently *(Jarang-jarang)*	Sometimes *(Kerap)*	Frequently *(Sangat kerap)*	Always *(Sentiasa)*
26	How often do you have negative feelings such as blue mood, despair, anxiety or depression? *(Berapa kerapkah anda mempunyai perasaan-perasaan negatif, seperti susah hati, kecewa, kegelisahan atau kemurungan?)*	1	2	3	4	5

APPENDIX 4

Project Gant Chart

Task	2023				2024												2025		
	Sept	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Literature finding																			
Conducting Systemic Review																			
Publication Systemic Review																			
Writing research proposal																			
Defend Research Proposal																			
Ethics UiTM Approval Committee (Puncak Alam Campus and Shah Alam Campus)																			
Ethics NMRR and MREC Approval Committee																			
Ethics JKWP&Putrajaya Approval Committee																			
Pilot study																			
Data collection																			
Data analysis																			
Report writing/ final																			
Publication																			
Final thesis Submission																			

APPENDIX 5: Summary of the study of ED in men with DM

Objectives/ phases	Design	Setting	Sample and sample size	Instruments	Data analysis
RO1: To identify the prevalence and severity. RO2: Identify Quality of Life (QoL) RO3: Impact of socio-demographic factors, including age, BMI, education level, ethnicity, and occupation, on the occurrence of ED RO4: The impact of clinical factors such as the duration of diabetes, diabetes control level, presence of high blood pressure, presence of other chronic diseases, smoking status, alcohol consumption, physical activity level, and drug or medication use on the occurrence of ED. RO5: Relationship between the severity of ED, measured and QoL scores	Cross-sectional	• Kuala Lumpur Health Clinic • Sentul Health Clinic • Jinjang Health Clinic, • Setapak Health Clinic • Kampung Pandan Health Clinic • Tanglin Health Clinic.	• Multistage sampling approach (stratified sampling and simple random sampling). • 37 sample for pilot study. • 374 sample for actual study.	IIEF-15 questionnaire WHOQOL-BREF (Malay)-26 items	• RO1 and RO2 - Descriptive (Frequency and Percentage) • RO3 and RO4: Bivariable and multivariable binary logistic regression analysis • RO5 - Inferential (Pearson correlation or Spearmon Correlation). • Software - SPSS version 27

APPENDIX 6: Defend Research Proposal RESULT

Universiti Teknologi MARA
40450 Shah Alam, Selangor, MALAYSIA
Tel : (+603) 5544 4691/4666/4766
Fax : (+603) 5544 4693

UNIVERSITI TEKNOLOGI MARA

Reference : 600-FSK(PT.3/9/11)
Date : 04 April 2024

JHEFFANY BIN YAZID (2023449586)
FACULTY OF HEALTH SCIENCES
UiTM Kampus Puncak Alam

Mr/Mrs,

DEFENCE OF RESEARCH PROPOSAL (DRP) RESULT

STUDENT'S NAME	:	JHEFFANY BIN YAZID
NO. STUDENT	:	2023449586
PROGRAM CODE	:	HS769
THESIS TITLE	:	PREVALENCE OF ERECTILE DYSFUNCTION, FACTORS ASSOCIATED, AND QUALITY OF LIFE AMONG MALE WITH DIABETES IN KUALA LUMPUR, MALAYSIA: A CROSS-SECTIONAL STUDY
DRP DATE	:	04 April 2024
DRP COUNT	:	1

2. With reference to your Defence of Research Proposal (DRP) session on 04 April 2024, the panel of examiners has agreed to grant you the result as stated below:

Ranking	Description
3	Proposal accepted with minimal amendments. The amendment must be verified by the DRP Panels and submitted within one(1) month from the date of DRP

3. Please refer to the supervisor for further action.

Thank You

"MALAYSIA MADANI"
"BERKHIDMAT UNTUK NEGARA"

Your sincerely,
Dean

c.c
1. Dean, Institute of Postgraduate Studies (IPSis)
2. Head of Centre for Graduate Studies

APPENDIX 7: Research Ethics Committee UiTM

www.uitm.edu.my

UNIVERSITI TEKNOLOGI MARA

Pejabat
Timbalan Naib Canselor
(Penyelidikan dan Inovasi)

Reference : 600-TNCPI (5/1/6)
Our reference : REC/01/2025 (PG/MR/32)
Date : 1446H رجب 9
9 January 2025

