

Prevalence and Risk Factors of Erectile Dysfunction in Patients with Type 2 Diabetes Mellitus in Erbil-Iraq

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Abstract

Background and Objectives: Erectile dysfunction is a highly prevalent disease. It affects multiple aspects of health and can have a serious adverse effect on both the patients and their partners. Diabetes mellitus is a metabolic disorder associated with many chronic complications including erectile dysfunction. The aim of this study was to find out the prevalence and risk factors of erectile dysfunction in patients with type 2 diabetes mellitus.

Patients and Methods: A cross-sectional study had been done on 100 adult male patients with type 2 diabetes mellitus, attending endocrinology outpatient at Erbil teaching hospital between June and December 2021, and another 50 age-matched non-diabetic controls. Each one of them underwent detailed history taking, clinical examination, and relevant biochemical study.

Results: Sixty-three diabetic patients (63%) had erectile dysfunction compared to 6 nondiabetic subjects (12%). Mild, mild-to-moderate, moderate, and severe erectile dysfunction among these patients were 17 (27%), 21 (33.3%), 16 (25.4%), and 9 (14.3%), respectively. Among diabetics, erectile dysfunction was significantly associated with age, obesity, glycated hemoglobin level, duration of diabetes, presence of hypertension, dyslipidemia, and neuropathy ($p= 0.001, 0.005, <0.001, 0.038, 0.02, 0.017$ and 0.025 respectively)

Conclusion: Erectile dysfunction was significantly more prevalent in patients with type 2 diabetes than in non-diabetic patients. Being older than 50 years old, obesity, glycated hemoglobin level higher than 9, diabetes more than 10 years duration, presence of hypertension, dyslipidemia, and neuropathy were significantly in favor of a higher prevalence of erectile dysfunction in this group.

Key words: Diabetes; Erbil-Iraq; Erectile dysfunction; Prevalence; Risk factors.

Introduction

Erectile dysfunction (ED) is a sustained inability to have and keep an erection enough to allow the sexual activity to be satisfactory.^{1, 2} Available studies reveal that ED is highly prevalent worldwide; it affects multiple aspects of wellbeing and can have a serious adverse effect on both the patients and their partners.³⁻⁵ Based on the variation in the study methods, cultural differences, and the description of ED, large variations in the prevalence of ED

are being identified.⁶ The prevalence of ED is anywhere from 35% to 75% in several cross-sectional publications.⁷⁻⁸ Notable findings have been published in two landmark articles, the Massachusetts Male Ageing Study (MMAS) from the United States (USA) and the European Male Ageing Study (EMAS) from Europe.^{3, 9} About 52% had an occurrence of mild to moderate ED in males aged 40-70 years, and this was significantly

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associated with age, health, and emotional condition, as stated by the MMAS.¹⁰⁻¹¹ Whereas, based on different age subgroups, the EMAS multicenter population-based research for male patients 40-79 years of age recorded an incidence of 6-64 percent and an overall prevalence of 30 percent.^{9, 11} Diabetes mellitus (DM), on the other hand, is a metabolic disorder associated with many chronic complications including sexual disorders.¹² Current data shows that DM seems to reach a pandemic level globally. As of 2019, nearly 463 million adults (20-79 years) were having diabetes; by 2045 this will go up to 700 million.¹³ Furthermore, the main burden and the

Patients and Methods

This observational cross-sectional study had been done at the endocrinology outpatient at Erbil teaching hospital which is located in the Kurdistan Region at the north of Iraq. Recruitment was for six months between June and December 2021. We employed a convenience sampling method. Men attending the endocrinology outpatient at Erbil teaching hospital during the study period were recruited if met the inclusion criteria. The patients included in this study must meet the following inclusion criteria: (1) male patients; (2) diagnosed with type 2 DM (as per the American Diabetes Association definitions);¹⁸ (3) aged 20 years and more; and (4) being married. The exclusion criteria were: (1) pathological anomalies of the genitals that might affect erection (e.g., Peyronie disease); (2) type 1 diabetes; (3) a history of pelvic or gonadectomy operation; (4) organ transplantation history; (5) known or suspected chronic disabling disease such as chronic renal failure, chronic hepatic failure, chronic heart failure and chronic obstructive pulmonary disease; (6) a primary diagnosis (e.g., hyposexuality) of concomitant sexual dysfunction (such is primary hypogonadism); and (7) Drug abuse history over the past 12 months. In total,

