INDONESIAN JOURNAL OF NURSING PRACTICES OPEN ACCESS

Volume 7, Issue 1, June 2023, p. 37-49

Prevalence of Erectile Dysfunction Among Men with Type 2 Diabetes Mellitus in Indonesia: An Observational Study

Yanuar Primanda[1]*, Taufik Wiyoga Nugroho[2], Vignesvararajah Lokeesan[3]

[1]Department of Adult Nursing, School of Nursing, Universitas Muhammadiyah Yogyakarta, Indonesia
[2]Clinical Nurse Practitioner, Rajawali 1A/HCU-Inpatient Unit Class III and Unit Stroke, RSUP dr. Kariadi Semarang, Indonesia
[3]Department of Supplementary Health Sciences, Faculty of Health-Care Sciences, Eastern University Sri Lanka

Corresponding Author: Yanuar Primanda
Email: yanuarprimanda@umy.ac.id

Article Info
Online : http://journal.umy.ac.id/index.php/ijnp
ISSN : 2548 4249 (Print)
: 2548 592X (Online)
DOI :10.18196/ijnp.v7i1.18111

Article History
Received : 08 March 2023
Revised : 22 May 2023
Accepted : 24 May 2023

Abstract

Background: Diabetes mellitus (DM) is a chronic metabolic disorder that can lead to multiple long-term complications in the human body including erectile dysfunction (ED). ED is a condition that commonly affects men and may reduce their quality of life. However, ED amongst men with type 2 DM (T2DM) has rarely been assessed and addressed by nurses who have an essential role in providing holistic patient care.
Objective: This study aimed to describe ED among men with T2DM based on their demographic characteristics and health profiles.
Methods: This was a descriptive study with a cross-sectional approach of 32 male respondents who were selected through convenience sampling in the outpatient department of PKU Muhammadiyah Hospital Yogyakarta, Indonesia. The data was collected by using the erectile function's domain of Indonesian version of International Index of Erectile Function (IIEF). Descriptive statistics were used to present this study's findings.
Results: The results showed that 62.5% of the participants had uncontrolled blood glucose levels with an average random blood glucose of 207.75 ± 77.21 mg/dl. Only four respondents (12.5%) had received sexual counselling. Twenty-nine respondents (90,6%) had ED which were categorized into mild (17.2%), mild to moderate (6.9%), moderate (24.1%) and severe (51.7%).
Conclusion: ED levels varied across age, duration of T2DM, random blood glucose levels, previous history of smoking, current smoking status, sexual counselling experience, complications, and occupation levels. Severe ED was common amongst men with T2DM in this study. Nurses should assess patient's sexual function regularly and identify the effects of ED in men with T2DM. Early detection of ED could allow nurses to plan adequate intervention and health education to provide better outcomes for men with T2DM.

Keywords: Erectile Dysfunction; Indonesia; type 2 Diabetes Mellitus

INTRODUCTION

Diabetes mellitus (DM) is one of the most devastating diseases in the world that leads to multiple complications in the human body. The International Diabetes Federation reported that approximately 537 million adults between 20-79 are living with diabetes and almost 81% of them are living in low and middle income countries including Indonesia (International Diabetes Federation, 2021). In Indonesia, approximately 19.5 million people, which represents 10.8% of Indonesian adult population, were living with DM in 2021 (International Diabetes Federation, 2021). In Yogyakarta, Indonesia, one of the special provinces in Java, DM affects one third of people older than 15 years (Ministry of Health of the Republic of

Indonesia, 2018). The Indonesian Ministry of Health ranked Yogyakarta as one of the top three provinces with the highest numbers of people living with DM, after Jakarta and Kalimantan (Ministry of Health of the Republic of Indonesia, 2018). Therefore, this study was conducted in Yogyakarta.

DM causes various microvascular and macrovascular complications including erectile dysfunction (ED) (Jelinek et al., 2017; Litwak et al., 2013; Papatheodorou et al., 2018). A complex process that involves vascular, neurologic, psychological and hormonal factors contribute to the development of ED amongst men with DM (Jumani & Patil, 2020). Hyperglycaemia causes endothelial dysfunction as a result of the failure of nitric oxide induced smooth muscle relaxation (Jumani & Patil, 2020). Hormonal factors, including hypogonadism are commonly found in men with DM who experience ED (Cannarella et al., 2021). The complex pathogenesis of insulin and leptin-dependent altered function of the gonadotropin-releasing hormone neuron further contribute to hypogonadism and ED in men with DM (Cannarella et al., 2021).

Several factors are associated with ED in men with DM including: advanced age (Bahar et al., 2020; Jumani & Patil, 2020; Omar et al., 2022; Zeleke et al., 2021), the length of the duration of DM (Omar et al., 2022; Zeleke et al., 2021), poor blood glucose control (Omar et al., 2022; Zeleke et al., 2021), high cholesterol level (Omar et al., 2022), active smoking status (Jumani & Patil, 2020), sedentary lifestyle (Defeudis et al., 2022; Jumani & Patil, 2020), obesity or being overweight (Defeudis et al., 2022; Jumani & Patil, 2020), increased calorie intake (Defeudis et al., 2022), and excessive alcohol consumption (Jumani & Patil, 2020; Zeleke et al., 2021).

ED is common amongst men who have DM. A review study reported that the prevalence of ED among men with DM is about 60-80% (Jumani & Patil, 2020). A meta-analysis of 145 studies in 2017, which involved more than 90,000 men with DM, found that the overall prevalence of ED amongst men with DM was 52.5% (Kouidrat et al., 2017). ED was also found to be more common amongst men with type 2 DM (T2DM) than those with type 1 DM (66.3% VS 37.5%) (Kouidrat et al., 2017). A recent study from Indonesia reported that the prevalence of ED among male with T2DM (n=815) was 32.4% (Cholil et al., 2019).