Mr Jheffany Yazid - 2023449586
(Supervisor: Suzana Yusof)
Faculty of Health Sciences
UiTM Puncak Alam Campus
42300 Puncak Alam
SELANGOR

سلام عليكم ورحمة الله وبركاته and Greetings

Mr

APPROVAL LETTER - UiTM RESEARCH ETHICS COMMITTEE

Thank you for submitting your research proposal to the Research Ethics Committee (REC). After considering your application, the Committee approved your proposal titled "Prevalence of Erectile Dysfunction, Factors Associated, and Quality of Life Among Male with Diabetes in Kuala Lumpur, Malaysia: A Cross-Sectional Study". Details of the approval are as follows:

Ref. number:	REC/01/2025 (PG/MR/32)
Approval Period:	9 January 2025 until 30 October 2025
Authorised personnel:	1. Jheffany Yazid 2. Suzana Yusof 3. Dr Siti Khuzaimah Ahmad Sharoni

The UiTM Research Ethics Committee operates in accordance with ICH Good Clinical Practice Guidelines, Malaysian Good Clinical Practice Guidelines and the Declaration of Helsinki. The approval of this project is conditional upon your continuing compliance with these guidelines and declaration.

We draw to your attention the requirement that a report on this research, must be submitted every 12 months from the date of the approval or on the completion of the project, whichever occurs first. Failure to submit reports will result in withdrawal of consent for the project to proceed. Amendments, if any, to the study documents are to be submitted to the REC for approval.

If you require further information, please contact the REC Secretariat at 03-55442846/03-55442737 or email at recsecretariat@uitm.edu.my.

اوسهاء تقوى، مولنا
"MALAYSIA MADANI"
"BERKHIDMAT UNTUK NEGARA"

Yours sincerely,

(EMERITUS PROFESSOR DATO' DR RAYMOND AZMAN ALI)
Chairman
UiTM Research Ethics Committee

c.c.: Dean (Research and Innovation), Faculty of Health Sciences, UiTM

Universiti Teknologi MARA
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ISO 9001:2015 No. Sijil: 10120156

UiTM di hatiku

Reference : 600-TNCPI (5/1/6)
Our reference : REC/01/2025 (PG/MR/32)
Date : 1446H رجب 9
9 January 2025

Ref. number:	REC/01/2025 (PG/MR/32)
Approval Period:	9 January 2025 until 30 October 2025
Authorised personnel:	1. Jheffany Yazid 2. Suzana Yuso 3. Dr Siti Khuzaimah Ahmad Sharoni
Location of research:	1. Health District Lembah Pantai 2. Health Clinic Tanglin 3. Health District Titiwangsa 4. Health Clinic Kampung Pandan 5. Health Clinic Setapak 6. Health Clinic Kuala Lumpur 7. Health District Kepong 8. Health Clinic Jinjang 9. Health Clinic Segambut 10. Health Clinic Sentul

APPENDIX 8: Approval Letter from Medical Research Ethics Committee (MREC), Ministry of Health Malaysia

JAWATANKUASA ETIKA & PENYELIDIKAN PERUBATAN
(*MEDICAL RESEARCH & ETHICS COMMITTEE*)
KEMENTERIAN KESIHATAN MALAYSIA
MINISTRY OF HEALTH MALAYSIA
Kompleks Institut Kesihatan Negara (NIH)
No.1, Persiaran Setia Murni U13/52,
Seksyen U13 Setia Alam,
40170 Shah Alam, Selangor.
Tel.: +(6)03-33628888/ 33628205

Ruj.Kami/ *Ref.*: **24-01907-GTP**
Tarikh/ *Date* : **18-07-2024**

JHEFFANY BIN YAZID
FAKULTI SAINS KESIHATAN, UNIVERSITI TEKNOLOGI MARA,
BANDAR PUNCAK ALAM, SELANGOR

Dato'/ Dr/ Tuan/ Puan,

SURAT KELULUSAN ETIKA/ *LETTER OF ETHICAL APPROVAL*:

NMRR ID-24-01907-GTP (IIR)
PREVALENCE OF ERECTILE DYSFUNCTION, FACTORS ASSOCIATED, AND QUALITY OF LIFE AMONG MALE WITH DIABETES IN KUALA LUMPUR, MALAYSIA: A CROSS-SECTIONAL STUDY

Dengan hormatnya perkara di atas adalah dirujuk.

