

# Prevalence and Associated Factors of Erectile Dysfunction among Diabetic Patients Attending Primary Health Care Settings in Ismailia Governorate

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## Abstract

**Background:** Erectile dysfunction is widespread among men with diabetes and can affect all aspects of their life including physical, emotional, social, sexual, and relationships. In Egypt, there are limited studies on this health problem in primary healthcare patients. **Aim:** This study was carried out to assess the prevalence and associated factors of erectile dysfunction among diabetic primary care patients in Ismailia governorate. **Patients and Methods:** This cross-sectional study included 420 diabetic patients and was conducted in primary healthcare settings in the Ismailia governorate affiliated with the General Authority of Healthcare from April 2021 to April 2022. All participants were interviewed. Sociodemographic data, diabetes characteristics, lifestyle, surgical and sexual history, the Arabic translations of the abridged 5-item version of the International Index of Erectile Function (IIEF-5) Questionnaire, and the 5-item World Health Organization Well-Being Index (WHO-5) were collected. **Results:** Overall, 68.6% of patients had erectile dysfunction classified as mild (27%), mild-to-moderate (23.8%), moderate, (13.4%), and severe dysfunctions (4.4%). Erectile dysfunction had significant and positive associations with rising age (odds ratio [OR] 1.088,  $P=0.001$ ), not working (OR 0.207,  $P=0.016$ ), current smoking (OR 5.510,  $P<0.001$ ), having retinopathy (OR 3.862,  $P=0.019$ ), suboptimal glycemic control (OR 0.214,  $P=0.035$ ), hypertension (OR 4.683,  $P<0.001$ ), increased body mass index (OR 1.139,  $P=0.033$ ), and lower well-being score (OR 0.698,  $P<0.001$ ). **Conclusion:** Erectile dysfunction is prevalent among diabetic primary care men, and its assessment and management are needed during caring for diabetic PHC patients.

**Keywords:** Diabetes mellitus, Erectile dysfunction, Primary care.

## Introduction

Diabetes mellitus (DM) is a common chronic illness. The global prevalence is 9.8% in adults 20-79 years. It affects 20.9%

of Egyptian adults. It is associated with significant morbidity and mortality<sup>(1)</sup>. Male sexual dysfunctions are a significant complication of DM including erectile dysfunction (ED), the commonest, ejaculatory dysfunction, and loss of libido<sup>(2)</sup>. ED is defined

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as the consistent or recurrent inability to attain and/or maintain penile erection sufficient for sexual satisfaction<sup>(3)</sup>. Diabetes is an independent risk factor for ED; men with DM have a 3-fold increased risk for the development of ED compared with nondiabetics. ED occurs at an earlier age in men with DM than in those without it and it may be the first symptom of undiagnosed<sup>(4)</sup>. The prevalence of ED among diabetic men ranged from 35% to 90%<sup>(5)</sup>. A systematic review revealed that the overall prevalence of ED in DM was 52.5%<sup>(6)</sup>. In Arab region countries, the prevalence of ED ranged from 20% to 90% among patients with different risk factors and medical comorbidities<sup>(7)</sup>. ED was very prevalent among diabetic primary health care (PHC) patients in Arab region countries. The estimated prevalence of ED among diabetic PHC patients was 81.9% in Bahrain<sup>(8)</sup>, 82% in Morocco<sup>(9)</sup>, and 83% in Saudi<sup>(10)</sup>. In Egypt, the prevalence of ED was 23.6% among males in Ismailia<sup>(11)</sup>, and 5,4.7% among men with type 2 DM (T2DM) attending the andrology clinic at the Alexandria University Hospital<sup>(12)</sup>. A recent Egyptian study found the estimate of ED was 80% among T2DM patients attending the diabetes clinic at Alexandria University Hospital<sup>(13)</sup>. However, an older study demonstrated that 63% of males attending PHC centers in Cairo had ED<sup>(14)</sup>. The pathogenesis of ED in diabetes is multifactorial. The proposed mechanisms of ED in diabetic patients are represented by vasculopathy (micro and macrovascular arterial disease), neuropathy, visceral adiposity, insulin resistance, hypogonadism, psychogenic components, and drug side effects<sup>(6,7,15-17)</sup>. ED in men with DM was positively associated with depressive symptoms<sup>(6)</sup> and was a strong predictor of lower quality of life<sup>(18)</sup>. Therefore, early detection of ED is essential to improve the psychological health and quality of life of men with DM<sup>(6)</sup>. ED is associated with higher cardiovascular risk in diabetic

