JOMH
Journal of Men's Health

Original Article
DOI: 10.31083/jomh.v16i4.286

THE VALIDITY OF USING A SINGLE-QUESTION SELF-REPORT OF ERECTILE DYSFUNCTION AS A SCREENING TOOL AMONG MEN WITH TYPE 2 DIABETES MELLITUS

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Submitted: 22 June 2020. Accepted: 09 September 2020. Published: 03 October 2020.

ABSTRACT

Background and objective

This study aimed to determine the validity of using a single-question self-report of erectile dysfunction (ED) as a screening tool among Saudi men with type 2 diabetes mellitus (T2DM).

Materials and methods

A cross-sectional study was conducted using a single-question self-report questionnaire to determine the association between the risk of ED and poor glycemic control among men with T2DM. The study was conducted in a hospital-based diabetes clinic in Riyadh, Saudi Arabia. Married adults (aged >18 years)

suffering from T2DM for at least 1 year were included in the study. All statistical analyses were performed using SAS version 9.2 and R software (Foundation for Statistical Computing, Vienna, Austria).

Results

With 86% response rate, 293 participants were included in this study. Over half (53.9%) of the participants were below 60 years of age. More than half (55.3%) were suffering from uncontrolled diabetes (i.e., HbA1c > 7%). There was significant correlation between the International Index of Erectile Function (IIEF) and self-reported question in terms of duration of T2DM ($p < 0.001$), type of treatment ($p = 0.004$), income of the participants ($p = 0.005$), age ($p < 0.001$), education level ($p = 0.032$), and occupation ($p < 0.001$). However, there was no significant correlation between IIEF and self-reported question in terms of body mass index ($p = 743$) and smoking. Regarding overall diagnostic accuracy of IIEF score to predict self-reported ED, receiver operating characteristic curve showed area under curve as 89.4%, which is statistically significant.

Conclusion

Single-question self-report of ED is a valid and reliable tool to screen diabetic patients suffering from sexual problems. Such tool may help to identify ED in diabetic patients and warrant early management.

Keywords: *diabetes; erectile dysfunction; glycemic control; Saudi Arabia; sexual dysfunction*

INTRODUCTION

On clinical grounds, erectile dysfunction (ED) refers to "a consistent or recurrent inability to attain and/or maintain penile erection sufficient for sexual satisfaction."[1] ED is one of the most common sexual dysfunctions affecting millions of men worldwide.[2,3] Epidemiological studies have estimated that 422 million individuals will be suffering from ED by the year 2025.[4] Globally, prevalence of ED ranges from 33.2 to 46.9% among men with or without benign prostatic hyperplasia (BPH).[5] In fact, ED is a highly prevalent problem, especially among the individuals who suffer from various chronic illnesses, leading to poor quality of life and well-being.[6,7]

Erectile dysfunction is a multi-factorial condition where a large number of risk factors are involved in its pathophysiology, including aging, chronic illnesses (i.e., cardiovascular disease, hypertension, diabetes, hyperlipidemia), cigarette smoking, metabolic disorders, hypogonadism, urinary tract infection, surgical procedures, medications, sedentary lifestyle, and depression.[8–11] It was found also that the presence of metabolic syndrome had a significant correlation with lower International Index of Erectile Function–erectile dysfunction (IIEF-ED) scores, lower intercourse satisfaction scores, and lower total testosterone ($p < 0.01$), and the greater the number of components of metabolic syndrome, the higher the prevalence of ED.[12] Thus, early identification and treatment of metabolic syndrome risk factors, including diet and lifestyle interventions, might be helpful to prevent ED and secondary cardiovascular disease.[12] The Massachusetts Male Aging Study (MMAS) has reported that risk of ED increases by 1.2% and 4.6% per year for men aged 40–49 years and 60–69 years, respectively.[13]

Among these chronic diseases, diabetes is strongly associated with ED, affecting the penile vasculature.[14] Overall, prevalence of ED in diabetes is 52.5%.[15] Similarly, in men with type 2 diabetes mellitus (T2DM), the prevalence of ED is high and ranges from 35 to 90%.[16,17] The wide range of reported prevalence of ED in men with T2DM in various studies may be attributed to the dissimilar study design and different populations. In addition,

it has been reported that the risk of ED is 2–3 times higher among men with diabetes, and the risk is even higher in men with T2DM in comparison to the normal ones.[18]

