Prevalence of erectile dysfunction in Type 2 diabetes mellitus (T2DM) and its predictors among diabetic men

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ABSTRACT

Background: Diabetes mellitus (DM) is one of the common causes of morbidity and mortality globally. It has also been associated with erectile dysfunction (ED) adding to poor quality of life. The present study aimed to determine the prevalence of ED and its predictors among diabetic men. Material and Methods: A hospital-based cross-sectional observational study was conducted at a tertiary care centre including 357 diabetic men recruited over one and half years. ED was identified using International Index of Erectile Function score and independent predictors were identified using multiple logistic regression analysis. Results: ED was found in 212 (59.38%) diabetic males. A strong negative correlation was found between potency score and age (r = −0.647), and a moderate negative correlation with duration of DM (r = −0.324), systolic blood pressure (SBP), and diastolic blood pressure. BMI, fasting blood sugar, serum cholesterol, and serum creatinine showed a weak negative correlation with potency score. Serum testosterone level showed a strong positive correlation with potency score. Age, SBP, duration of diabetes, fasting blood sugar, and serum-free testosterone (P < 0.05) were independent predictors of ED. Conclusion: Prevalence of ED is high in diabetic males. Better blood sugar control and blood pressure control could reduce sexual dysfunction in diabetic men and improve quality of life.

Keywords: Diabetes, diabetes mellitus, erectile dysfunction, hyperglycemia, sexual dysfunction

Introduction

Diabetes mellitus (DM) is one of the most common chronic diseases worldwide,¹ expected to rise significantly in coming decades,² with India already been called “The Diabetes capital of the world.” Diabetes is now one of the leading causes of death worldwide.¹,³ It has been associated with both macrovascular (cardiovascular disease [CVD] and stroke) and microvascular (including retinopathy, nephropathy, and neuropathy) complications.⁴,⁵

Recent concept in the pathogenesis of Type 2 DM (T2DM) is an ominous octet. Increased risk of CVD results, in part, due to clustered risk factors accompanying diabetes⁶ including hypertension, elevated low-density lipoprotein cholesterol, and obesity.⁷ A diabetic person also has an elevated risk for sight loss, foot and leg amputation, and renal failure, due to microvascular complications, which cause damage to the nerves and small blood vessels.⁸,⁹

Diabetes has also been associated with sexual dysfunction in men¹⁰ including increased risk of erectile dysfunction (ED)¹¹,¹²

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Among women, evidence regarding the association between diabetes and sexual dysfunction is less conclusive,[23] though some studies have also reported a higher prevalence of female sexual dysfunction in diabetic women.[24]

Though hyperglycemia is the main determinant of vascular diabetic complications, its role in the pathogenesis of sexual dysfunction is unclear. Clinical conditions like hypertension, obesity, metabolic syndrome, smoking, and atherogenic dyslipidemia that coexist with diabetes are risk factors for sexual dysfunction.[16]

Several studies have associated ED with cardiovascular risk factors, like diabetes,[10,15,16] smoking,[17] hypertension,[18] hyperlipidemia,[19] metabolic syndrome as well as depression[19] lower urinary tract symptoms,[20] and poor health state.[11] Moreover, ED is a marker of significantly increased risk of CVD, CHD, stroke, and all-cause mortality.[21]

ED is a common sexual disorder that increases with age in the general population. However ED is known to occur at an earlier age,[10] is more severe, and less responsive to oral drugs[22] in diabetes, leading to poor quality of life.[23] Identification of factors associated with ED might prevent or delay its progression. Here, the role of primary healthcare physician plays a critical role in raising the awareness among the patient suffering from the disease that early identification, controlling the diabetes. Educating them that ED can be because of the uncontrolled disease can significantly decrease the prevalence of same and at the same time can improve the quality of life. Hence, the present study aims to determine the proportion of Diabetics with ED and to determine its associated factors.