men<sup>(6)</sup>. The risk of total cardiovascular disease, coronary heart disease, stroke, and all-cause mortality was significantly increased in men with ED<sup>(19)</sup>. ED itself is a cardiovascular risk factor in addition to its other risk factors, which are very similar to the established cardiovascular risk factors. It can predict future cardiovascular events, occurring 3-5 years before an event<sup>(20)</sup>. Despite the burden of ED among diabetic patients, studies into this issue among PHC attendants with DM seem to be limited in Egypt, so this research was conducted to investigate the prevalence and associated factors of ED among patients with DM attending PHC settings in the Ismailia governorate.

## Patients and Methods

### *Design, setting, and sampling*

A cross-sectional study was conducted in PHC settings in the Ismailia governorate affiliated with the General Authority for Healthcare. Two rural and two urban PHC settings were selected randomly. The study included married males with either type 1 or type 2 DM, aged 20 years or more, and diagnosed with DM for at least one year. We excluded diabetic males who were seriously ill during data collection and had a record of renal failure, hepatic impairment, severe depression, or dementia that interfered with communication comprehension questions and had visual and hearing impairment that interfered with communication or self-reporting. Multi-stage random cluster sampling technique was employed in the 4 PHC settings. Relative equal distribution of numbers of persons within each PHC center/unit was maintained. The sample size was calculated using the following formula<sup>(21)</sup>:

$$n = \left[ \frac{Z_{\alpha/2}}{E} \right]^2 * P(1 - P)$$

n = sample size,  $Z_{\alpha/2} = 1.96$  (The critical value that divides the central 95% of the Z

distribution from the 5% in the tail),  $P =$  Prevalence of ED among diabetic patients = 54.7%<sup>(12)</sup>,  $E =$  Margin of error/Width of confidence interval = 5%, So, by calculation, the sample size was equal to 380 subjects. After adding 10% non-response, it was 420 participants.

#### *Tools of the study*

Data was taken from April 2021 to April 2022. All participants were interviewed, and their medical records were revised. Data collected by using a questionnaire, which is included the following: Sociodemographic data, diabetes characteristics, lifestyle, surgical, and sexual history, the Arabic translation of the abridged 5-item version of the International Index of Erectile Function (IIEF-5) Questionnaire, and the 5-item World Health Organization Well-Being Index (WHO-5). Demographic data included age, marital status, educational level, employment status, and income. Disease profile included duration of DM (years), co-morbidities (e.g. hypertension, dyslipidemia, benign prostate hyperplasia, and premature ejaculation), diabetes-related complications (microvascular and macrovascular complications e.g. stroke, coronary artery disease, and peripheral arterial diseases), current diabetes medications, family history of DM and lifestyle (smoking status, alcohol intake, history of substance or drug-abuse and physical activity). Surgical and sexual history included a diagnosis of ED and its treatment, diagnosis of premature ejaculation and its treatment, prostate problems and its treatment, and the number of sexual episodes per week. The abridged IIEF-5 Questionnaire is a brief, reliable, and valid tool to diagnose the presence and severity of ED. It is also called the Sexual Health Inventory for Men (SHIM) questionnaire. It is an abridged five-item version of the 15-item IIEF and is a five-item scale in which each item is scored from 0 to 5 on four items and