ED can lead to serious problems especially related to mental or psychological well-being and quality of life. Amongst the general population, a meta-analysis study found that ED is associated with the risk of depression (Liu et al., 2018). A previous study reported that compared to people without DM history, people with DM who experienced ED also have worse sexual satisfaction, emotional life (Penson et al., 2003) and quality of life (Avasthi et al., 2011). Another study has confirmed that ED is a strong predictor of poor generic and disease-specific quality of life (Malavige et al., 2014). Feelings of low self-esteem, loneliness, unattractiveness, and negative relationship with their spouses were often reported by men with DM who had ED (Barnard-Kelly et al., 2019). Furthermore, ED also caused negative relationship effects including mutual mistrust, fear of losing support from spouse, general unhappiness, and infidelity (Cooper et al., 2018).

Considering the devastating impact of ED amongst men with T2DM, the Indonesian Endocrinologist Association (PERKENI) recommends regular assessment of sexual function amongst men with DM using the International Index of Erectile Function (IIEF) (Indonesian Endocrinologists Association, 2021). ED is considered as a common complication that is rarely disclosed by men with DM to their health care professionals (Indonesian Endocrinologists Association, 2021). These communication problems are a common barrier in assessing ED among men with DM because health care professionals rarely ask about ED issues and men with DM also do not regularly inform their practitioner regarding their ED condition (Barnard-Kelly et al., 2019). The failure of early identification of ED causes there to be a lack of appropriate interventions place and leading to further deterioration and aggravation of the psychological distress of the patient, their spouse and their quality of life (Barnard-Kelly et al., 2019). Barnard-Kelly et al. (2019) further report that almost half of men who have DM experienced ED did not seek help.

While studies have identified a high prevalence of ED among men with DM especially in T2DM, and the

regular screening of sexual problems among men with DM is recommended, ED is one of the often neglected complications of DM (Cannarella et al., 2021; Verschuren et al., 2010). In Yogyakarta, several studies have been conducted to describe or provide interventions related to DM including diabetic foot care (Arianti, 2015; Pranata et al., 2016; Primanda et al., 2017; Rias, 2016; Rias et al., 2016; Windasari, 2015), mental health (Susanti, 2014; Wardaningsih & Widyaningrum, 2019), dietary behaviours (Primanda et al., 2011; Putranto & Primanda, 2019), insulin management (Santosa & Rosa, 2014), and knowledge (Haris & Kristianti, 2020). However, few studies have been conducted related to ED amongst men with DM in Yogyakarta. A literature review that sort to describe ED among men with DM in Indonesia from 2010-2016 was only cited in four other studies from Bali, Manado (Warsono & Permana, 2017). Similarly, another study also reported that sexuality including ED only appeared in the title of only about 100 studies relating to DM in 2009 (Verschuren et al., 2010). This indicates that less attention is paid to ED in comparison to other DM complications. Considering the high number of people with T2DM who live in Yogyakarta, it is important to investigate the prevalence of ED in men with T2DM in the region.

There are several barriers relating to addressing ED problems amongst men in general as well as men with DM have been reported, including factors associated with patients and health care providers. Patients frequently encounter difficulties in discussing sexual health problems with their care providers because patients of feelings of embarrassment in discussing the problem (Jiann et al., 2009; Rutte et al., 2016). Patients has experienced with health care providers were incapable, embarrassed, and unwilling to discuss ED (Rutte et al., 2016). Misconception surrounding the effectiveness of ED treatments, the importance of discussing ED to find appropriate treatment, and effects of ED treatment were reported as the reasons in avoiding discussions about ED by men with T2DM (Jiann et al., 2009). Health care providers were seen as un aware of the distressful nature of sexual problems (Rowland, 2011) and perceived as reluctant or bothered by discussions relating to sexual issues (Rowland, 2011; Rutte et al., 2016). Further, studies revealed that the barriers for nurses in assessing ED included communication (Barnard-Kelly et al., 2019), embarrassment, lack of time, not considering sexual assessment as a priority, fear of causing offence, and lack of knowledge of sexual health (Bilal-Salim, 2019). Furthermore, it was noted that nurses have limited formal education in sexual health that inadequately prepare nurses to address ED issues in their daily practices (Bilal-Salim, 2019).

While nurses face several barriers in managing patient sexual health, nurses have essential roles in providing holistic care to all of patients including those with T2DM and ED without discrimination. Addressing patient's sexual health forms part of holistic care which sometimes requires nurses to put aside any personal attitudes and beliefs about sexual health, resulting in nurses who can address sexual health issues adequately (Bilal-Salim, 2019). It is important to create supportive and safe environments to encourage men with T2DM to report sexual health issues and reduce their embarrassment associated with asking for help regarding their sexual health issues including ED (Thongtang et al., 2021). Sexual health related issues are an essential part in assessing men with T2DM to provide routine care (Thongtang et al., 2021). Further, nurses also have important roles in providing education and raising awareness of ED amongst men with T2DM (Bilal-Salim, 2019). Therefore, nurses are expected to help with early identification of the problem, facilitate appropriate interventions and treatments that could subsequently improve the patient and their spouse's sexual health and quality of life.

Due to the high prevalence of ED among men with T2DM and the lack of existing studies in exploring ED among men with T2DM in the Indonesian context, this study was developed to assess ED among men with T2DM in a hospital outpatient department in PKU Muhammadiyah Hospital Yogyakarta, Indonesia. This study's aim was to answer the following research questions: 1. What was the prevalence of ED among men with T2DM? 2. What is the frequency and percentage of ED based on the demographic characteristics of men with T2DM?

METHOD

A cross-sectional study was conducted to answer the research questions. The participants were 32 males with T2DM who were enrolled through a convenience sampling technique. The sample calculation was based on the prediction of

population number (N = 35, based on the number of patient in August – September 2017), Z score (1.96), prediction of proportion (50%), and d value (0.05) (Nursalam, 2016). The inclusion criteria were: male, diagnosed with T2DM based on the patient's medical record, attending outpatient department of PKU Muhammadiyah Yogyakarta Hospital, 17 years old or above, able to communicate in Bahasa Indonesia, and willing to give consent to participate in this study. The exclusion criteria were: below 17 years old, patients who refused to give consent to participate in this study and those who withdrew from the study during the data collection period. The data collection was conducted by the author (TWS) through a self-administered questionnaire in the outpatient department of PKU Muhammadiyah Yogyakarta, Indonesia from February to March 2018.