**Material and Methods**

This hospital-based cross-sectional observational study was conducted in the Department of General Medicine, one of the largest tertiary referral hospital in Northern India. Informed written consent was sought from all the participants following the administration of the participant information sheet. The study was done according to principles laid by the Declaration of Helsinki. The study was approved by the ethics review board of SMS Medical College, Rajasthan, India (IEC No/2006/MC/EC/2020). For sample size calculation, the prevalence of ED was taken as 50% among men to obtain the maximum sample size for a fixed absolute precision. Using $n = Z^2pq/d^2$ formula for cross-sectional study, where $n = \text{sample size}, Z = \text{Level of significance which is 1.96 for reporting confidence interval of 95\%}, p = \text{the prevalence of ED}, q = 1 - p, \text{and } d = \text{absolute precision of 5\%}$. The total sample size was found to be 384 participants, out of which 357 participants (93\% response rate) were included in the study over a period of one and half years. Patients with diagnosis of major depressive disorder or history of spinal or prostate surgery or other known secondary causes of ED were excluded from the study.

ED is defined as the persistent inability to achieve or maintain penile erection for successful sexual intercourse,[24] causing decreased quality of life in men.[15,22] In the present study, ED was identified in study subjects using the International Index of Erectile Function-5.[25] General, demographic, and clinical information was obtained using a predesigned semi-structured questionnaire. Data collection was started after obtaining ethical clearance from Institute’s Ethical Committee. Eligible study subjects were recruited consecutively and written informed consent was obtained from all study subjects.

**Statistical analyses**

The qualitative variables were expressed as frequencies and percentages and analyzed using the Chi-square test. Quantitative variables were expressed as mean and standard deviations and analyzed using the student $t$-test. Correlation was found between continuous variables analyses by using Pearson correlation coefficient. Multiple logistic regression analysis was performed to find out the significant predictors of the ED. A $P$ value < 0.05 was taken as statistically significant. All statistical analyses were done using SPSS trial version 20.

**Results**

ED was found in 212 patients (59.38\%) diabetic males [Figure 1]. The mean potency score of diabetics with ED (11.45 ± 3.86) was significantly higher ($P < 0.001$) as compared to those without ED (23.34 ± 1.14). A strong negative correlation was found between potency score and age ($r = -0.647$), and a moderate negative correlation with duration of DM ($r = -0.324$), systolic blood pressure (SBP), and diastolic blood pressure (DBP). BMI, fasting blood sugar (FBS), serum cholesterol, and serum creatinine showed a weak negative correlation with potency score [Table 1]. Serum testosterone level showed a strong positive correlation with potency score [Figure 2]. On univariate analysis, age, BMI, duration of DM, FBS, SBP, and DBP, serum total cholesterol, serum creatinine were found to be significantly associated with ED. Serum-free testosterone was also significantly lower in those with ED [Table 2].

| Variables                  | Correlation coefficient | $P$     |
|----------------------------|-------------------------|---------|
| Age                        | −0.647                  | <0.001  |
| Duration of diabetes       | −0.324                  | <0.001  |
| SBP (mmHg)                | −0.593                  | <0.001  |
| DBP (mmHg)                | −0.317                  | <0.001  |
| BMI (kg/m²)                | −0.179                  | 0.001   |
| FBS (mg/dL)                | −0.240                  | <0.001  |
| HbA1C (%)                  | −0.057                  | 0.282   |
| Serum TG (mg/dL)           | −0.004                  | 0.947   |
| Serum HDL (mg/dL)          | 0.183                   | 0.052   |
| Serum Cholesterol (mg/dL)  | −0.131                  | 0.013   |
| Serum Creatinine (mg/dL)   | −0.133                  | 0.012   |
| Serum Free Testosterone (pg/mL) | 0.408                | <0.001  |
A test of full model was statistically significant indicating that the predictors as an asset reliably distinguish between ED status. (Chi-square 174, df 7, P < 0.001). Also, the Hosmer and Lemshwow test shows a good fit by high P value and low Chi-square value (Chi-square 9.44, df 8, P > 0.05). NagelKerke’s $R^2$ of 0.522 indicates a good relationship between predictors and grouping. Prediction success overall was 81.5%. The Wald criteria demonstrated that age, systolic blood pressure, duration of diabetes, fasting blood sugar, and serum-free testosterone $(P < 0.05)$ were independent predictors of ED [Table 3].