largest increase seems to be in the developing countries. About 80% of diabetic patients were discovered to be the residents of low- and middle-income countries.¹³ Diabetes typically causes multiple variants of sexual dysfunction, mainly ED, premature ejaculation and diminished libido, occasionally delayed/prolonged ejaculation.¹⁴⁻¹⁵ The most common sexual disorder associated with DM is erectile dysfunction.^{12, 16-17} The aim of this study is to find out the prevalence of ED in patients with type 2 DM and its relation to several contributing factors. More attention will be given to certain risk factors to assess their significance in developing ED.

180 male participants had been invited to this study; however 150 participants were included in this study. Of them, 100 were suffering from Diabetes and considered as patients group and 50 age-matched disease-free participants who were named control group (non-diabetic). Diabetes period in this study is determined by the date of onset of the disease. The BMI was classified into: Normal=18-24.9 kg/m², Overweight >25-29.5 kg/m² and Obese > 30 kg/m².¹⁸ Smoking was classified into either never-smoker (including ex-smoker), or current smoker. We recorded glycosylated hemoglobin A1c (HbA1c) levels assessed in the last 3 months. DM therapies were listed as oral anti-diabetic drug (OAD) or insulin (alone or in combination with OAD). The presence of hypertension was assessed by history and hypertension treatment was classified into 1/ Beta Blocker. 2/Angiotensin converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB). 3/Others. Ankle systolic blood pressure (BP) was measured and its ratio to the systolic BP of the arm was calculated according to a standardized method to find the ankle brachial pressure index (ABI) and was used to evaluate the presence of peripheral arterial disease (PAD). A value of 0.9 or less in either legs

is agreed to be diagnostic for PAD. Dyslipidemia was defined by the presence of any of the following: total cholesterol >4.5 mmol/L, low density lipoprotein >2.6 mmol/L, triglycerides >1.7 mmol/L, high density lipoprotein <1.1 mmol/L, or non-high-density lipoprotein >3.4 mmol/L. Total serum testosterone levels were considered to be normal (>10 nmol/L) or low (<10 nmol/L), depending on the agreed reference ranges.¹⁹ Thyroid Stimulating Hormone TSH: was classified into Normal (0.4-4 IU/ml) or High (>4 IU/ml). Prolactin Hormone also was classified into either Normal (< 20 mcg/L) or High (> 20 mcg/L). Neuropathy (by neurological examination) and nephropathy (by testing for microalbuminuria or elevated levels for creatinine) were investigated by history, examination, and laboratory testing. Educational level of the participants was classified into Primary (elementary), Secondary (Intermediate and Preparatory) or other (higher education, post-graduation). Alcohol drinking was classified into either yes (regardless of amount, frequency, or type) or No. Due to participants' very low responsiveness screening for depression was omitted from the study. ED was evaluated using a face-to-face interview approach implementing the five questions of the International Index of Erectile Function Questionnaire

Results

We recruited 100 participants with type 2 diabetes Miletus ,with mean age of 51.6±11.4 years old, 54% were above 50 years, 32% were obese, more than 40% were with HbA1c above 9, more than 50% were with DM Duration above 10 years, 86% were receiving oral hypoglycemic agents, 53% with hypertension 19% receiving Beta Blocker medications,43%