This letter is made in reference to the matter above.

2. Bersama dengan surat ini dilampirkan surat kelulusan saintifik dan etika bagi projek ini. Segala rekod dan data subjek adalah SULIT dan hanya digunakan untuk tujuan kajian dan semua isu serta prosedur mengenai *data confidentiality* mesti dipatuhi. **Kebenaran daripada Pengarah Hospital/ Institusi di mana kajian akan dijalankan mesti diperolehi terlebih dahulu sebelum kajian dijalankan.** Dato'/ Tuan/ Puan perlu akur dan mematuhi keputusan tersebut dan undang-undang lain yang berkaitan.

   The Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (MOH) has provided ethical approval for this study. Please take note that all records and data are to be kept strictly ***CONFIDENTIAL*** *and can only be used for the purpose of this study. All precautions are be taken to maintain data confidentiality. Permission from the District Health Officer / Hospital Administrator/ Hospital Director and all relevant heads of departments /units where the study will be carried out must be obtained prior to the study. You are required to follow and comply with their decision and all other relevant regulations.*

3. Penyelidik- penyelidik dan lokasi penyelidikan yang terlibat ialah:

   The investigators and sites involved in this study are:

   KLINIK KESIHATAN KUALA LUMPUR
   Jheffany Bin Yazid (Penyelidik Utama/ *Principal Investigator*)
   Siti Khuzaimah Binti Ahmad Sharoni
   Suzana Binti Yusof

   KLINIK KESIHATAN SENTUL
   Jheffany Bin Yazid (Penyelidik Utama/ *Principal Investigator*)

   KLINIK KESIHATAN JINJANG
   Jheffany Bin Yazid (Penyelidik Utama/ *Principal Investigator*)

.../4-

Ruj.Kami/ *Ref*: **24-01907-GTP**

KLINIK KESIHATAN TANGLIN
Jheffany Bin Yazid (Penyelidik Utama/ *Principal Investigator*)

KLINIK KESIHATAN SETAPAK
Jheffany Bin Yazid (Penyelidik Utama/ *Principal Investigator*)

KLINIK KESIHATAN KAMPUNG PANDAN
Jheffany Bin Yazid (Penyelidik Utama/ *Principal Investigator*)

KLINIK KESIHATAN SEGAMBUT
Jheffany Bin Yazid (Penyelidik Utama/ *Principal Investigator*)

JABATAN KESIHATAN WILAYAH PERSEKUTUAN KUALA LUMPUR & PUTRAJAYA
Jheffany Bin Yazid (Penyelidik Utama/ *Principal Investigator*)

4. Dokumen- dokumen kajian berikut telah diterima dan disemak dengan merujuk kepada kajian di atas:

   The following study documents have been received and reviewed with reference to the above study:

Senarai dokumen yang diterima dan disemak/ *List of documents received and reviewed:*

1. Surat iringan kepada JEPP
   Cover letter to MREC
   (Versi/ *Version* 5, bertarikh/ *dated* 07-06-2024)

2. Pengisytiharan Konflik Kepentingan
   Declaration of Conflict of Interest (COI)
   (Versi/ *Version* 2, bertarikh/ *dated* 07-06-2024)

3. Protokol
   Protocol
   (Versi/ *Version* 2, bertarikh/ *dated* 12-07-2024)

4. Lembaran maklumat pesakit & borang persetujuan
   Participant information sheet & informed consent form
   Versi Bahasa Inggeris/ *English version* (Versi/ *Version* 2, bertarikh/ *dated* 12-07-2024)
   Versi Bahasa Melayu/ *Malay version* (Versi/ *Version* 2, bertarikh/ *dated* 12-07-2024)

5. Borang soal selidik
   Questionnaire
   Versi Bahasa Inggeris/ *English version* (Versi/ *Version* 1, bertarikh/ *dated* 08-04-2024)
   Versi Bahasa Melayu/ *Malay version* (Versi/ *Version* 1, bertarikh/ *dated* 08-04-2024)