Keeping in mind the fact that the patients with T2DM are at higher risk of ED, recently published guidelines have advised the physicians to ask their patients with T2DM about their erection function. Indeed, guidelines of the National Institute for Health and Care Excellence (NICE) have recommended men with T2DM to discuss ED with their physicians every year.[19]

The diagnosis of ED requires broad-based medical history and proper physical examination along with psychosocial assessment and laboratory testing.[20] Unfortunately, this approach of diagnosing ED is an impractical method to screen in routine clinical work as it needs to talk upon a sensitive topic in detail and could be time-consuming. Therefore, a number of instruments have been employed to pick up ED cases. In addition, questionnaire-based methods have been used recently by many researchers for screening of ED.[21] For instance, the Brief Male Sexual Function Inventory (BMSFI), the IIEF, and the MMAS scales are three well-known questionnaire-based tools used extensively in previous researches.[22–25] However, data is likely to be missed due to ethical constraints associated with ED and multiple items in the above-mentioned tools, thus preventing the clinicians from reaching the diagnosis of ED.

As a result, the development of a concise, single-style, self-reported question to screen for ED is highly needed. Studies have reported that a single-style, self-reported question correlated well with other measures and validated in different clinical situations.[26–28] Many attempts were made to invent and validate a single question for ED screening. In MMAS, the researchers have developed and examined a single question for screening of ED among general population. They found that this question is well correlated with BMSFI, IIEF (15 items), and men who were clinically diagnosed with ED.[29,30] On the contrast, some of the studies have reported that a single, self-reported question about ED underestimates the right percentage of ED when compared with IIEF (five items).[31] In this context, although the validity of single, self-reported question to screen ED is controversial, it is the need of the hour to develop such a question to identify people with ED at an earlier stage.

No evidence exists to support the using of single, self-reported question among men with T2DM, as this group of patients has a very high chance to suffer from ED as mentioned above. In addition, no attempt has been made earlier to validate this question in the Saudi community where the all-risk factors of ED are highly prevalent. Therefore, our aim was to determine the validity of using a single-question self-report of ED as a screening tool among Saudi men with T2DM.

MATERIALS AND METHODS

A cross-sectional study was conducted using a single-question self-report questionnaire to determine the association between the risk of ED and poor glycemic control among men with T2DM. After the approval of Institutional Review Board (IRB), the study was conducted in a hospital-based diabetes clinic (concealed text) in Riyadh, Saudi Arabia, from July to September 2017.

Married adults (aged >18 years) suffering from T2DM for at least 1 year were included in the study. The participants could read and write in Arabic language. The participants with a history of prostate disease or surgery, spinal trauma, or anatomical penile deformities were excluded from the study. Four medical students collected the data from 293 patients visiting diabetes clinic after having their informed consent and assuring confidentiality. The participants were asked to fill a single-question self-report questionnaire. The questionnaire comprised three sections. The first section was about background data, that is, age, body mass index (BMI; height and weight), education level, marital

status, location, current occupation, income, smoking, and duration of T2DM. The second section was about self-reported ED with answer "Yes" or "No." The third section comprised IIEF-5 to diagnose ED. The latest record of HbA1c (to monitor glycemic control), lipid profile, and co-morbidities (hypertension, dyslipidemia, and cardiovascular disease) was also collected. HbA1c > 7 and total cholesterol level > 6.22 mmol/L were taken as poor glycemic control and dyslipidemia, respectively.