(IIEFQ).²⁰ IIEFQ-5 is scored on a Likert scale (0-5), in which a higher score suggests better sexual function. Sexual dysfunction severity was divided into five classes according to the total score (i.e., severe 5-7, moderate 8-11, mild to moderate 12-16, mild 17-21 and no erectile dysfunction 21-25). Data was analyzed using SPSS (Statistical Package for Social Scientists) version 25.0 for Windows (Chicago, Illinois, USA). Descriptive statistics in terms of mean and standard deviation (SD) was computed for the continuous variables. While descriptive statistics consisting of frequencies and percentages (%) was computed and level of significance was investigated using the Pearson Chi-square test to analyze the association between categorical data. A p-value ≤ 0.05 was regarded as significant. All patients involved in our study were invited to join voluntarily. We obtained informed consent from our subjects based on a thorough clarification of the study's goals and procedures. This study was carried out in agreement with the ethical standards set out at the Helsinki Declaration and was accepted by Hawler Medical University's ethics committee. Respondents were further assured of confidentiality and anonymity. All participants were informed that they can refuse to participate and / or withdraw from this research.

were currently smokers,48% had dyslipidemia ,74% were of secondary education, 28% with peripheral arterial disease , 47% suffering from neuropathy, 39% from Nephropathy,6% were alcohol users, 9% with high prolactin level, 16% with low testosterone levels and 15% were with high TSH levels Table (1).

Table (1): Diabetic Participants' Distribution according to study Variables

Study Variable	Percentage					
	Age	>50 years	(54)54%	≤50 Years old	(46)46%	
BMI	Normal	(33)33%	Overweight	(35)35%	Obese	(32)32%
HbA1C	<7	(39)39%	7-9	(20)20%	>9	(41)41%
DM Duration	>10 Years	(54)54%	≤10 Years	(46)46%		
DM Treatment	Oral Agents	(86)86%	Insulin	(14)14%		
Hypertension	Present	(53)53%	Absent	(47)47%		
Hypertension Treatment	Beta Blocker	(19)19%	ACEi or ARB	(17)17%	Other	(17)17%
Currently Smoker	Smoker	(43)43%	Non	(57)57%		
Dyslipidemia	Present	(48)48%	Absent	(52)52%		
ABI	Present	(28)28%	Absent	(72)72%		
Neuropathy	Present	(47)47%	Absent	(53)53%		
Nephropathy	Present	(39)39%	Absent	(61)61%		
Education	Primary	(17)17%	Secondary	(74)74%	Other*	(9)9%
Prolactin Hormone	High	(9)9%	Normal	(91)91%		
Testosterone Hormone	Low	(16)16%	Normal	(84)84%		
TSH	High	(15)15%	Normal	(85)85%		
Alcohol drink	Drinker	(6)6%	Nondrinker	(94)94%		

*: other: higher education including undergraduate and postgraduate

We further recruited 50 diabetic free demographic features are shown in Table participants as control group. Their (2).

Table (2): Control Participants' Distribution according to study Variables

Study Variable	Percentage					
	Age	>50 years	(22)44%	≤50 Years old	(28)56%	
BMI	Normal	(27)54%	Overweight	(13)26%	Obese	(10)20%
Hypertension	Present	(18)36%	Absent	(32)64%		
Hypertension Treatment	Beta Blocker	(4)8%	ACEi or ARB	(8)16%	Other	(6)12%
Currently Smoker	Smoker	(30)60%	Non	(20)40%		
Dyslipidemia	Present	(12)24%	Absent	(38)76%		
ABI	Present	(6)12%	Absent	(44)88%		
Neuropathy	Present	(4)8%	Absent	(46)92%		
Nephropathy	Present	(2)4%	Absent	(48)96%		
Education	Primary	(15)30%	Secondary	(24)48%	Other	(11)22%
Prolactin Hormone	High	(2)4%	Normal	(48)96%		
Testosterone Hormone	Low	(4)8%	Normal	(46)92%		
TSH	High	(1)2%	Normal	(49)98%		
Alcohol drink	Drinker	(3)6%	Nondrinker	(47)94%		

The study showed that ED was significantly higher (p = <0.001 using Pearson Chi-square) among Diabetic group 63% Vs 12% among control (Nondiabetic) groups Table (3)

Table (3): Erectile dysfunction distribution among study groups

Study Variable	ED	Not ED	P Value (Pearson Chi-square)
DM	(63) 63%	(37) 37%	<0.001
Not DM	(12) 12%	(88) 88%	

In this study diabetic participant were distributed according to ED severity into 23% mild, 60% moderate and 12% were severe Table (4).