The demographic questionnaire was developed by the researchers and the International Index of Erectile Function (IIEF) for erectile function domain (Rosen et al., 2002) was used to collect data. The demographic questionnaire contained questions related to demographic characteristics (age, gender, occupation, experience in receiving consultation about ED) and health profiles (duration of DM, smoking history, family history of DM, recent blood glucose test, known comorbidities). The IIEF erectile function domain has six total items with a five-point Likert scale (very low = 1 to very high = 5) for one question and six-point Likert scale (No sexual activity = 0 to almost always or always = 5) for five questions. The possible total score of the questionnaire was 0 – 30. The ED levels were categorized into no ED (score 26 – 30), mild (score 22 – 25), mild to moderate (score 17 – 21), moderate (score 11 – 16) and severe (score 0 – 10). The IIEF is a validated and reliable scale to assess ED (Cronbach's alpha, range 0.73 – 0.99 and test-retest reliability r, range 0.64 – 0,84) (Rosen et al., 2002).

The IIEF was available in English language. Therefore for this study, it was translated into Bahasa Indonesia through six steps of a back translation process (Wild et al., 2005). The Indonesian version of IIEF was further tested for its validity and reliability among 20 participants with DM using Pearson Product Moment correlation and Cronbach's alpha test. The results found that the Bahasa Indonesian version of IIEF used in this study has the value of r = 0.836 – 0.957 and the Cronbach's Alpha of 0.953. The validity and reliability test showed that the IIEF Bahasa Indonesia version of the scale was valid and reliable to use in the Indonesian context (Polit & Beck, 2018).

Descriptive statistics was used to present the findings. The continuous data was reported using mean±SD for normally distributed data while median (Inter quartile range/IQR) for not normally distributed data. The categorical data was reported as frequency (percentage). There was no gold standard in measuring normality of the data (Kim, 2013). The normal distribution in this study followed the normal distribution criteria based on Kirkwood and Sterne (2003) including : (1) median close to ±10% of mean, (2) mean ±3 x SD approximate the minimum and maximum values, (3) skewness coefficient, (4) kurtosis coefficient between -2 and +2; and (5) approximately distribution looks bell-shaped. Data was considered normally distributed if all the five normal distribution criteria have been met (Kim, 2013; Kirkwood & Sterne, 2003). This study was granted ethical clearance from Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta Ethical Committee (058/EP-FKIK-UMY/I/2018).

RESULT

The normality test revealed that the data of age and duration of T2DM were not normally distributed based on the Kirkwood and Sterne (2003)'s criteria. The median age of participants was 57.5 (IQR = 52.5 – 64.75) years and the median duration of being diagnosed with DM was 10 (IQR = 3.25 – 16) years. The average random blood glucose was 207.75±77.21 mg/dl. The previous history of smoking question showed that more than two thirds of participants (68.8%) were smokers. Seven participants were active smokers during the study research. All of the participants had no prior history of ED before being diagnosed with T2DM. Seven (21.9%) participants had previously consumed over the counter medications to treat their ED without a prescription. The majority of participants had never received sexual counselling from their physician or sexologist. Amongst the participants, hypertension was experienced by five (15.6%) and dyslipidaemia by four (12.5%) individuals. Other complications such as stroke and cardiovascular disease were only

experienced by one participant. Participants' work levels could inform on required power and energy to accomplish their work and were categorised based on Indonesian Endocrinologist Association (PERKENI) into mild, moderate, hard, and very hard levels. Most of participants (81.3%) have mild level of work level such as civil servant, retired, and teacher. See Table 1.

Table 1. Demographic characteristics and health profiles of participants (N = 32)

Variable	Values
Age	
20 – 39 years	1 (3.1%)
40 – 59 years	18 (56.2%)
≥ 60 years	13 (40.6%)
Median Age	57.5 (52.5 – 64.75)
Duration of T2DM	
≤ 5 years	11 (34.4%)
6 – 10 years	9 (28.1%)
≥ 11 years	12 (37.5%)
Median duration of DM	10 (3.25 – 16)
Random Blood Glucose	
≤ 180 mg/dl	12 (37.5%)
> 180 mg/dl	20 (62.5%)
Mean random Blood Glucose	207.75 ± 77.21
Previous history of smoking	
No	10 (31.2%)
Yes	22 (68.8%)
Current smoking status	
No	25 (78.1%)
Yes	7 (21.9%)
History of ED	
No	32 (100%)
Yes	0 (0.0)
Consume over the counter medication to treat ED	
No	25 (78.1%)
Yes	7 (21.9%)
Received sexual counselling	
No	28 (87.5%)
Yes	4 (12.5%)
Complications	
Hypertension	5 (15.6%)
Dyslipidaemia	4 (12.5%)
Others	23 (71.9%)
Works' level	
Mild	26 (81.3%)
Moderate	3 (9.4%)
Hard	2 (6.3%)
Very hard	1 (3.1%)

Note: DM = diabetes mellitus, ED = erectile dysfunction. Data are expressed as Mean±SD, Median (Q1-Q3), or Frequency (percentage)

ED had been experienced by 90.6% of participants at various levels from mild to severe based on the IIEF scale. Almost half of the participants (46.0%) experienced severe ED (See Table 2). Table 3 describes the responses of the participants based on

each item of the IIEF scale. More than half of the participants reported difficulty in obtaining an erection during sexual activities, during penetration, maintaining an erection, and completing sexual intercourse. Only a quarter of participants reported no issues with erection during sexual activities.