6. Carta *Gantt*
   Gantt Chart
   (Versi/ *Version* 1, bertarikh/ *dated* 08-04-2024)

7. Borang IA-HOD-IA dan *Curiculum Vitae (CV)*
   IA-HOD-IA form, Curiculum Vitae (CV) of:
   - Jheffany Bin Yazid

8. *Curiculum Vitae (CV)* dan sijil *Good Clinical Practice (GCP)*
   Curiculum Vitae (CV) and Good Clinical Practice (GCP) certificate of:
   - Siti Khuzaimah Binti Ahmad Sharoni

-2-

9. *Curiculum Vitae (CV)*
   Curiculum Vitae (CV) of:
   - Suzana Binti Yusof

5. Adalah dimaklumkan bahawa kelulusan ini adalah sah sehingga **17-07-2025**. Tuan/ Puan perlu menghantar dokumen-dokumen seperti berikut selepas mendapat kelulusan etika. Borang-borang berkaitan boleh dimuat turun daripada laman web *National Medical Research Registry (NMRR)*.

   *Please note that the approval is valid until **17-07-2025**.The following are to be reported upon receiving ethical approval. Required forms can be obtained from the National Medical Research Registry (NMRR) website.*

   i. ***Continuing Review Form*** harus dihantar kepada JEPP dalam tempoh 2 bulan (60 hari) sebelum tamat tempoh kelulusan ini bagi memperbaharui kelulusan etika.

      Continuing Review Form *must be submitted to MREC within 2 months (60 days) prior to the expiry of ethical approval.*

   ii. ***Study Final Report (Closure Notification)*** harus dihantar kepada JEPP pada penghujung kajian.

      Study Final Report (Closure Notification) *must be submitted to MREC upon study completion.*

   iii. Mendapat kelulusan etika sekiranya terdapat pindaan **ke atas sebarang dokumen kajian/ lokasi kajian/ penyelidik**. Pihak JEPP mempunyai hak untuk menarik balik kelulusan etika sekiranya terdapat perubahan dokumen kajian yang tidak diisytiharkan.

      *Ethical approval is required in the case of **amendments/ changes** to the **study documents/ study sites/ study team**. MREC reserves the right to withdraw ethical approval if changes to study documents are not completely declared.*

   iv. **Kajian berkenaan intervensi klinikal sahaja:** Laporan mengenai ***all Serious Adverse Events (SAEs), Suspected Unexpected Serious Adverse Reaction (SUSARs)*** dan ***Protocol Deviation/Violation*** di lokasi kajian yang diluluskan oleh JEPP jika berkenaan. *SAE* perlu dilaporkan dalam tempoh 15 hari kalender dari kesedaran kejadian (*awareness of event)* oleh penyelidik. Laporan awal *SUSAR* perlu dikemukakan seawal mungkin tapi tidak melewati 7 hari calendar dari kesedaran kejadian oleh penyelidik, disusuli dengan laporan lengkap dalam tempoh tambahan 8 hari kalender.

      Applicable for Clinical interventional Studies only: *Report occurrences of **all Serious Adverse Events (SAEs), Suspected Unexpected Serious Adverse Reaction (SUSARs)** and **Protocol Deviation/Violation** at all MREC approved sites to MREC. SAEs are to be reported within 15 calendar days from awareness of event by investigator. Initial report of SUSARs are to be reported as soon as possible but not later than 7 calendar days from awareness of event by investigator, followed by a complete report within 8 additional calendar days.*

6. Bilangan **subjek/ pesakit/ responden** yang akan terlibat dalam kajian ini di Malaysia adalah seramai **449 orang**.

   *There will be **449 subjects/ patients/ respondents** involved in this study within Malaysia.*

7. Sila ambil maklum bahawa sebarang urusan surat-menyurat berkaitan dengan penyelidikan ini haruslah dinyatakan nombor rujukan surat ini untuk melicinkan urusan yang berkaitan.

   Please take note that the reference number of this letter must be stated in all future correspondence related to this study to facilitate the administrative processes.

8. Jawatankuasa Etika & Penyelidikan Perubatan, Kementerian Kesihatan Malaysia, beroperasi mengikut *Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use (ICH)*. Mana-mana ahli JEPP yang terlibat dalam kajian/ projek yang dinilai tidak akan mengambil bahagian dalam kelulusan kajian/ projek.

   The Medical Research & Ethics Committee, Ministry of Health Malaysia, operates in accordance to the International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use (ICH). Any member of the MREC who is involved in the study/ project under review will not participate in the approval of the study/ project.