**Discussion**

ED is a common occurrence in aged men especially in Diabetic ones, who are affected with diabetic vasculopathy and neuropathy.\cite{36} ED is associated with a reduced quality of life and unfortunately occurs at an earlier age in diabetic patients when compared with the general population.\cite{37}

ED was found in 59.39% of diabetic men in the present study. Previous studies have reported the prevalence of ED among diabetic men varying between 35 and 90%\cite{28,36}. Other studies have reported ED in over 50% of diabetic men in the United States\cite{31} and 41% of diabetic men in the Netherlands.\cite{31} Studies from Saudi diabetic patients reported ED among 80% to 90% of the patients.\cite{28,31,32} Higher prevalence reported by some studies could be explained by the fact that they did not exclude secondary psychological factors associated with ED leading to false high prevalence.

In the present study, a significant moderate correlation was found between potency score and age ($r = -0.647$), duration of DM ($r = -0.324$). Whereas SBP, DBP, BMI, FBS, serum cholesterol, and serum creatinine showed a weak correlation with potency score. Serum testosterone level showed a strong positive correlation with potency score. Sharifi et al\cite{32} in 2012 reported almost similar findings including significant moderate correlation with age ($r = -0.44$) and weak correlation with SBP ($r = -0.18$), FBS ($r = -0.17$), HbA1c ($r = -0.2$) and serum creatinine ($r = -0.2$).

ED was found to be significantly associated with higher age. Similar finding had been reported in studies by Sharifi et al\cite{32} and Shi et al\cite{36}. In the present study, the mean duration of diabetes in patients with ED was significantly longer than those without ED which is in concordance with the findings of Sharifi et al\cite{32} Higher mean SBP and DBP were also significantly associated
with ED. Other studies like those by Sharifi et al[34] and Fanuel et al[35] also reported significantly higher mean SBP and DBP in those with ED as compared to without ED.

BMI was significantly lower in the diabetic males with ED (P < 0.001). Contrary to this, Shi et al[35] reported slightly higher BMI (27.72 ± 4.36 kg/m²) in those with ED as compared to those without ED (27.13 ± 3.65 kg/m²). Some other studies have reported no correlation between ED and BMI.[37,38]

In the present study, the mean FBS of patients with ED was significantly higher as compared to those without ED (P < 0.001) as was similarly found reported by Fanuel et al[35]. However, Sharifi et al[34] did not find any significant association of FBS with ED. No significant association was found between ED and HbA1C supporting the results of Sharifi et al[34]. These findings indicate that immediate diabetic control is a possible predictor of ED rather than long-term diabetic control.

Considering lipid profile, only serum cholesterol was found to be significantly associated with ED, and serum triglyceride and HDL showed no significant association. Sharifi et al[34] found no significant association with any lipid parameter, whereas Shi et al[35] found a significant association with HDL. These varying results could be due to the presence of confounding factors like hypolipidemic drugs not taken into consideration in these studies.

Mean creatinine level in those with ED was significantly higher (P = 0.002) as was similarly found in the study by Sharifi et al[34]. Mean serum testosterone level in patients with ED was significantly lower than in those without ED mean level 5.95 ± 1.7 pg/mL (P < 0.001). This result was supported by the findings of Shi et al[35]. Multiple logistic regression analysis found only age, SBP, duration of diabetes, FBP, and serum-free testosterone (P < 0.05) to be independently associated with ED in diabetic men.

**Conclusion**

The prevalence of ED was found to be very high in men with T2DM. Age, blood pressure, duration of disease, FBS, and serum-free testosterone were independent predictors of ED in men with T2DM and some of these are modifiable. Better control of blood pressure and blood sugar level may reduce the prevalence of ED in diabetic, thus improve quality of life and reduce the economic impact associated with its management. Also, community awareness on the same should be included at the primary healthcare level, regular screening using simple one or two questions can be used to prevent the irreversible ED among poor glycemic control diabetic males.

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**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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