Table 2. Erectile dysfunction among participants (N = 32)

ED levels	Frequency (%)
No ED	3 (9.4%)
Mild ED	5 (15.6%)
Mild to moderate ED	2 (6.3%)
Moderate ED	7 (21.9%)
Severe ED	15 (46.9%)

Note: ED = erectile dysfunction

Table 3. The responds of the participants based on each item of IIEF (N = 32)

Items	0	1	2	3	4	5
How often were you able to get an erection during sexual activity?	2 (6.3%)	14 (43.8%)	4 (12.5%)	5 (15.6%)	5 (15.6%)	2 (6.3%)
When you had erections with sexual stimulation, how often were your erections hard enough for penetration?	0	17 (53.1%)	4 (12.5%)	3 (9.4%)	7 (21.9%)	1 (3.1%)
When you attempted intercourse, how often were you able to penetrate (enter) your partner?	2 (6.3%)	15 (46.9%)	6 (18.8%)	1 (3.1%)	4 (12.5%)	4 (12.5%)
During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	2 (6.3%)	15 (46.9%)	5 (15.6%)	3 (9.4%)	6 (18.8%)	1(3.1%)
During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?	2 (6.3%)	3 (9.4%)	5 (15.6%)	7 (21.9%)	5 (15.6%)	10 (31.3%)
How do you rate your confidence that you could get and keep an erection?*	[redacted]	2 (6.3%)	11 (34.4%)	10 (31.3%)	8 (25%)	1 (3.1%)

Note: Data presented as percentage. 0 = no sexual activity/did not attempt intercourse, 1 = almost never or never, 2 = a few times, 3 = sometimes, 4 = most times, 5 almost always or always.* 1 = very low, 2 = low, 3 = moderate, 4 = high, 5 = very high

The levels of ED based on the demographic characteristics and health profiles are shown in Table 4. Only one participant who was younger than 40 years old has no ED issues. One third of participants between 40-59 years old and more than two thirds of elderly participants (more than 60 years old) experienced severe ED. More than half of those who had been diagnosed with DM for more than 11 years experienced severe ED. Interestingly, almost half of participants who had been diagnosed with DM for less than 5 years also experienced severe ED.

The percentage of severe ED between the participants who have controlled (less than 180 mg/dl) or uncontrolled (more than 180 mg/dl) blood glucose levels was comparable and accounted for approximately 50% of the participants. More than a third of those who had a history of smoking reported to have severe ED. Only one participant who still actively smoking reported severe ED. Two out of seven participants who bought over the counter ED

medication without medical prescription reported severe ED. Half of the participants who either have experience in receiving sexual counselling or had not reported having severe ED. Nearly half of the participants in all of the complications subgroups experienced severe ED.

Table 4. Levels of ED based on demographic characteristics and health profiles of participants (N=32)

Characteristics (n)	ED Levels				
	No	Mild	Mild-Moderate	Moderate	Severe
Age					
20 – 39 years (n=1)	1 (100%)	0	0	0	0
40 – 59 years (n=18)	2 (11.1%)	5 (27.8%)	1 (5.6%)	4 (22.2%)	6 (33.3%)
≥ 60 years (n=13)	0	0	1 (7.7%)	3 (23.1%)	9 (69.2%)
Duration of DM					
≤ 5 years (n=11)	1 (9.1%)	3 (27.3%)	1 (9.1%)	1 (9.1%)	5 (45.5%)
6 – 10 years (n=9)	1 (11.1%)	2 (22.2%)	0	3 (33.3%)	3 (33.3%)
≥ 11 years (n=12)	1 (8.3%)	0	1 (8.3%)	3 (25.0%)	7 (58.3%)
Random Blood Glucose					
≤ 180 mg/dl (n=12)	2 (16.7%)	1 (8.3%)	1 (8.3%)	2 (16.7%)	6 (50%)
> 180 mg/dl (n=20)	1 (5.0%)	4 (20.0%)	1 (5.0%)	5 (25.0%)	9 (45%)
Previous History of smoking					
No (n=10)	0	1 (10.0%)	0	2 (20.0%)	7 (70%)
Yes (n=22)	3 (13.6%)	4 (18.2%)	2 (9.1%)	5 (22.7%)	8 (36.4%)
Current Smoking status					
No (n=25)	1 (4.0%)	4 (16.0%)	1 (4.0%)	5 (20.0%)	14 (56.0%)
Yes (n=7)	2 (28.6%)	1 (14.3%)	1 (14.3%)	2 (28.6%)	1 (14.3%)
Consume store bought medication to treat ED					
No (n=25)	2 (8.0%)	3 (12.0%)	0	7 (28.0%)	13 (52.0%)
Yes (n=7)	1 (14.3%)	2 (28.6%)	2 (28.6%)	0	2 (28.6%)
Received sexual counselling					
No (n=28)	2 (7.1%)	5 (17.9%)	2 (7.1%)	6 (21.4%)	13 (46.4%)
Yes (n=4)	1 (25%)	0	0	1 (25%)	2 (50%)
Complications					
Hypertension (n=5)	0	1 (20.0%)	0	2 (40.0%)	2 (40.0%)
Dyslipidaemia (n=4)	2 (50.0%)	0	0	0	2 (50.0%)
Others (n=23)	1 (4.3%)	4 (17.4%)	2 (8.7%)	5 (21.7%)	11 (47.8%)
Occupation levels					
Mild (n=26)	2 (7.7%)	4 (15.4%)	2 (7.7%)	7 (26.9%)	11 (42.3%)
Moderate (n=3)	1 (33.3%)	0	0	0	2 (66.7%)
Hard (n=2)	0	0	0	0	2 (100%)
Very hard (n=1)	0	1 (100%)	0	0	0

Note: Data presented as percentage ED = erectile dysfunction.

DISCUSSION

This study revealed that majority (90.6%) of participants had experienced ED at various levels and that severe ED was common (46.9%) amongst the participants. This number is considered higher than those in previous studies conducted in Indonesia and overseas. A study conducted at an outpatient department of provincial hospital Bali among 34 people with type 2 DM have found that 61.8% of them had experienced ED, though the

levels of severity of ED were not reported (Sugiharso & Saraswati, 2016).

Another more recent study conducted in Manado amongst 38 participants with T2DM at endocrine polyclinic of tertiary hospital found that 89.5% of participants experienced ED and only four (10.5%) participants had severe ED (Panelewen et al., 2017). In North West Ethiopia, a study which involved 362 participants with T2DM in a diabetic clinic found that ED was found in 59.7% of participants and severe ED was found in 13.3% of participants (Mehiret et al., 2021). In Southern Ethiopia, the number was slightly higher where 72.2% of male with DM have experienced ED (Zeleke et al., 2021).