1-5 on one item. It includes items on maintenance ability, erection confidence, maintenance frequency, erection firmness, and a single item on intercourse satisfaction<sup>(22)</sup>. The cutoff score of 21 discriminated best ED (sensitivity 0.98, specificity 0.88). ED was classified into five severity levels, ranging from none (22–25), mild (17–21), mild-to-moderate ED (12–16), moderate ED (8–11), and severe (5–7)<sup>(22)</sup>. The Arabic version of the SHIM was proved to be a valid and reliable tool, the internal consistency was 0.91<sup>(23)</sup>. The WHO-5 is among the most widely used questionnaires assessing subjective psychological well-being and it has adequate validity and reliability as a screening tool for depression. This scale was originally presented at a WHO meeting in Stockholm in Feb. 1998 as part of a project on the measurement of well-being in PHC patients<sup>(24)</sup>. It was derived from the WHO-10<sup>(25)</sup>. The WHO-5 only contains positively phrased items during the last 2 weeks, and it is a 6-point Likert-type scale ranging from 0 (not present) to 5 (constantly present). Item scores are summated and transformed to a 0–100 scale, multiplying the raw score by 4<sup>(26)</sup>. A valid and reliable Arabic version of WHO-5 was developed for Lebanon's elderly population. The internal consistency was good, the Cronbach's alpha coefficient was 0.877. The cutoff value <13 produced maximal agreement with the clinical diagnosis (Kappa = 0.61)<sup>(27)</sup>. Weight, height, waist circumference, and blood pressure were measured, while BMI was calculated. The most recent glycated hemoglobin (HbA1c) and lipid profiles were checked in patients' records. HbA1c values <7% and 7.5% were used to identify adult and older adult patients with good glyce-mic control, respectively<sup>(28)</sup>.

#### **Statistical Analysis**

The Statistical Package for the Social Sci-

ences (SPSS), version 26.0 (IBM Corporation, NY, USA) was used to perform all data management and analyses. All categorical variables were summarized as frequencies and percentages (%). The distributions of continuous variables were tested for normality with the Shapiro-Wilk test. The median and interquartile ranges were used for the not-normally distribution variables.

The chi-squared or Fisher exact tests as appropriate were used to compare categorical data. Mann-Whitney test was used to compare quantitative data with dichotomous variables. Bivalent regression analysis was used to assess the predictors of ED. A significance level of 0.05 was used in all statistical analyses.

<b>Table 1. Association of erectile dysfunction with socio-demographic characteristics and lifestyle among the study participants</b>				
<b>Variables</b>	<b>Erectile dysfunction</b>		<b>Test value</b>	<b>p-value</b>
	<b>Absent (n=132)</b>	<b>Present (n=288)</b>		
<b>Age (years)</b>				
<60 years	132 (100%)	194 (67.4%)	55.51 <sup>a</sup>	<0.001*
≥60 years	0 (0%)	94 (32.6%)		
<b>Educational level</b>				
Illiterate	12 (9.1%)	75 (26.0%)	17.16 <sup>a</sup>	0.001*
Less than secondary education	54 (40.9%)	107 (37.9%)		
Secondary education	50 (37.9%)	80 (27.8%)		
University and above	16 (12.1%)	24 (8.3%)		
<b>Occupation</b>				
Non-worker	7 (5.3%)	72 (25.0%)	23.06 <sup>a</sup>	<0.001*
Manual worker/Trades	110 (33.3%)	192 (66.7%)		
Semi-professional/ Professional	15 (11.3%)	24 (8.3%)		
<b>Income</b>				
Not Sufficient	85 (64.4%)	211 (73.3%)	3.423 <sup>a</sup>	0.064
Sufficient	47 (35.6%)	77 (26.7%)		
<b>Smoking</b>				
Current smoker	31 (23.5%)	105 (36.5%)	8.45 <sup>a</sup>	0.015*
Ex-smoker	31 (23.5%)	69 (24.0%)		
Never smoke	70 (53.0%)	114 (39.6%)		
<b>Physical activity,</b>				
Active	38 (28.8%)	27 (9.4%)	26.08 <sup>a</sup>	<0.001*
Inactive	94 (71.2%)	261 (90.6%)		
<b>History of substance or drug abuse,</b>	20 (15.2%)	48 (16.7%)	0.15 <sup>a</sup>	0.696
<b>Sexual intercourse per week, Median (IQR)</b>	2 (2-3)	1 (0-1)	5235.5 <sup>b</sup>	<0.001*

<sup>a</sup>. Chi-square test, <sup>b</sup>. Mann-Whitney test. \*. Data are presented as n (%), Statistically significant p-value at p <0.05