Lokasi kajian/ *Project Sites*:
KLINIK KESIHATAN KUALA LUMPUR
KLINIK KESIHATAN SENTUL
KLINIK KESIHATAN JINJANG
KLINIK KESIHATAN TANGLIN
KLINIK KESIHATAN SETAPAK
KLINIK KESIHATAN KAMPUNG PANDAN
KLINIK KESIHATAN SEGAMBUT
JABATAN KESIHATAN WILAYAH PERSEKUTUAN KUALA LUMPUR & PUTRAJAYA

Keputusan Jawatankuasa Etika & Penyelidikan Perubatan/
Decision by Medical Research & Ethics Committee:
(√) Lulus/ *Approved*
( ) Tidak lulus/ *Disapproved*

Tarikh Kelulusan Etika/ *Date of Ethical Approval*: **18-07-2024**

Sekian terima kasih.
Thank you.

"MALAYSIA MADANI"

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,
I who carry out the trust,

.....
DR. NURAIN BINTI MOHD NOOR
Pengerusi/ *Chairperson*
Jawatankuasa Etika & Penyelidikan Perubatan/ *Medical Research & Ethics Committee*
Kementerian Kesihatan Malaysia/ *Ministry of Health Malaysia*
(No. MPM/ *MMC No*: 31576)

APPENDIX 9: Consent Site (JKWPKL & Putrajaya Approval)

JABATAN KESIHATAN WILAYAH PERSEKUTUAN
KUALA LUMPUR DAN PUTRAJAYA
Jalan Cenderasari
50590 KUALA LUMPUR
MALAYSIA

Tel : 03-2268 7333
Laman Web : jknkl.moh.gov.my

Ruj. Kami : Bil.(2)dlm.JKWPKL/203/4 Bhg.20
Tarikh : 8 Oktober 2024

Jheffany bin Yazid
Penyelidik
Fakulti Sains Kesihatan
UITM Selangor, Puncak Alam Kampus
42300 Bandar Puncak Alam, Selangor

Tuan,

MAKLUMBALAS PERMOHONAN KEBENARAN UNTUK MENJALANKAN PENYELIDIKAN

TAJUK KAJIAN : ***PREVALENCE OF ERECTILE DYSFUNCTION, FACTORS ASSOCIATED, AND QUALITY OF LIFE AMONG MALE WITH DIABETES IN KUALA LUMPUR, MALAYSIA : A CROSS-SECTIONAL STUDY***
NMRR ID : NMRR-24-01907-GTP (IIR)

Dengan segala hormatnya merujuk kepada perkara di atas dan surat Tuan bertarikh 19 Julai 2024 adalah berkaitan.

2. Sukacita dimaklumkan bahawa pihak kami **tiada halangan** untuk membenarkan Tuan menjalankan penyelidikan seperti di atas bermula dari 11 Oktober 2024 sehingga 17 Julai 2025 di Klinik Kesihatan Sentul, Klinik Kesihatan Kuala Lumpur, Klinik Kesihatan Jinjang, Klinik Kesihatan Tanglin, Klinik Kesihatan Setapak, Klinik Kesihatan Kampung Pandan dan Klinik Kesihatan Segambut.

3. Untuk makluman, Tuan dimohon agar mematuhi perkara-perkara berikut semasa menjalankan kajian di fasiliti kesihatan Jabatan Kesihatan Wilayah Persekutuan Kuala Lumpur & Putrajaya:

3.1 Sebarang bentuk kajian yang dijalankan tidak mengganggu kelancaran perkhidmatan klinik dan tugas hakiki pegawai yang terlibat.

3.2 Melibatkan anggota JKWPKL&P dalam penyelidikan yang dijalankan jika bersesuaian.

3.3 Perlu mengikuti segala perundangan dan prosedur yang telah ditetapkan oleh Kerajaan Malaysia, Kementerian Kesihatan Malaysia (KKM), Pejabat Kesihatan Daerah (PKD) dan Klinik Kesihatan.

3.4 Membentangkan hasil kajian kepada pihak kami setelah kajian selesai.

1/2...