Categorical data were summarized with absolute numbers and percentages, whereas continuous data were summarized as mean values and standard deviations (SD) or median and inter-quartile ranges (IQR). Comparisons between different groups were made using Chi-square test or Fisher's exact test for categorical variables, whereas for continuous data, Student's t-test or Mann–Whitney U-test was used for two groups, or analysis of variance or Kruskal–Wallis test was used for more than two groups. The diagnostic accuracy of self-reported ED was measured with sensitivities, specificities, positive predictive values (PPV), and negative predictive values (NPV) along with 95% confidence intervals (CI). In order to study agreement between IIEF and self-reported ED, we used Kappa statistics. A receiver operating characteristic (ROC) curve was used to measure the overall diagnostic accuracy of IIEF score to predict self-reported ED. All statistical analyses were performed using SAS, version 9.2 (SAS Institute Inc., Cary, NC) and R software (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

A total of 340 questionnaires were distributed, of which 293 participants completed it (86% response rate). Over half (53.9%) of the participants were below 60 years of age. More than half (55.3%) were suffering from uncontrolled diabetes (i.e., HbA1c >7%). Prevalence of ED was 80.5%. Increasing age was significantly associated with ED ($p = 0.881$; Table 1; Figures 1(a) and (b)). More than three-fourth (77.8%) of the participants were living in Riyadh. Two hundred and sixty-five (90.4%) participants had a single wife, while 28 (9.6%) participants had more than one wives. The majority (66.7%) of participants had more than five children. More than half (59.4%) of the participants had a history of T2DM for less than 10 years, while 119 (40.6%) had a history of T2DM for more than 10 years. However, there was significant correlation between IIEF and self-reported question in terms of duration of T2DM ($p < 0.001$). In all, 51 (17.4%) participants had a BMI of <25, while more than half (53.9%)) of the participants had a BMI of ≥30. Hence, there was no significant correlation between IIEF and self-reported question in terms of BMI ($p = 743$).

Regarding education level, of the total participants, 35 (11.9%), 41 (14%) and 71 (24.2%) had primary, secondary and tertiary levels of education, respectively, while 31 (10.6%) did not go to school and 115 (39.2%) participants had achieved university, college or higher education. IIEF and self-reported question had statistical correlation in terms of education level ($p = 0.032$; Table 1; Figures 1(a) and (b)). Regarding income, 83 (28.3%), 66 (22.5%), 88 (30%) and 56 (19.1%) participants were earning <5000, 5000–10,000, 10,001–15,000, and >15,000 SAR, respectively. Statistical analysis showed significant correlation between IIEF and self-reported question in terms of income of the participants ($p = 0.005$). In terms of occupation, 12 (4.1%) participants were currently unemployed and more than half of the participants, that is, 154 (52.6%) were retired. IIEF and self-reported question had significant correlation in terms of occupation as well ($p < 0.001$; Table 1).

More than half of the participants 159 (54.3%) never smoked, 44 (15%) were current smokers, while 90 (30.7%) participants were former smokers. It showed no statistically significant correlation between IIEF and self-reported question in terms of smoking. Regarding type of diabetes treatment, 13 (4.4%), 201 (68.6%), 24 (8.2%), and 55 (18.8%) participants were on diet control, oral hypoglycemic

TABLE 1 Comparison between IIEF Tool and Self-Reported Question.