## Results

The mean age of the participants was 49.2 ± 11.5 years and 77.6% were below 60 years old. About 39% of the participants were illiterate or read-and-write, while only 9.5% were highly educated. About 19% of the participants were not working, while two-thirds were working in manual unskilled or skilled jobs, 5.2% working in trading and 9.3% were professionals or semi-professionals. Most of the participants had limited financial resources, with 70.3% of them having insufficient or hardly sufficient income. About one-third of the participants were current smokers while 23.8% were ex-smokers. The majority of the participants were physically inactive (84.5%) and had no history of substance or drug abuse (83.8%). The median coitus frequency among the participants was twice per week, with 59.2% of them having 1-2 coitus per week. Overall, 68.6% of patients had ED classified as mild, mild-to-moderate, moderate, and severe dysfunctions (27%, 23.8%, 13.4%, and 4.4%, respectively). Only 29 participants (10.1%) received phosphodiesterase type 5 (PDE5) inhibitors for treating ED. **Table 1** demonstrates that ED was significantly associated with older age ( $p < 0.001$ ), low education ( $p = 0.001$ ), and non-working ( $p < 0.001$ ). ED was more frequent among physically inactive patients ( $p = 0.015$ ) and current smokers ( $p < 0.001$ ). **Table 2** shows that ED was significantly more frequent among patients with T2DM ( $p = 0.014$ ), longer duration of diabetes ( $p < 0.001$ ), existing diabetes-related complications e.g. retinopathy ( $p < 0.001$ ), nephropathy ( $p < 0.001$ ), peripheral neuropathy ( $p < 0.001$ ), stroke ( $p = 0.012$ ), coronary artery disease ( $p < 0.001$ ), and peripheral arterial disease ( $p < 0.001$ ), presence of comorbidities e.g. hypertension ( $p < 0.001$ ), dyslipidemia ( $p < 0.001$ ), benign prostate

hyperplasia ( $p < 0.001$ ), and premature ejaculation ( $p < 0.001$ ), patients on oral hypoglycemic agents ( $p = 0.044$ ), positive family history of diabetes ( $p = 0.016$ ), and poor glycaemic control ( $p < 0.001$ ). Patients with ED had significantly higher levels of BMI, waist circumference, systolic and diastolic blood pressure, total cholesterol, low-density lipoprotein (LDL), and triglyceride (TG), but lower high-density lipoprotein (HDL), compared to patients without ED ( $p < 0.001$ ). All patients who reported poor well-being had ED ( $p < 0.001$ ). Binary logistic regression analysis in **table 3** shows that ED was positively and significantly associated with increased age (OR 1.088,  $P = 0.001$ ), current smoking (OR 5.510,  $P < 0.001$ ), having retinopathy (OR 3.862,  $P = 0.019$ ), being hypertensive patient (OR 4.683,  $P < 0.001$ ), increased BMI (OR 1.139,  $P = 0.033$ ). However, ED had significant and negative associations with being working (OR 0.207,  $P = 0.016$ ), optimizing glycaemic control (OR 0.214,  $P = 0.035$ ), and having higher well-being scores (OR 0.698,  $P < 0.001$ ). The participants who had atherosclerosis cardiovascular disease (CVD) had more prevalence of ED compared with participants without CVD, but there was no clinical significance (OR 1.632,  $P = 0.644$ ).

## Discussion

This study found that the prevalence rate of ED was 68.6% among diabetic patients attending PHC settings in the Ismailia governorate. ED was associated with increased age, non-working status, current smoking, retinopathy, poor glycaemic control, hypertension, higher BMI, and poor well-being scores. The high prevalence rate of ED in this study is similar to previous studies<sup>(6,29-31)</sup>. Previous studies found that the prevalence estimates of ED were less or slightly less than our finding, in

which the prevalence ranged from 23.6% to 63.6%<sup>(11,12,14,32,33,34)</sup>. However, other studies reported higher prevalence estimates of ED (80% to 85.5%)<sup>(8,9,10,13,35)</sup>.