There are several factors that may explain the high number of ED amongst participants in this study. The first possible reason is the uncontrolled blood glucose level of participants. Previous studies have demonstrated the correlation between poor blood glucose control with the prevalence of ED amongst men with DM. Zeleke et al. (2021) found that the odds of developing ED among men with DM with fasting blood glucose (FBG) ≥ 126mg/dl was increased by 10.3 times as compared with FBG < 126 mg/dl. Another study found higher odds of ED among those with uncontrolled blood glucose where the odds of having ED was 15.26 times more likely to occurs among those with uncontrolled blood glucose (Mehiret et al., 2021). High blood glucose levels can cause vasculopathy including microangiopathy, macroangiopathy, and endothelial dysfunctions which subsequently cause ED among men with DM (Cannarella et al., 2021; Castela & Costa, 2016; Jumani & Patil, 2020; Maiorino et al., 2014). It is also believed that high blood glucose is responsible for the autonomic and peripheral neuropathy which can further contribute to DM induced ED because of the destruction of sensory impulses that occur during erection (Cannarella et al., 2021; Jumani & Patil, 2020; Maiorino et al., 2014).

The second possible factor is the long duration of DM. The odds of developing ED among men with DM for more than 10 years was 6.2 times higher than those with DM for less than 10 years (Mehiret et al., 2021). It has also been found that the odds of ED among those who have had DM for more than 10 years is 17.7 higher than those with DM for less than 5 years (Zeleke et al., 2021). Another study also estimated that each 1-year increment in duration of DM was associated with 10% higher risk of ED (Shiri et al., 2005). It is argued that these increased odds amongst people with long standing DM could be explained by increasing microvascular and macrovascular complications and neurogenic and vasogenic problems that mainly occur amongst people with long standing DM (Zeleke et al., 2021). In addition, sexual hormones imbalances such as low testosterone concentration which occurs in approximately a quarter of males with T2DM could also contribute to ED among men with long standing DM (Maiorino et al., 2014).

Aging is considered as another possible factor that can cause high percentage of ED among men with DM. Regardless of existing medical conditions, an epidemiological review study found that the prevalence of ED increased with age. The prevalence of ED was 1-10% for those below 40 years old, 2-15% for those between 40-49 years old, 20-40% for 60-69 years old age group, and 50-100% for those older than 70 years old (Lewis et al., 2010). Compared to those with age less than 25 years old, the odds of having ED for men with DM with an age of more than 55 years old is 3.2 times higher (Zeleke et al., 2021). A previous study estimated that every 1-year increment of patient age was associated with 12% of higher risk of ED (Shiri et al., 2005). Aging affects physical and morphological changes in the body which can lead to ED. Vascular alterations (e.g. vascular endothelium damages due to various processes in aging such as inflammation, pressure changes in the cavernosal space which manage the balance between a penis' erectile/flaccid states, and penile morphological changes (e.g. destruction of corpus covernosum tissue, decreasing collagen and elastic fibres) are pathological changes due to the normal aging process that decline ED (Ferrini et al., 2017; Tirado et al., 2016) as well as the testosterone deficiencies (Tirado et al., 2016).

Unhealthy lifestyles such as smoking may also contribute to the development of ED amongst men with T2DM in this study. Most of the participants in this study had a previous history of smoking and some of them still smoked. People who actively engage in smoking have higher risk of developing ED

between 1.4 - 3.1 times higher compared to those who do not smoke and the cumulative dose of the cigarettes consumed daily can predict the odds of developing ED (Kovac et al., 2015). Furthermore, the study also suggested that smoking cessation may increase erectile function although the study was only limited to younger group with low smoking history and rare comorbid conditions (Kovac et al., 2015). Other unhealthy behaviours such as physical inactivity and alcohol consumption can also increase the odds of having ED about three fold more than those who actively exercise and avoid alcohol (Mehiret et al., 2021). The adoption of more healthy lifestyles could potentially reduce the oxidative stress, endothelial dysfunction, and insulin resistance and improve the erectile function (Maiorino et al., 2014).

The last possible contributing factor is participants' existing medical conditions or DM complications. The prevalence of ED is higher amongst those with an underlying medical condition such as cardiovascular disease (hypertension and heart diseases), microalbuminuria, or pulmonary disease, although there was no statistically significant association between ED and microalbuminuria and pulmonary conditions (Shiri et al., 2005). Mehiret et al. (2021) found that hypertension increased the odds of ED by 3.59 times percent among men with DM. Another previous study found that men who have depression had a 10.7 times higher risk of developing ED compared to those without ED (Shiri et al., 2005). Furthermore, men with both depression and cardiovascular diseases have significant risk of ED with a 17.2 times higher chance of developing ED compared to men without depression and cardiovascular diseases (Shiri et al., 2005). It has also been argued that ED can predict the silent coronary artery diseases in men with DM, suggesting further screening for other comprehensive complications may be necessary amongst men with DM who have ED (Lewis et al., 2010; Maiorino et al., 2014).

As discussed earlier, nurses have an important role in providing holistic care for people with T2DM. The results of this study showed that majority of men with T2DM had never received sexual counselling despite having prevalent ED. These results should alert the nurses about the importance of assessing ED in men with DM. Early identification of these sexual issues could be beneficial for nurses so they may plan adequate intervention and treatments that could bring about better outcomes for their patient and their spouse. Utilising questionnaires such as IIEF, the sexual health inventory for man (SHIM), the brief male sexual function inventory, and the ED inventory for treatment satisfaction could overcome the embarrassment surrounding discussing ED (Bilal-Salim, 2019). Previous studies reported a lack of information and understanding about the impact of DM on sexual health amongst men with DM (Barnard-Kelly et al., 2019; Cooper et al., 2018). Therefore, it is imperative to increase the patient's knowledge and awareness about ED as a consequence of T2DM. Nurses may provide individual and/or group education with appropriate educational materials based on the patient's learning preferences and organise regular mass communication campaigns to promote awareness to the broader population (Bilal-Salim, 2019).

It is worth to note that this study only involved small sample size therefore findings were presented using descriptive statistics. However, this study used a translation process based on previous studies and found valid and reliable results. Thus, the Bahasa Indonesia version of the IIEF for ED domain in this study could be used for future studies in Indonesia.