Table (4): Diabetic Participants' Distribution according to ED severity

Erectile Dysfunction Severity	No.	%
Mild	17	27.0
Mild to Moderate	21	33.3
Moderate	16	25.4
Sever	9	14.3

There was a statistically significant association between increase in age and ED presence ($p=0.001$), being older than 50 was associated with higher ED prevalence. Also, a statistically significant association was found between ED and

BMI classification, Obese participants were with higher chance to develop ED ($p=0.005$). No statistical difference was found between ED presence and smoking, educational levels, or Alcohol use ($p=0.71$, 0.23 and 0.64 respectively) Table (5).

Table (5): Distribution according to Sociodemographic Variables among Diabetic Patients

Sociodemographic Variable	ED	No ED	P Value (Pearson Chi-square)
Age	> 50 Years	(42) 77.80%	0.001
	≤ 50 Years	(21) 45.70%	
BMI	Obese	(26) 81.30%	0.005
	Overweight	(23) 65.70%	
	Normal	(14) 42.40%	
Currently Smoker	Yes	(28) 65.10%	0.703
	No	(35) 61.40%	
Education	Primary	(13) 76.50%	0.231
	Secondary	(43) 58.10%	
	Other	(7) 77.80%	
Alcohol user	Yes	(4) 66.7	0.847
	No	(59) 62.8	

There was a strong association between ED and HbA1c levels, higher HbA1c (>9) was in favor of higher ED presence ($p<0.001$). Furthermore, the prevalence of ED was significantly associated with a longer duration of DM ($p=0.038$). Also, ED prevalence was significantly higher in diabetic patients with hypertension than in non-hypertensive patients ($p=0.02$). Plus, the presence of dyslipidemia in diabetic patients was again significantly associated

with higher ED than those who did not have dyslipidemia ($p=0.017$). ED prevalence was significantly higher in Diabetic patients with neuropathy than those with no neuropathy ($p=0.02$). On the other hand, there was no significant relationship between the prevalence of ED and type of DM treatment, type of antihypertensive medication, PAD, or nephropathy among diabetic patients

($P=0.63$, 0.13 , 0.276 and 0.06 respectively) Table (6).

Table (6): Distribution according to chronic illnesses and complication Among Diabetic Patients

Study Variable		ED	No ED	P Value (Pearson Chi-square)
HbA1C	>9	(35) 85.40%	(6) 14.60%	<0.001
	7-9	(8) 40.00%	(12) 60.00%	
	<7	(20) 51.30%	(19) 48.70%	
DM Duration	>10 Years	(39)72.20%	(15) 27.80%	0.038
	≤ 10 Years	(24) 52.20%	(22) 47.80%	
DM Treatment	Insulin	(8) 57.10%	(6) 42.90%	0.624
	Oral Hypo.	(55) 64.00%	(31) 36.00%	
Hypertension	Yes	(39) 73.60%	(14) 26.40%	0.019
	No	(24) 51.10%	(23) 48.90%	
Hypertension treatment	B Blocker	(14) 73.70%	(5) 26.30%	0.135
	ACE or ARB	(12) 70.60%	(5) 29.40%	
	Other	(13) 76.50%	(4) 23.50%	
Dyslipidemia	Yes	(36) 75.00%	(12) 25.00%	0.017
	No	(27) 51.90%	(25) 48.10%	
PAD	Yes	(20) 71.40%	(8) 28.60%	0.276
	No	(43) 59.70%	(29) 40.30%	
Neuropathy	Yes	(35) 74.50%	(12) 25.50%	0.025
	No	(28) 52.80%	(25) 47.20%	
Nephropathy	Yes	(29) 74.40%	(10) 25.60%	0.0599
	No	(34) 55.70%	(27) 44.30%	

No statistical difference was found in the prevalence of ED among diabetic patients and levels of prolactin, TSH or

Testosterone levels ($p=0.44$, 0.155 and 0.082 respectively) Table (7).