Table 2. Association of erectile dysfunction with disease characteristics among the study participants.				
Variables	Erectile dysfunction		Test value	p-value
	Absent (n=132)	Present (n=288)		
<b>Type of diabetes</b>				
Type 1 diabetes	6 (4.5%)	2 (0.7%)	ND <sup>f</sup>	<b>0.014*</b>
Type 2 diabetes	126 (95.5%)	286 (99.3%)		
<b>Duration of diabetes</b>				
< 5 years	79 (59.8%)	45 (15.6%)	90.34 <sup>a</sup>	<b>&lt;0.001*</b>
5-10 years	32 (24.2%)	96 (33.3%)		
> 10 years	21 (15.9%)	147 (51.0%)		
<b>Diabetes-related complications</b>				
Retinopathy	7 (5.3%)	162 (56.3%)	97.70 <sup>a</sup>	<b>&lt;0.001*</b>
Nephropathy	3 (2.3%)	71 (24.7%)	31.23 <sup>a</sup>	<b>&lt;0.001*</b>
Peripheral neuropathy	10 (7.6%)	101 (35.1%)	35.19 <sup>a</sup>	<b>&lt;0.001*</b>
Lower circulatory insufficiency	6 (4.5%)	88 (30.6%)	35.25 <sup>a</sup>	<b>&lt;0.001*</b>
Stroke	0 (0.0%)	13 (4.5%)	ND <sup>f</sup>	<b>0.012*</b>
Coronary artery disease	0 (0.0%)	36 (12.5%)	18.05 <sup>a</sup>	<b>&lt;0.001*</b>
<b>Associated comorbidities</b>				
Hypertension	18 (13.6%)	184 (63.9%)	91.56 <sup>a</sup>	<b>&lt;0.001*</b>
Dyslipidemia	33 (25.0%)	193 (67.0%)	64.28 <sup>a</sup>	<b>&lt;0.001*</b>
Benign prostate hyperplasia	0 (0.0%)	40 (13.9%)	20.26 <sup>a</sup>	<b>&lt;0.001*</b>
Premature ejaculation	14 (10.6%)	226 (78.5%)	170.23 <sup>a</sup>	<b>&lt;0.001*</b>
<b>Antidiabetic medication</b>				
None	2 (1.5%)	0 (0.0%)	5.46 <sup>f</sup>	<b>0.044*</b>
Oral hypoglycemic agents	84 (63.6%)	205 (71.2%)		
Insulin alone or combined	46 (34.8%)	83 (28.8%)		
<b>Family history of diabetes</b>				
Positive	66 (50.0%)	180 (62.5%)	5.83 <sup>a</sup>	<b>0.016*</b>
Negative	66 (50.0%)	108 (37.5%)		
<b>Glycemic control</b>				
Good	31 (23.5%)	4 (1.4%)	57.85 <sup>a</sup>	<b>&lt;0.001*</b>
Poor	101 (76.5%)	284 (98.6%)		
<b>HbA1c (%), Median (IQR)</b>	7.60 (7-8)	8.60 (8-9.05)	6205 <sup>b</sup>	<b>&lt;0.001*</b>
<b>BMI (kg/m<sup>2</sup>), Median (IQR)</b>	27.3 (24.4-29.6)	29.07 (27.3-32.05)	12795.5 <sup>b</sup>	<b>&lt;0.001*</b>
Normal	29 (22.0%)	42 (14.6%)	14.81 <sup>a</sup>	<b>0.001*</b>
Overweight	79 (59.8%)	141 (49.0%)		
Obesity	24 (18.2%)	105 (36.5%)		
<b>Central obesity</b>				
Present	84 (63.6%)	212 (73.6%)	4.33 <sup>a</sup>	<b>0.037*</b>
Absent	48 (36.4%)	76 (26.4%)		
<b>Subjective well-being</b>				
Good (WHO-5 $\geq$ 50)	132 (100.0%)	208 (72.2%)	45.29 <sup>a</sup>	<b>&lt;0.001*</b>
Poor (WHO-5 < 50)	0 (0.0%)	80 (27.8%)		

Data are presented as n (%), BMI, body mass index; DBP, diastolic blood pressure; HbA1c, glycated hemoglobin; HDL, high-density lipoprotein; IQR, interquartile range; LDL, low-density lipoprotein; SBP, systolic blood pressure; TG, triglyceride; WHO-5, the 5-item World Health Organization Well-Being Index. <sup>a</sup>. Chi-square test, <sup>b</sup>. Mann-Whitney test, \*. Statistically significant  $p < 0.05$ .