CONCLUSION

This study found that ED and severe ED are common amongst men with T2DM. Considering the high number of participants who experienced ED, it is important for nurses to assess ED and overall sexual function routinely amongst men with T2DM. Early identification of ED could help the nurses to plan appropriate interventions and health education which could prevent psychological and emotional issues and increase quality of life amongst patients who experience ED. Further research is needed to assess the barriers of ED among men with T2DM based on the healthcare providers and develop related interventions to improve the ED and sexual problem assessment practices. It is also necessary to assess potential sexual problems amongst women who have T2DM since sexual issues do not only affect males. Future research should consider the rigour methodological approach to improve the validity of the research.

ACKNOWLEDGEMENT

The research teams thank to all participants and School of Nursing, Faculty of Medicine and Health

Sciences, Universitas Muhammadiyah Yogyakarta for partial funding of the research publication.

REFERENCES

Arianti, A. (2015). Hubungan antara perawatan kaki dengan risiko ulkus kaki diabetes di rumah sakit PKU Muhammadiyah Yogyakarta. *IJNP (Indonesian Journal of Nursing Practices); Vol 2, No 1: Muhammadiyah Journal of Nursing* https://journal.umy.ac.id/index.php/ijnp/article/view/665

Avasthi, A., Grover, S., Bhansali, A., Dash, R. J., Gupta, N., Sharan, P., & Sharma, S. (2011). Erectile dysfunction in diabetes mellitus contributes to poor quality of life. *International Review of Psychiatry*, *23*(1), 93-99. https://doi.org/10.3109/09540261.2010.545987

Bahar, A., Elyasi, F., Moosazadeh, M., Afradi, G., & Kashi, Z. (2020). Sexual dysfunction in men with type II diabetes. *Caspian J Intern Med*, *11*(3), 295-303. https://doi.org/10.22088/cjim.11.3.295

Barnard-Kelly, K., Meeking, D., Cummings, M., Reidy, C., Scibilia, R., Aldred, C., & Naranjo, D. (2019). Diabetes and male sexual health: An unmet challenge. *Practical Diabetes*, *36*(6), 201-206. https://doi.org/10.1002/pdi.2246

Bilal-Salim, A. (2019). The role of the practice nurse in assessing erectile dysfunction in men with type 2 diabetes. *Primary Health Care (2014+)*, *29*(2), 26-31. https://doi.org/10.7748/phc.2019.e1467

Cannarella, R., Barbagallo, F., Condorelli, R. A., Gusmano, C., Crafa, A., La Vignera, S., & Calogero, A. E. (2021). Erectile dysfunction in diabetic patients: From etiology to management. *Diabetology*, *2*(3), 157-164. https://doi.org/10.3390/diabetology2030014

Castela, Â., & Costa, C. (2016). Molecular mechanisms associated with diabetic endothelial–erectile dysfunction. *Nature Reviews Urology*, *13*(5), 266-274. https://doi.org/10.1038/nrurol.2016.23

Cholil, A. R., Lindarto, D., Pemayun, T. G. D., Wisnu, W., Kumala, P., & Puteri, H. H. S. (2019). DiabCare Asia 2012: Diabetes management, control, and complications in patients with type 2 diabetes in Indonesia. *Medical Journal of Indonesia*, *28*(1). https://doi.org/10.13181/mji.v28i1.2931

Cooper, S., Leon, N., Namadingo, H., Bobrow, K., & Farmer, A. J. (2018). "My wife's mistrust. That's the saddest part of being a diabetic": A qualitative study of sexual well-being in men with Type 2 diabetes in sub-Saharan Africa. *PloS one*, *13*(9), e0202413. https://doi.org/10.1371/journal.pone.0202413

Defeudis, G., Mazzilli, R., Tenuta, M., Rossini, G., Zamponi, V., Olana, S., Faggiano, A., Pozzilli, P., Isidori, A. M., & Gianfrilli, D. (2022). Erectile dysfunction and diabetes: A melting pot of circumstances and treatments. *Diabetes Metab Res Rev*, *38*(2), e3494. https://doi.org/10.1002/dmrr.3494

Ferrini, M. G., Gonzalez-Cadavid, N. F., & Rajfer, J. (2017). Aging related erectile dysfunction-potential mechanism to halt or delay its onset. *Translational andrology and urology*, *6*(1), 20-27. https://doi.org/10.21037/tau.2016.11.18

Haris, F., & Kristianti, L. Y. (2020). The Correlation between The Knowledge Level of Diabetes Management toward The Preprandial Glucose Levels. *IJNP (Indonesian Journal of Nursing Practices); Vol 4, No 1 (2020): Indonesian Journal Of Nursing PracticesDO - 10.18196/ijnp.41104*. https://doi.org/10.18196/ijnp.41104

Indonesian Endocrinologists Association. (2021). *Pedoman pengelolaan dan pencegahan diabetes melitus tipe 2 dewasa di Indonesia 2021 [Guideline in managing and preventing diabetes mellitus type 2 in adult population in Indonesia 2021]*. Indonesian Endocrinologists Association,. Retrieved 01/02/2023 from https://pbperkeni.or.id/wp-content/uploads/2021/11/22-10-21-Website-Pedoman-Pengelolaan-dan-Pencegahan-DMT2-Ebook.pdf

International Diabetes Federation. (2021). *IDF diabetes atlas 10th edition 2021*. Retrieved 28 Jan 2022 from https://diabetesatlas.org/idfawp/resource-files/2021/07/IDF_Atlas_10th_Edition_2021.pdf

Jelinek, H. F., Osman, W. M., Khandoker, A. H., Khalaf, K., Lee, S., Almahmeed, W., & Alsafar, H. S. (2017). Clinical profiles, comorbidities and complications of type 2 diabetes mellitus in patients from United Arab Emirates. *BMJ*

open diabetes research & care, *5*(1), e000427-e000427. https://doi.org/10.1136/bmjdrc-2017-000427

Jiann, B. P., Lu, C. C., Lam, H. C., Chu, C. H., Sun, C. C., & Lee, J. K. (2009). Patterns and their correlates of seeking treatment for erectile dysfunction in type 2 diabetic patients. *J Sex Med*, *6*(7), 2008-2016. https://doi.org/10.1111/j.1743-6109.2009.01264.x

Jumani, D. K., & Patil, O. (2020). Erectile dysfunction in diabetes mellitus: A review. *Journal of Diabetology*, *11*(1). https://doi.org/10.4103/jod.jod_42_18

Kim, H. Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restor Dent Endod*, *38*(1), 52-54. https://doi.org/10.5395/rde.2013.38.1.52

Kirkwood, B. R., & Sterne, J. A. C. (2003). *Essential medical statistics* (2nd Edition ed.). Blackwell publishing.