Covariate	Level	Group				p
		Both positive, N = 218	Both negative, N = 53	IIEF positive and self-reported negative, N = 18	IIEF negative and self-reported positive, N = 4	
Age	≤60 y	105 (48.17)	45 (84.91)	7 (38.89)	1 (25)	**<0.001**
	>60 y	113 (51.83)	8 (15.09)	11 (61.11)	3 (75)	
Married	One wife	195 (89.45)	49 (92.45)	17 (94.44)	4 (100)	0.881
	More than one wife	23 (10.55)	4 (7.55)	1 (5.56)	0 (0)	
Diabetes duration	≤10	116 (53.21)	45 (84.91)	11 (61.11)	2 (50)	**<0.001**
	>10	102 (46.79)	8 (15.09)	7 (38.89)	2 (50)	
BMI	<25	42 (19.27)	6 (11.32)	3 (16.67)	0 (0)	0.743
	25–29.9	60 (27.52)	16 (30.19)	7 (38.89)	1 (25)	
	≥ 30	116 (53.21)	31 (58.49)	8 (44.44)	3 (75)	
Highest level of education	No school	28 (12.84)	0 (0)	3 (16.67)	0 (0)	**0.032**
	Primary	32 (14.68)	1 (1.89)	1 (5.56)	1 (25)	
	Secondary	31 (14.22)	6 (11.32)	3 (16.67)	1 (25)	
	Tertiary	51 (23.39)	16 (30.19)	4 (22.22)	0 (0)	
	College, university, or higher	76 (34.86)	30 (56.6)	7 (38.89)	2 (50)	
Location	Riyadh	162 (74.31)	46 (86.79)	16 (88.89)	4 (100)	0.115
	Outside Riyadh	56 (25.69)	7 (13.21)	2 (11.11)	0 (0)	
Monthly income	<5000 SAR	72 (33.03)	7 (13.21)	4 (22.22)	0 (0)	**0.005**
	5000–10,000 SAR	48 (22.02)	13 (24.53)	4 (22.22)	1 (25)	
	10,001–15,000 SAR	69 (31.65)	14 (26.42)	4 (22.22)	1 (25)	
	>15,000 SAR	29 (13.3)	19 (35.85)	6 (33.33)	2 (50)	
Current occupation	Unemployed	9 (4.13)	2 (3.77)	1 (5.56)	0 (0)	**<0.001**
	Government work	35 (16.06)	21 (39.62)	7 (38.89)	0 (0)	
	Private work	42 (19.27)	16 (30.19)	5 (27.78)	1 (25)	
	Retired	132 (60.55)	14 (26.42)	5 (27.78)	3 (75)	
Children	≤5	57 (26.89)	23 (46)	6 (35.29)	1 (25)	0.057
	>5	155 (73.11)	27 (54)	11 (64.71)	3 (75)	
Smoking status	Never	118 (54.13)	29 (54.72)	11 (61.11)	1 (25)	0.555
	Current	33 (15.14)	10 (18.87)	1 (5.56)	0 (0)	
	Former	67 (30.73)	14 (26.42)	6 (33.33)	3 (75)	
Type of diabetes treatment	Diet	7 (3.21)	6 (11.32)	0 (0)	0 (0)	**0.004**
	Tablets	144 (66.06)	42 (79.25)	14 (77.78)	1 (25)	
	Insulin	20 (9.17)	2 (3.77)	2 (11.11)	0 (0)	
	Tablet and insulin	47 (21.56)	3 (5.66)	2 (11.11)	3 (75)	

SAR, Saudi Riyal; IIEF, International Index of Erectile Function.

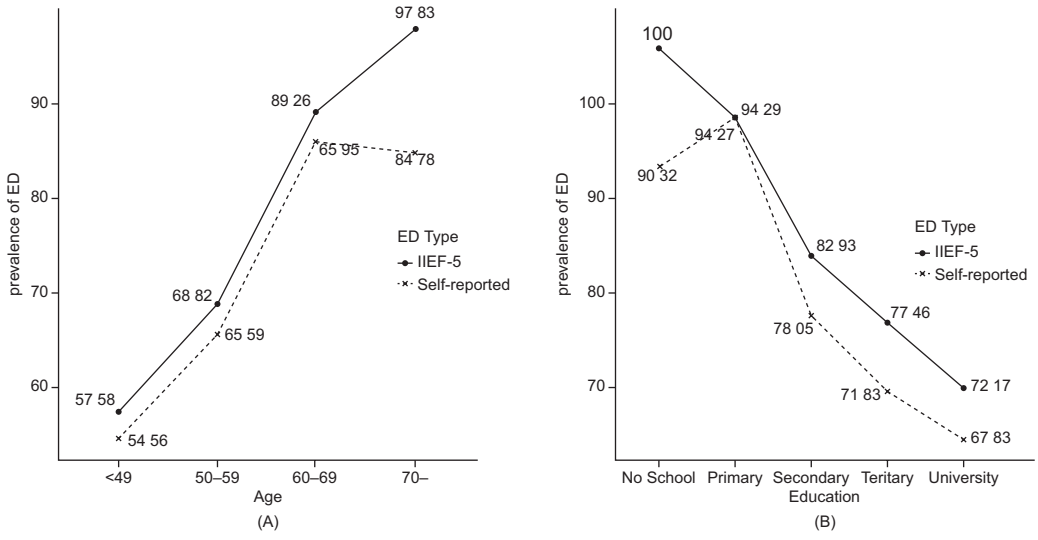

FIGURE 1 (A) Age and prevalence of ED in T2DM with respect to IIEF-5 and self-reported question. (B) Education and prevalence of ED in T2DM with respect to IIEF-5 and self-reported question. ED, erectile dysfunction; IIEF, International Index of Erectile Function; T2DM, type 2 diabetes mellitus.