In our study, the participants had mild (27%), mild-to-moderate (23.8%), moderate (13.4%), and severe ED (4.4%). Seid et al. showed that 32.9% suffered from mild, 31.7% moderate, and 5.2% severe ED<sup>(31)</sup>, while Goyal et al. demonstrated that most of the participants had mild ED (37%), moderate ED (26.1%), and severe ED

(14%)<sup>(36)</sup>. These discrepancies in the prevalence of ED might be due to differences in methods for assessing ED, the participants' characteristics, and the sample size. Periodic assessment of ED should form part of routine diabetes care in Egypt for early detection of this prevalent health problem.

Table 3. Predictors of erectile dysfunction among the study participants (n= 420)				
Variables	P-value	OR	95% C.I for OR	
			Lower	Upper
Age (years)	0.001*	1.088	1.034	1.144
Education (Reference category = illiterate)	0.966	1.025	0.322	3.270
Occupation (Reference category = not working)	0.016*	0.207	0.057	0.748
Income (Reference category = insufficient income)	0.607	0.796	0.335	1.895
Smoking (Reference category = nonsmoker currently)	<0.001*	5.510	2.442	12.430
Regular physical activity (Reference category = inactive)	0.882	0.929	0.352	2.454
Type of diabetes (Reference category = type 1 diabetes)	0.552	0.472	0.040	5.619
Diabetes duration (years)	0.701	1.020	0.921	1.130
Retinopathy (Reference category = absent)	0.019*	3.862	1.254	11.900
Nephropathy (Reference category = absent)	0.355	0.341	0.035	3.337
Peripheral neuropathy (Reference category = absent)	0.800	1.233	0.244	6.235
Established CVD (Reference category = absent)	0.644	1.632	0.205	13.020
Family history of diabetes (Reference category = absent)	0.306	1.447	0.713	2.939
Glycemic control (Reference category = poor)	0.035*	0.214	0.051	0.898
Hypertension (Reference category = absent)	<0.001*	4.683	2.057	10.662
Dyslipidemia (Reference category = absent)	0.801	1.110	0.493	2.497
Body mass index (Kg/m <sup>2</sup> )	0.033*	1.139	1.011	1.283
5-item World Health Organization total score	<0.001*	0.698	0.601	0.811

OR: Odds ratio, CI: Confidence interval, CVD: Cardiovascular disease.

Binary logistic regression model: Omnibus Tests for Model fit ( $p < 0.001$ ),

Cox & Snell R Square = 0.503; Nagelkerke R Square = 0.706; Overall correct classification = 86.4%

Dependent Variable: (Erectile dysfunction), \*. Statistically significant  $p < 0.05$

Family physicians are advised to do their best to be close to their patients to be able to communicate openly with them about this sensitive issue. We found that ED was significantly associated with increased age. Similar findings had been found in previous studies<sup>(6,10,13,16,33,37-39)</sup>. These findings might be related to increased age as a risk factor for atherosclerosis and the development of subsequent ED. In our study, the bivariate analysis showed that ED had statistically significant associations with low education and non-working status. ED was significantly associated with only non-working status

after multivariate analysis. Unworked participants may suffer from psychological burdens which may hurt their sexual potency. AlMogbel et al. found that there was a high relationship between retired and unemployed patients and ED in comparison to the employees. Moreover, completing secondary education or higher had the least relationship with ED<sup>(10)</sup>. However, Langer et al. showed that ED was not significantly associated with education, occupation, and family income<sup>(40)</sup>. ED was notably more frequent among current smokers than non-smokers and this was statistically significant in

our study. Previous studies demonstrated that ED was significantly associated with smoking<sup>(6,37)</sup>, however, another study found that smoking was not a significant risk factor for ED<sup>(41)</sup>. We found that ED was less frequent among physically active patients. This is in line with previous studies which demonstrated that regular performing of physical activity showed a protective effect against ED<sup>(16)</sup>, and ED was significantly associated with sedentary life<sup>(6)</sup>. Moreover, Silva et al. showed that moderate-to-vigorous physical activity improved patient-reported ED<sup>(42)</sup>. Family physicians should advise diabetic patients to stop smoking and perform regular physical activity aiming to prevent ED. Our results showed that ED was significantly associated with a longer duration of diabetes but, this significant association was lost after multivariate analysis. The longer duration of diabetes was significantly related to ED in previous studies<sup>(16,33,37)</sup>, while another study found that the duration of diabetes was not associated with ED<sup>(43)</sup>. A longitudinal study is needed to investigate this relationship among males with newly diagnosed diabetes in primary care. This study demonstrated that ED was significantly associated with the presence of microvascular complications in bivariate analysis, however, after multivariate analysis, ED was significantly associated with having only retinopathy. Previous studies found that ED was highly linked with the presence of microvascular complications e.g. retinopathy, neuropathy, and nephropathy<sup>(37)</sup>. In previous studies, peripheral neuropathy<sup>(16)</sup> and autonomic neuropathy were associated with ED<sup>(17)</sup>. Gerber et al. concluded that microvascular endothelial dysfunction was a potential contributor to ED<sup>(44)</sup>. Our study found significant associations between ED and macrovascular complications of diabetes e.g. coronary artery disease,