Kouidrat, Y., Pizzol, D., Cosco, T., Thompson, T., Carnaghi, M., Bertoldo, A., Solmi, M., Stubbs, B., & Veronese, N. (2017). High prevalence of erectile dysfunction in diabetes: a systematic review and meta-analysis of 145 studies. *Diabetic Medicine*, *34*(9), 1185-1192. https://doi.org/10.1111/dme.13403

Kovac, J. R., Labbate, C., Ramasamy, R., Tang, D., & Lipshultz, L. I. (2015). Effects of cigarette smoking on erectile dysfunction. *Andrologia*, *47*(10), 1087-1092. https://doi.org/10.1111/and.12393

Lewis, R. W., Fugl-Meyer, K. S., Corona, G., Hayes, R. D., Laumann, E. O., Moreira Jr, E. D., Rellini, A. H., & Segraves, T. (2010). ORIGINAL ARTICLES: Definitions/Epidemiology/Risk Factors for Sexual Dysfunction. *The Journal of Sexual Medicine*, *7*(4pt2), 1598-1607. https://doi.org/10.1111/j.1743-6109.2010.01778.x

Litwak, L., Goh, S.-Y., Hussein, Z., Malek, R., Prusty, V., & Khamseh, M. E. (2013). Prevalence of diabetes complications in people with type 2 diabetes mellitus and its association with baseline characteristics in the multinational A1chieve study. *Diabetology & Metabolic Syndrome*, *5*(1), 57. https://doi.org/10.1186/1758-5996-5-57

Liu, Q., Zhang, Y., Wang, J., Li, S., Cheng, Y., Guo, J., Tang, Y., Zeng, H., & Zhu, Z. (2018). Erectile dysfunction and depression: A systematic review and meta-analysis. *The Journal of Sexual Medicine*, *15*(8), 1073-1082. https://doi.org/https://doi.org/10.1016/j.jsxm.2018.05.016

Maiorino, M. I., Bellastella, G., & Esposito, K. (2014). Diabetes and sexual dysfunction: current perspectives. *Diabetes, metabolic syndrome and obesity : targets and therapy*, *7*, 95-105. https://doi.org/10.2147/DMSO.S36455

Malavige, L. S., Jayaratne, S. D., Kathriarachchi, S. T., Sivayogan, S., Ranasinghe, P., & Levy, J. C. (2014). Erectile dysfunction is a strong predictor of poor quality of life in men with Type 2 diabetes mellitus. *Diabetic Medicine*, *31*(6), 699-706. https://doi.org/10.1111/dme.12412

Mehiret, G., Dersie, B., & Yalgaw, L. (2021). Magnitude and factors contributing to erectile dysfunction among diabetic men attending the diabetic clinic at debre tabor comprehensive and specialized, hospital in North West, Ethiopia 2020, institutional based cross-sectional study. *Journal of Diabetes Mellitus*, *11*(3), 62-69. https://doi.org/10.4236/jdm.2021.113006.

Ministry of Health of the Republic of Indonesia. (2018). National Report of Basic Health Research 2018. https://dinkes.kalbarprov.go.id/wp-content/uploads/2019/03/Laporan-Riskesdas-2018-Nasional.pdf

Nursalam. (2016). *Metodologi penelitian ilmu keperawatan: Pendekatan praktis* (4th ed.). Salemba Medika.

Omar, S. M., Musa, I. R., Idrees, M. B., Abdelbagi, O., & Adam, I. (2022). Prevalence and associated factors of erectile dysfunction in men with type 2 diabetes mellitus in eastern Sudan. *BMC endocrine disorders*, *22*(1), 141. https://doi.org/10.1186/s12902-022-01060-0

Panelewen, R., M, R. J., & Satiawati, L. (2017). Hubungan usia penyandang diabetes melitus tipe 2 dan disfungsi ereksi. *e-Biomedik*, *5*(2), 1-5. https://doi.org/https://doi.org/10.35790/ebm.v5i2.17513

Papatheodorou, K., Banach, M., Bekiari, E., Rizzo, M., & Edmonds, M. (2018). Complications of diabetes 2017. *Journal of Diabetes Research*, *2018*, 3086167. https://doi.org/10.1155/2018/3086167

Penson, D. F., Latini, D. M., Lubeck, D. P., Wallace, K. L., Henning, J. M., & Lue, T. F. (2003). Do impotent men with diabetes have more severe erectile dysfunction and worse quality of life than the general population of impotent patients? *Diabetes Care*, *26*(4), 1093. https://doi.org/10.2337/diacare.26.4.1093

Polit, D. F., & Beck, C. T. (2018). *Essentials of nursing research: Appraising evidence for nursing practice* (9th ed.). Wolter Kluwer.

Pranata, S., Nugroho, K. H., & Untung, S. (2016). The effect of transcutaneous electrical nerve stimulation (TENS) towards pain level of patients with diabetes mellitus (DM) with peripheral neuropathy in diabetic foot ulcer treatment in Yogyakarta General Hospital Indonesia. *IOSR Journal of Nursing and Health Science*, *5*(5), 76-80. https://doi.org/10.9790/1959-0505037680

Primanda, Y., Kritpracha, C., & Thaniwattananon, P. (2011). Dietary Behaviors among Patients with Type 2 Diabetes Mellitus in Yogyakarta, Indonesia. *Nurse Media Journal of Nursing; Vol 1, No 2 (2011): (DECEMBER 2011)DO - 10.14710/nmjn.v1i2.975*. https://ejournal.undip.ac.id/index.php/medianers/article/view/975

Primanda, Y., Putra, P. B., Soleman, S. R., & Arba, W. M. (2017). The effect of the foot care education program onknowledge and self-efficacy among family of diabetes mellitus patients in PKU MuhammadiyahGamping Yogyakarta Indonesia. *Advanced Science Letters*, *23*(12), 12619–12622. https://doi.org/https://doi.org/10.1166/asl.2017.10830

Putranto, D., & Primanda, Y. (2019). Effects of fasting on every monday and thursday to cholesterol levels of patients with type 2 diabetes mellitus. The Third International Conference on Sustainable Innovation 2019 – Health Science and Nursing (IcoSIHSN 2019), Yogyakarta, Indonesia.