Ruj. Kami : Bil.(2)dlm.JKWPKL/203/4 Bhg.20

3.5 Memberikan sesalinan hasil kajian kepada pihak kami sebagai bahan bacaan dan rujukan pegawai-pegawai di Jabatan ini.

3.6 Sebarang penerbitan atau diseminasi hasil penyelidikan tersebut sama ada melalui penulisan, pengiklanan, pembentangan atau untuk ke media perlu mendapat kelulusan Ketua Pengarah Kesihatan Malaysia terlebih dahulu. Tuan boleh merujuk kepada garis panduan Institut Kesihatan Negara mengenai penyelidikan di institusi dan fasiliti Kementerian Kesihatan Malaysia Edisi Ke-3 2021.

4. Untuk perbincangan lanjut, Tuan boleh berhubung terus dengan Pegawai Kesihatan Kepong (no telefon: 03-62570352), Pegawai Kesihatan Lembah Pantai (no telefon: 03-26913200) dan Pegawai Kesihatan Titiwangsa (no telefon: 03-26980282) sebelum penyelidikan bermula bagi memastikan kelancaran penyelidikan tersebut. Kerjasama dan perhatian daripada Tuan amat dihargai dan didahulukan dengan ucapan terima kasih.

Sekian.

"MALAYSIA MADANI"

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

(DR. NOR'AISHAH BINTI ABU BAKAR) **(MMC: 32601 / NSR: 127813)**
Pakar Perunding Perubatan Kesihatan Awam
Pengarah Kesihatan Negeri
Jabatan Kesihatan Wilayah Persekutuan
Kuala Lumpur & Putrajaya

s.k - Timbalan Pengarah Kesihatan Negeri (Kesihatan Awam)
- Pegawai Kesihatan Kepong
- Pegawai Kesihatan Lembah Pantai
- Pegawai Kesihatan Titiwangsa

...2/2

GRAMMARLY

THESIS JHEFF 40K TANPA TABLE

by Jeffrey Aron

General metrics

79,712	11,728	579	46 min 54 sec	1 hr 30 min
characters	words	sentences	reading time	speaking time

Score

99

This text scores better than 99% of all texts checked by Grammarly

Writing Issues

32	✓	32
Issues left	Critical	Advanced

Plagiarism

This text hasn't been checked for plagiarism

JHEFFANY THESIS BAB 3

by Jeffrey Aron

General metrics

58,825	8,484	546	33 min 56 sec	1 hr 5 min
characters	words	sentences	reading time	speaking time

Writing Issues

No issues found

Plagiarism

This text hasn't been checked for plagiarism

JHEFFANY BAB 4 RESULTS

by Jeffrey Aron

General metrics

65,150	10,149	1662	40 min 35 sec	1 hr 18 min
characters	words	sentences	reading time	speaking time

Score

This text scores better than 99% of all texts checked by Grammarly

Writing Issues

12	✓	12
Issues left	Critical	Advanced

Plagiarism

This text hasn't been checked for plagiarism

Jheffany thesis discusssion 1

by Jeffrey Aron

General metrics

53,691	7,908	313	31 min 37 sec	1 hr 0 min
characters	words	sentences	reading time	speaking time

Writing Issues

No issues found

Plagiarism

This text hasn't been checked for plagiarism

JHEFFANY THESIS BAB 5

by Jeffrey Aron

General metrics

48,892	7,025	300	28 min 5 sec	54 min 2 sec
characters	words	sentences	reading time	speaking time