agents only, insulin only, and oral hypoglycemic plus insulin, respectively. Hence, IIEF and self-reported question had significant correlation in terms of type of treatment ($p = 0.004$; Table 1). In addition, IIEF and self-reported question showed significant correlation in terms of age and prevalence of ED in T2DM (Figures 1(a) and (b)). Regarding overall diagnostic accuracy of IIEF score to predict self-reported ED, ROC curve showed 89.4% area under curve (AUC), which is statistically significant (Figure 2).

There was reported significant correlation between IIEF score and self-reported question in terms of mild-to-moderate (100%), moderate (87.76%) and severe (94.87%) ED (Figure 3).

DISCUSSION

The current study validates using a single-question self-report of ED as a screening tool among Saudi men with T2DM. In addition, it investigated association between ED and other demographic and clinical characteristics of participants. The study compared IIEF-5 and single-question self-report of ED, revealing statistically significant correlation between IIEF-5 and self-reported ED in terms of diagnostic accuracy using ROC curve. For the way

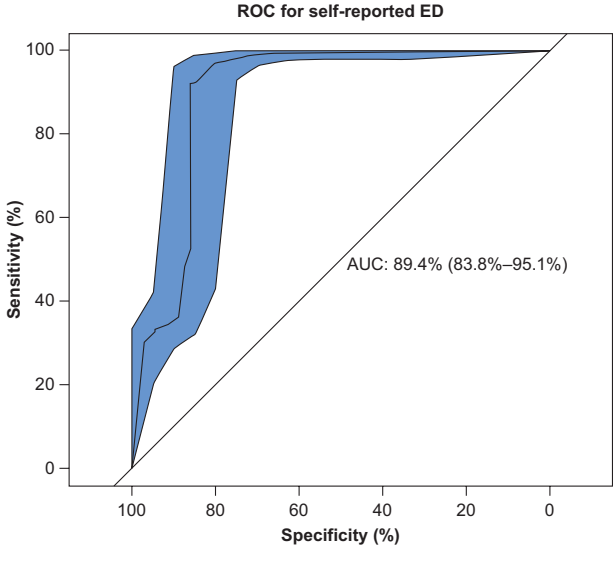

FIGURE 2 ROC for self-reported ED in terms of sensitivity and specificity. ED, erectile dysfunction; ROC, receiver operating characteristic.

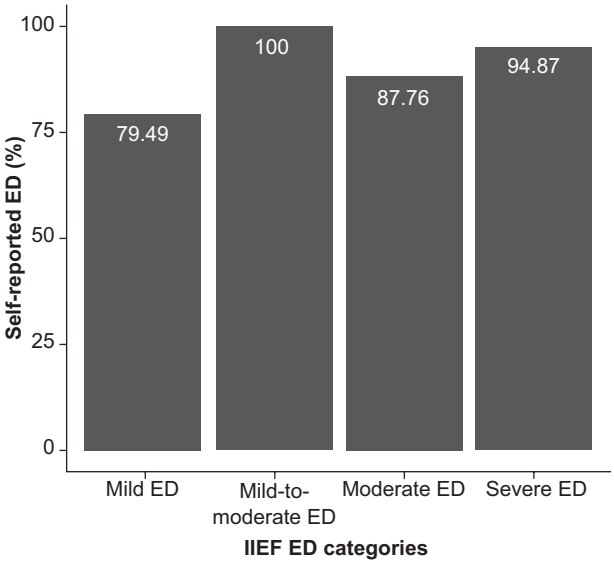

FIGURE 3 IIEF ED categories with respect to self-reported ED. IIEF, International Index of Erectile Function; ED, erectile dysfunction.

of explanation, single-question self-reported ED by the patients with T2DM is a reliable tool to screen ED among Saudi population.