stroke, and peripheral arterial disease. In multivariate analysis, the participants with atherosclerosis CVD had suffered frequently from ED compared with those with absent CVD, but this finding lacked clinical significance. These results might be because CVD and ED share pathophysiological mechanisms and often co-occur. Zhao et al. demonstrated that the risk of total CVD, and stroke were significantly increased in populations with ED. The evidence suggests the need for diligent observation of at-risk men and reinforces the importance of early treatment to prevent cardiovascular events<sup>(19)</sup>. The presence of suboptimal glycemic control was significantly related to ED in our study, this finding is congruent with previous studies<sup>(13,17,29,37)</sup>. However, Andersson et al. showed that HbA1c level was not correlated to the grade of ED among patients with diabetes<sup>(43)</sup>. Family physicians should take into consideration achieving optimal glycemic targets to prevent, delay progression, or reverse the established ED in persons. In our study, the bivariate analysis showed that ED was significantly associated with increased BMI, hypertension, and dyslipidemia. However, the multivariate analysis did not find a statistically significant association between ED and dyslipidemia despite the existence of clinical significance. Obesity, hypertension, and dyslipidemia are independent risk factors of ED<sup>(7)</sup>. However, Lu et al. revealed that neither hypertension nor dyslipidemia was a significant risk factor for ED among the participants<sup>(41)</sup>. Reducing body weight and better targets of hypertension and dyslipidemia should be considered when dealing with diabetic patients in primary care aiming to reduce the incidence of ED. This study demonstrated that premature ejaculation and benign prostatic hyperplasia frequently and significantly coexist with ED. These results were



supported by previous studies<sup>(45-47)</sup>. The link between these issues might be due to sharing the same risk factors e.g. old age, smoking, DM, hypertension, and dyslipidemia<sup>(45-47)</sup>. We found that all participants who reported poor well-being had suffered from ED. ED was significantly and positively associated with lower well-being. Those participants with poor well-being might have depressive symptoms because of suffering from ED. Kouidrat et al. reported that significant and positive associations have been demonstrated between depressive symptoms and ED. Additionally, ED contributes strongly to lower quality of life in males with DM. Therefore, early detection of ED is essential to improve psychological health and men's quality of life<sup>(6)</sup>. Further studies are needed to assess the predictors of well-being among men with diabetes and ED. Family physicians should be proactive in questioning their patients about sexual health, perform a focused history and physical examination, obtain appropriate laboratory tests in patients with ED, prescribe an oral phosphodiesterase-5 inhibitor as a first-line treatment with concurrent lifestyle modifications, refer the indicated patients and evaluate and treat comorbidities, such as depression, metabolic syndrome, and cardiovascular disease, that often accompany ED<sup>(48, 49)</sup>. This study faced some limitations. The cross-sectional study design cannot demonstrate cause-effect relationships. Being a representative of limited areas in Ismailia governorate and only in primary health care settings hence can't be generalized for the entire population of Egypt. It is possible that dominant males respond differently to questions about sexual function, and thus the findings could be partly due to self-reporting bias. There is a wide discrepancy in our sample between diabetic type 1 and type 2 patients (8 vs. 412)

respectively; so, we cannot make any reliable association between types of diabetes and other factors related to ED.

## Conclusion

ED was highly prevalent among diabetic patients attending PHC settings. ED was associated with increased age, not working status, being a smoker currently, having retinopathy, poor glycemic control, hypertension, increased BMI, and poor well-being.

## Acknowledgments

We appreciate primary care patients with diabetes who participated in this study.

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