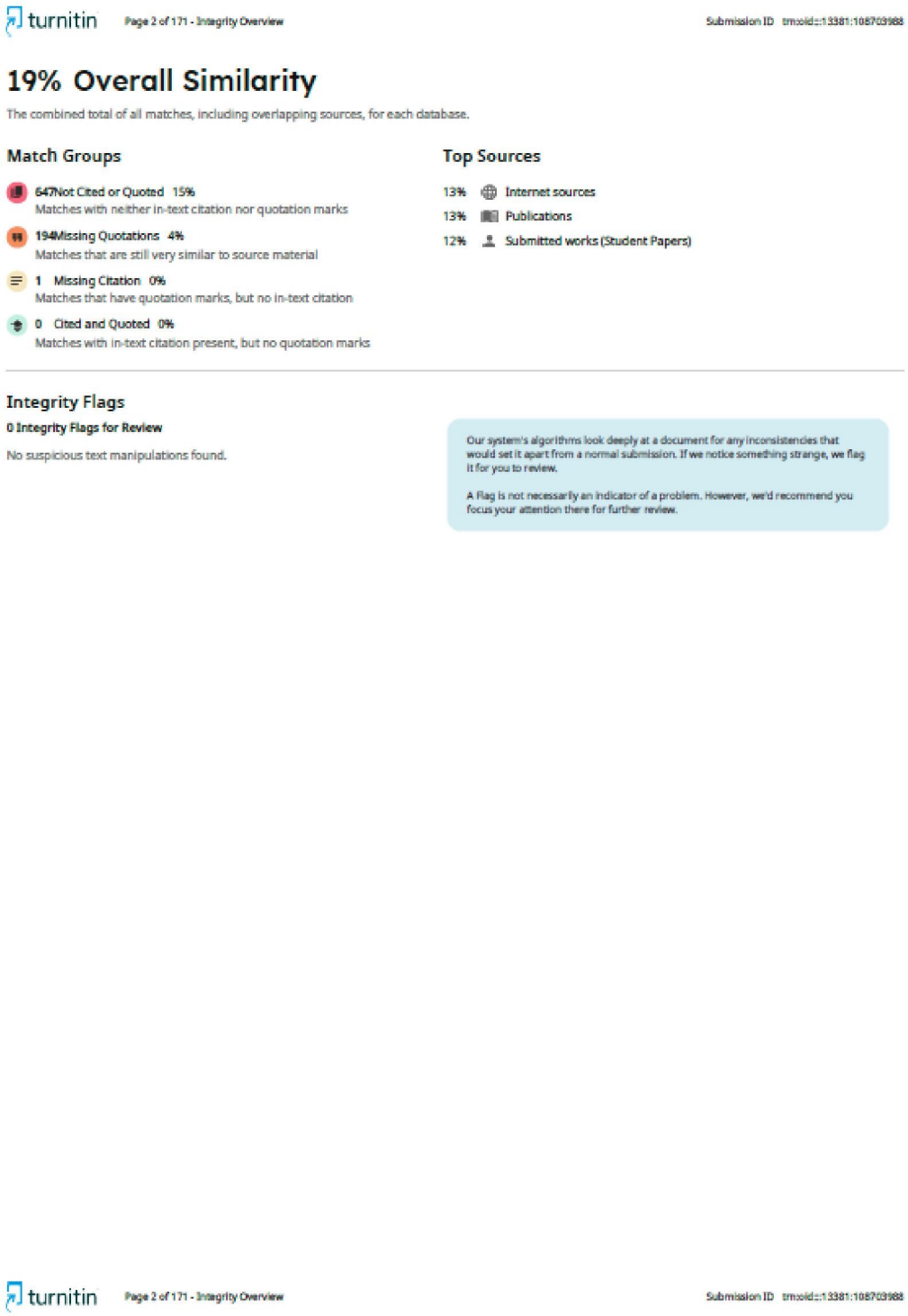
Writing Issues

✓ No issues found

Plagiarism

This text hasn't been checked for plagiarism

TURNITIN CHECK



AUTHOR'S PROFILE

Jheffany bin Yazid obtained a Diploma in Nursing from the Ipoh Nursing College, Perak (now known as ILKKM Sultan Azlan Shah, Perak) in 2007. He pursued a post-basic specialisation in Management in Diabetes Mellitus at ILKKM Kuantan, Pahang. Subsequently, he completed a Bachelor's Degree in Nursing (First Class) at Universiti Teknologi MARA (UiTM), Puncak Alam Campus, Selangor. He is currently serving as a Lecturer U9 at ILKKM Kubang Kerian (Nursing), Kota Bharu.

List of Publication:

Yazid, J., Yusof, S., Khuzaimah, S., Sharoni, A., & Wilandika, A. (2025). Prevalence of Erectile Dysfunction and Quality of Life among Males with Diabetes Mellitus: A Systematic Review. Environment-Behaviour Proceedings Journal, 215–222.

Yazid, J., Yusof, S., Ahmad Sharoni, S. K., & Wilandika, A. (2024). Cursed by Diabetes: The shadow of erectile dysfunction and its impact on male well-being. Journal of ASIAN Behavioural Studies, 9(29), 1–15. https://doi.org/10.21834/jabs.v9i29.450

List of Conferences

AicQoL2025 Pangkor, 13th AMER International Conference on Quality of Life, Puteri Bayu Beach Resort, Pangkor Island, Malaysia.