Diabetes is a prevalent and challenging problem in Saudi Arabia. According to an estimate, approximately 7 million people are living with diabetes, while 3 million are diagnosed with pre-diabetes in Saudi Arabia.[32–35] Unfortunately, T2DM is on rise in Saudi Arabia. Current prevalence of T2DM in Saudi Arabia is 32.8% and it has been predicted to be 40.37% and 45.36% in 2025 and 2030, respectively.[36,37] Similarly, ED among the patients with T2DM has been reported to be high. Recently, Almigbal and Schattner have reported ED in 89% of the patients with T2DM.[38] The present study reports ED in 80.5% of patients with T2DM. Another study conducted in Saudi Arabia has reported ED in 83% of patients with T2DM.[39] Moreover, in another cross-sectional study conducted among 293 Saudi men with type 2 diabetes, the prevalence of ED was 80.5%, of whom 33% had a severe degree of ED.[32]

The IIEF-5 questionnaire is one of the well-established, reliable, and convenient tools to screen ED. IIEF-5 comprises five questions to categorize the patients with no, mild, mild-to-moderate, moderate, and severe ED.[40] It has been validated globally by various studies to determine sexual dysfunction.[40,41] O'Donnell et al. studied 137 participants from MMAS, comparing single-question self-report of ED and gold standard clinical urologic examination.[30] They reported that single-question self-reported ED accurately correlates with clinically diagnosed ED. Similarly, Derby et al. studied 505 participants from MMAS using IIEF or BMSFI and a single-question self-assessment.[40] They reported that the single-question self-assessment of ED correlated well with IIEF and BMSFI. In the present study, single-question self-reported ED by the patients with T2DM correlated well with IIEF-5, especially in terms of mild-to-moderate and severe ED. It shows that use of a single-question self-reported ED by the patients with T2DM would be a reliable and convenient tool to screen ED in countries such as Saudi Arabia where DM and ED are prevalent. In India, Goyal et al. studied 348 patients with T2DM to determine the prevalence and severity of ED using IIEF-5 and vibration perception threshold (VPT).[41] They found ED in 77.2% patients with T2DM and determined that ED was significantly associated with age, duration of diabetes, glycemic control, and BMI. Glycemic control plays a vital role in the prevention and treatment of diabetic ED. During the experiment using 60 Sprague-Dawley rats to compare the improving effects of anti-glycemic agents phlorizin and insulin on diabetic ED, it was revealed that glycemic control, rather than the type of anti-glycemic agent, is more important for the prevention and treatment of diabetic ED.[42]

Furthermore, Almigbal's study has found several factors significantly associated with ED, including age ($p = 0.01$), level of education ($p = 0.01$), monthly income ($p = 0.01$), occupation ($p = 0.01$), duration of diabetes ($p = 0.01$) and type of diabetes treatment ($p = 0.01$).[32] Age of more than 60 years, duration of diabetes, and uncontrolled diabetes were also associated with increased risk

of ED.[32] The present study reveals significant association of ED with secondary outcomes such as advanced age, occupation, income, duration of diabetes, and type of diabetes treatment in Saudi population. Regarding age, MMAS has reported that risk of ED increases with age.[14] However, in another 10-year interval, web-based survey among 900 participants, there was no difference in the age-adjusted overall prevalence of IIEF-5 ED, although considerable decrease was found in the age-adjusted overall prevalence of self-ED. In addition, psychosocial factors were relatively important in young men aged less than 40 years with ED, and as age increased, systemic factors were more associated with ED. Therefore, a psychosocial approach needs to be considered in healthy young men with ED, and a focus on chronic diseases is required in older patients with ED.[43] Regarding occupation, Prabhakaran et al. have reported that unskilled workers suffered more from ED than skilled workers.[44] Regarding duration of diabetes and income, Seid et al. have reported significant association of ED in those with longer duration of diabetes and lower monthly income.[19] Contrary to the previous studies, the present study reveals no association between smoking and ED.

CONCLUSIONS

Single-question self-report of ED is a valid and reliable tool to screen the diabetic patients suffering from sexual problems. As both T2DM and ED are prevalent in Saudi Arabia, such tools may help to identify ED in diabetic patients and warrant early management.

ACKNOWLEDGEMENT

None.

DISCLOSURE OF INTEREST

The authors report no conflict of interest.

FUNDING

None

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