Table (7): Distribution according to hormones' level of Diabetic Patients

Hormone		ED	No ED	P Value (Pearson Chi-square)
Prolactin	High	(5) 55.60%	(4) 44.40%	0.44
	Normal	(58) 63.70%	(33) 36.30%	
TSH	High	(7) 46.70%	(8) 53.30%	0.155
	Normal	(56) 65.90%	(29) 34.10%	
Testosterone	Low	(7) 43.80%	(9) 56.30%	0.082
	Normal	(56) 66.70%	(28) 33.30%	

Discussion

In order to keep marital peace and happiness, healthy sexual functioning is necessary. Diabetes mellitus can cause normal sexual function to be disrupted in both men and women as a result of diabetic-induced end organ damage and psychological stress. This study showed

that the prevalence of ED was significantly higher among diabetic group versus non-diabetic group (63% VS 12 %) with $p < 0.001$. This finding was in line with several studies from USA and Egypt.²¹⁻²³ This study showed that being older in age was significantly associated with ED (p

=0.001). A cross-sectional survey of 400 Malaysian men confirmed this conclusion.²⁴ Due to alterations caused by atherosclerosis and the resulting decreased blood supply to the genitalia, aging posed a substantial risk for developing ED. Significantly higher prevalence of ED was detected among obese group ($p=0.005$), which was consistent with Polish research that revealed that a BMI of over 30 kg/m² was associated with a threefold increased probability of sexual dysfunction.²⁵ For obese patients, erectile dysfunction is caused by a number of issues that are common in people who have a lot of fat tissue, such as cardiovascular disease, diabetes, and dyslipidemia. This study revealed no association between ED and level of education ($p=0.23$) which was in contrast to two studies from Malaysia which showed men with secondary education were more prone to develop ED compared to those with tertiary education.^{24, 26} The disparity in sample size and sampling procedure might explain the discrepancy, especially as most of the persons sampled in our study were the visitors to public hospitals and most were from a lower socioeconomic and educational level. This study yielded in no significant difference between smoking status and ED ($p=0.71$) however this finding was contradicted by the Massachusetts Male Aging Study, where cigarette smokers were found to have a 1.97 times higher risk to develop ED.²⁷ In Finland, 1130 men between the ages of 50 and 70 were tracked for ten years in a study comparable to the Massachusetts Male Health Study, the odds-ratio in this study was 1.4, however it did not meet statistical significance according to the author of the mentioned study.²⁸ This disparity might be explained by the varied methodologies utilized in those studies, as cross section studies in general may not be able to detect causal and temporal links between cause and effect. According to the Boston Area Community Health Survey, the risk of having ED became considerable

only after 20 pack-years.²⁹ This study showed no statistical association between ED and alcohol consumption ($p=0.64$), while a Chinese meta-analysis cross-sectional study indicated that small to moderate alcohol intake (up to 21 drinks/week) was found to be associated with lower probability of erectile dysfunction (OR = 0.71, P = 0.000). A non-linear association was discovered between the risk of ED and alcohol intake, in a dose-response meta-analysis.³⁰ Possible explanation of this disagreement is that being alcoholic is a social stigma among Iraqi people and a lot of individuals hide the fact of drinking alcohol. Binge drinking has been shown to affect microvascular and macrovascular function, which might indicate early signs of cardiovascular risk.³¹ Epidemiologic research shows that consuming alcoholic beverages at low levels (1–2 drinks per day) on a regular basis may reduce the incidence of unfavorable cardiovascular events.³² This study found a clear positive relationship between ED and both HbA1c level, and DM duration ($p=0.001, 0.038$, respectively), which was supported by studies from the United Kingdom (Five cross-sectional studies including 3299 patients).³³ Available data has revealed a link between erectile dysfunction and glycemic management, as well as the duration of diabetes.^{33, 34} Diabetic males have a nearly threefold increased risk of developing ED when compared to non-diabetics in similar studies and they are also more likely to acquire ED 10 to 15 years before non-diabetics.³ This study revealed a significant association between hypertension and ED on one side and dyslipidemia and ED on the other side ($p=0.02$ and 0.017 respectively). Comparable results were found within an Italian study of 555 men¹⁷. However, studies from China and USA showed no significant association between serum lipid and the risk of ED, pointing to the apparent conclusion that dyslipidemia does not have a significant role in the