Rias, Y. A. (2016). Hubungan pengetahuan dan keyakinan dengan efikasi diri penyandang diabetic foot ulcer. *Jurnal Keperawatan Muhammadiyah*, *1*(1), 13-17. http://103.114.35.30/index.php/JKM/article/view/RA

Rias, Y. A., Rosa, E. M., & Yuniarti, F. A. (2016). Pengembangan Model Konservasi Discharge Planning Terstruktur Terhadap Individual And Family Self Management Diabetic Foot Ulcer. *Indonesian Journal of Nursing Practices*, *3*(1), 1-27. https://journal.umy.ac.id/index.php/ijnp/article/view/2218

Rosen, R. C., Cappelleri, J. C., & Gendrano, N. (2002). The International Index of Erectile Function (IIEF): A state-of-the-science review. *International Journal of Impotence Research*, *14*(4), 226-244. https://doi.org/10.1038/sj.ijir.3900857

Rowland, D. L. (2011). Psychological impact of premature ejaculation and barriers to its recognition and treatment. *Current Medical Research and Opinion*, *27*(8), 1509-1518. https://doi.org/10.1185/03007995.2011.590968

Rutte, A., Welschen, L. M. C., van Splunter, M. M. I., Schalkwijk, A. A. H., de Vries, L., Snoek, F. J., Enzlin, P., Nijpels, G., & Elders, P. J. M. (2016). Type 2 diabetes patients' needs and preferences for care concerning sexual problems: A cross-sectional survey and qualitative interviews. *Journal of Sex & Marital Therapy*, *42*(4), 324-337. https://doi.org/10.1080/0092623X.2015.1033578

Santosa, A., & Rosa, E. M. (2014). Efektivitas lokasi dan waktu injeksi insulin terhadap pengendalian kadar gula darah 2 jam setelah makan pada penderita diabetes melitus. *IJNP (Indonesian Journal of Nursing Practices); Vol 1, No 2 (2015): Muhammadiyah Journal of NursingDO - 10.18196/ijnp.v1i2.653*. https://journal.umy.ac.id/index.php/ijnp/article/view/653/810

Shiri, R., Hakama, M., Häkkinen, J., Tammela, T. L. J., Auvinen, A., & Koskimäki, J. (2005). Relationship between smoking and erectile dysfunction. *International Journal of Impotence Research*, *17*(2), 164-169. https://doi.org/10.1038/sj.ijir.3901280

Sugiharso, M. A., & Saraswati, M. R. (2016). hubungan disfungsi ereksi pada penderita diabetes melitus tipe 2 terhadap kualitas hidup di poliklinik penyakit dalam RSUP Sanglah Provinsi Bali. *E-Jurnal Medika*, *5*(6), 1-8.

https://ojs.unud.ac.id/index.php/eum/article/download/21109/13885

Susanti, E. (2014). Pengaruh Latihan Pasrah Diri Terhadap Tingkat Stres dan Kadar Gula Darah pada Pasien Diabetes Melitus Tipe 2 di Rumah Sakit PKU Muhammadiyah Yogyakarta. *IJNP (Indonesian Journal of Nursing Practices); Vol 1, No 1 (2014): Muhammadiyah Journal of NursingDO - 10.18196/ijnp.v1i1.646*. https://journal.umy.ac.id/index.php/ijnp/article/view/646

Thongtang, P., Fongkaew, W., Sansiriphun, N., & Chaloumsuk, N. (2021). My thing is dead: Experience of dealing with diabetic erectile dysfunction of Northern Thai men. *Pacific Rim International Journal of Nursing Research*, *25*(2), 255-268. https://he02.tci-thaijo.org/index.php/PRIJNR/article/view/242420

Tirado, E. L. C., Ferrer, J. E., & Herrera, A. M. (2016). Aging and Erectile Dysfunction. *Sexual Medicine Reviews*, *4*(1), 63-73. https://doi.org/https://doi.org/10.1016/j.sxmr.2015.10.011

Verschuren, J. E. A., Enzlin, P., Dijkstra, P. U., Geertzen, J. H. B., & Dekker, R. (2010). Chronic disease and sexuality: A generic conceptual framework. *The Journal of Sex Research*, *47*(2-3), 153-170. https://doi.org/10.1080/00224491003658227

Wardaningsih, S., & Widyaningrum, D. P. (2019). Pengaruh Intervensi Doa dan Dzikir Al-Ma'tsurat terhadap Skor Depresi pada Pasien Diabetes Melitus di Puskesmas Mlati 1. *IJNP (Indonesian Journal of Nursing Practices); Vol 2, No 2 (2018): Indonesian Journal Of Nursing PracticesDO - 10.18196/ijnp.2179*. https://journal.umy.ac.id/index.php/ijnp/article/view/3481

Warsono, W., & Permana, I. (2017). Gambaran pasien diabetes mellitus dengan disfungsi ereksi. *Care : Jurnal Ilmiah Ilmu Kesehatan; Vol 5, No 2 (2017)DO - 10.33366/cr.v5i2.534*. https://jurnal.unitri.ac.id/index.php/care/article/view/534

Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A., & Erikson, P. (2005). Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value in Health*, *8*(2), 94-104. https://doi.org/10.1111/j.1524-4733.2005.04054.x

Windasari, N. N. (2015). Pendidikan kesehatan dalam meningkatkan kepatuhan merawat kaki pada pasien diabetes mellitus tipe II. *IJNP (Indonesian Journal of Nursing Practices); Vol 2, No 1 (2015): Muhammadiyah Journal of NursingDO - 10.18196/ijnp.v2i1.670*. https://journal.umy.ac.id/index.php/ijnp/article/view/670

Zeleke, M., Hailu, D., & Daka, D. (2021). Erectile dysfunction and associated factors among diabetic patients at, Hawassa, Southern, Ethiopia. *BMC endocrine disorders*, *21*(1), 139. https://doi.org/10.1186/s12902-021-00807-5