probability of developing ED in diabetics.^{34, 35} The current study's findings, on the other hand, revealed no statistically significant differences in ED across various antihypertensive groups. This might be due to the fact that many patients were using more than one kind of antihypertensive medication, which could lead to confounding results if some medicines have a neutral/positive effect on the ED while others have unfavorable effects. Some earlier antihypertensive classes (beta blockers, diuretics) have a history of causing erectile dysfunction, whereas other medicines (ACEIs, calcium channel blockers) appear to be neutral. Furthermore, data shows that angiotensin receptor blockers may improve erectile function.³⁶ A significant increase in ED was reported among diabetic individuals with neuropathy ($p=0.025$), while no such significant increase was detected among diabetic participants with nephropathy ($p=0.06$) in this research. Similar findings were found in a Turkish,⁷ Japanese multicenter cross-sectional study,³⁷ Romanian³⁸ and Indian studies.³⁹ This research found no link between the presence of peripheral artery disease and ED ($p=0.27$), however a study from the United States of 690 males found a favorable link⁴⁰. This discrepancy might be related to differences in research duration and sample characteristics. Several atherosclerotic risk factors can lead to occlusive disorder in various arteries, eventually leading to some degree of vascular ED. Reduced neuronal or endothelial NO, as well as prolonged tissue ischemia; can result in decreased cavernosal smooth muscle relaxation. DM treatment showed no significant difference for ED prevalence ($p=0.63$). Same results were found with a Japanese³⁷ and a Chinese study.¹ The level of serum prolactin had no effect on ED ($p=0.44$),

Study Limitation

We are aware of several limitations of our study. First off, since this study is cross-

according to this study. In contrast to research from China, which found a deleterious impact on erectile function,⁴¹ our study found no such effect. This disparity might be explained by differences in research duration and sample size, especially as the current investigation focused solely on diabetes patients rather than the general population. The frequency of hyperprolactinemia was 9% in the study group, with most of them having just a mild (less than twice) rise in serum prolactin. This study showed no significant association between ED and testosterone levels ($p=0.082$). This finding contradicted other studies which showed lower levels of serum testosterone were associated significantly with higher prevalence of ED in men with Type 2 DM. A research done on 198 men with type 2 diabetes had showed that the presence of ED was significantly associated with both low levels of serum testosterone.⁴² Different methodologies and inclusion criteria might be the cause of the disparity, as one of the exclusion criteria in our study was a documented history of diagnosed primary hypogonadism. Finally, there was no association between TSH levels and ED in this investigation ($p=0.155$), however this contradicted an Italian multicenter prospective analysis of 48 males at endocrinology and andrology clinics in university hospitals, which revealed hypothyroidism nearly tripled the occurrence of ED.⁴³ In hypothyroid males, Krassas et al. found a considerably higher prevalence of ED than in controls ($p=0.0001$).⁴⁴ This discrepancy could be explained by the participants' different characteristics, and by the fact that this study investigated the presence of thyroid disorders in diabetic patients with ED, whereas most other studies looked into the presence of sexual disorders in those with thyroid dysfunction.

sectional in nature, we cannot be certain that ED and the study factors are related in

a causal way. Furthermore, because the sample was drawn from a single center, we were unable to generalize this information across the country. Finally, no information

Conclusion and Recommendation

Erectile dysfunction was significantly more prevalent in patients with type 2 diabetes than non-diabetic patients. Being older than 50 years old, obesity, HBA1c level higher than 9, DM more than 10 years duration, presence of hypertension, dyslipidemia and neuropathy were significantly in favor of higher prevalence of ED in this group. Considering the

was gathered about the individuals' social situation or partner, two factors that could theoretically influence the prevalence of ED.

increased frequency of ED in type 2 diabetes patients, physicians should focus on early detection and treatment of ED in diabetic men. Furthermore, maintaining effective glycemic management, avoiding DM-related comorbidities, and managing obesity, hypertension and dyslipidemia may lower the chance of developing ED.

Conflicts of interest

The author reports no conflicts of interest.

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