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Original Research Article

Erectile dysfunction in patients of diabetes mellitus: a cross sectional study

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ABSTRACT

Background: One of the independent risk factor for erectile dysfunction is diabetes mellitus. The present study planned to determine the prevalence and factors associated with ED in DM.
Methods: A one year cross-sectional study on a total of 208 patients with type 1 or 2 diabetes. National Institutes of Health (NIH) approved questionnaire for International Index of Erectile Function (IIEF) was used to interview each patient to assess for ED.
Results: In this study 12.98% of patients had ED score between 13 to 18 suggestive of mild to moderate ED and 9.62% with 19 to 24 scores suggestive of mild degree. The prevalence of erectile dysfunction was 32.21%. The mean age in patients with erectile dysfunction was significantly high (58.40±10.96 years) compared to those without erectile dysfunction (51.00±11.16 years) ($p<0.001$) Of the 119 patients with duration of diabetes between one to five years 42.02% had ED and of the 3 patients with duration of more than five years 66.67% had ED ($p<0.001$). Prevalence of ED was higher in patients with HbA1c levels between 7.0 to 8.5 (32.76%) and >8.5 (37.07%). Prevalence of erectile dysfunction was higher in patients with history of smoking (63.64%) ($p<0.001$) and alcohol intake (51.85%) ($p<0.001$). The prevalence of erectile dysfunction was also significantly high in patients with history of hypertension (59.7%) ($p<0.001$).
Conclusions: The ED in patients with diabetes mellitus was significantly prevalent with age, duration of diabetes, history of hypertension, cardiovascular disease, glycemic control and hypertriglyceridemia.

Keywords: Diabetes mellitus, Erectile dysfunction, Hypogonadism

INTRODUCTION

Erectile dysfunction is the inability is attain or maintain erection sufficient enough for vaginal penetration. Another word "impotence" can also be used to describe lack of sexual desire and problems with ejaculation or orgasm.[1] Erectile dysfunction (ED) is a major health problem, impairs sexual performance and diminishes self-esteem which leads to difficulty in marital relationship.[2] In year 1995, over 152 million men worldwide experienced ED which increased to 322 million worldwide in 2025.[3] Diabetes mellitus is characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism due to impairment in insulin secretion or action or both.[4] The cases of diabetes mainly fall into two broad categories: those having little or no endogenous insulin secretory capacity (IDDM or type 1 DM) and those who retain endogenous insulin secretory capacity but have a combination of resistance to insulin action and an inadequate compensatory insulin secretory response (NIDDM, or type 2 DM).[4, 5]

In 2011, centers for disease control and prevention (CDC) reported that nearly 26 million Americans have diabetes.[6] Type 2 diabetes mellitus (DM) accounts for

more than 90% of the diabetic population worldwide. According to International Diabetes Federation the number of diabetes cases will to rise from 366 million in 2011 to 552 million by 2030.[7] The top 10 countries in number of people with diabetes are currently India, China, the United States, Indonesia, Japan, Pakistan, Russia, Brazil, Italy, and Bangladesh. The prevalence of diabetes and its adverse health effects have risen more rapidly in South Asia than in any other region of the world.[8]

ED is a common condition among men with diabetes.[9-14] ED in diabetic men is usually because of various factors with neuropathy, atherosclerosis of penile blood vessels and psychological factors being the main underlying conditions.[15]

The prevalence of ED increases with age, and it is common in men with systemic disorders such as hypertension, ischemic heart disease, or diabetes mellitus. DM causes damage to the nerves and blood vessels essential for normal function of the genital organs and can result in impairment of sexual function in both sexes.

Multivariate analyses of several population based cohorts show that of all risk factors diabetes is the main risk factor for ED with an age adjusted relative risk of 1.3 to 3 depending on diabetes type.[16]

In men suffering from diabetes, in comparison with the general population there is earlier onset of ED and is associated with decreased health related quality of life and decreased success of all known ED treatments, including oral pharmacological therapy and penile implants. Glycemic control and ED in men with diabetes have been found to be associated and in patients with poor control are at 2 to 5-fold increased risk for ED compared to patients with good control.[17, 18]

Body weight and adiposity are significantly associated with ED.[19-21] Convergent data from the Health Professionals Follow-up Study, the National Health and Nutrition Examination Study and MMAS show that compared to men with a BMI of less than 25 kg/m^2 the odds of ED are higher in men with a BMI of 25 to 30 kg/m^2 and even higher in men with a BMI of greater than 30 kg/m^2. The risk is increased 1.5 to 3-fold.

Low physical activity and obesity have shown additional risk towards ED. Independent of BMI, physically active men (greater than 16 MET hours per week of exercise) are at 30% lower risk for ED than sedentary men.[22]

Hypogonadism may be a link between T2D/metabolic syndrome and ED. Men with ED and T2D have a higher prevalence of hypogonadism, and low testosterone correlates with poor glycemic control and worsening ED. Levels of testosterone have been seen to be directly affected by visceral and general obesity in men with T2D and metabolic syndrome. Increased aromatase in adipose tissue is responsible for increased androgen conversion from testosterone to estrogens.[22] An association between increased BMI, and waist circumference and hypogonadism has been established in men with T2D.[23-25] Hypogonadism is also associated with other components of metabolic syndrome, such as altered lipid status. Hypogonadal patients with T2D ED have increased triglycerides and lower HDL cholesterol.[26]

Exercise and lifestyle modifications may improve erectile function. Precise glycemic control in diabetics and hypertension can play an important role in preventing or reducing sexual dysfunction.[27]

Cigarette smoking has been shown to be an independent risk factor. In studies evaluating more than 6000 men, the risk of developing ED increased by a factor of 1.5.[28]

The EDIC (epidemiology of diabetes intervention and complication study) is a longitudinal cohort follows up study for the diabetes control and complication trial, in which patients with T1D were randomized to conventional or intensive glycemic control. In an ancillary study of urological complications, the Uro-EDIC, the effect of intensive glycemic control on the subsequent risk of ED was assessed.[29] ED was measured using IIEF in a subset of 291 men with a 1 to 5-year history of diabetes and no microvascular complications (primary prevention), and another group of 280 with a 1 to 15-year history of diabetes with minor complications (secondary intervention). In analyses comparing men initially randomized to intensive vs conventional therapy there was no difference in ED in the primary prevention cohort (OR 1.24; 95% CI 0.68, 2.28). In the secondary intervention cohort ED was significantly less likely in those assigned to intensive control than in those assigned to conventional therapy (OR 0.33; 95% CI 0.18, 0.60).

The prevalence of ED depends on the population studied and the definition and methods used. So far, very few studies have been carried out to establish the incidence and prevalence of this condition in DM patients. Also, epidemiological data on the prevalence of ED in DM in India is scarce. There are no studies from the state of Karnataka showing the prevalence of ED in DM patients. Hence the present study undertaken to determine the prevalence and factors associated with ED in DM.

The objective of the study was to determine the prevalence and factors associated with erectile dysfunction in patients with diabetes mellitus attending KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum or diabetic inpatients admitted in ward

METHODS

Study design: Hospital based cross-sectional study.

Study period: The present study was conducted for one year from January 2012 to December 2013.

Source of data

All patients with Type 1 or 2 diabetes mellitus getting admitted in KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum were studied.

Sample size

A total of 208 patients with type 1 or 2 diabetes were included in the study.

Sampling procedure

After reviewing the literature and considering prevalence as 58%[1] the sample size was calculated by the following formula.

$n=4\ p\ q\ /\ d^2$

Where, n=Sample size; p=Prevalence of the disease=58 q=100–p=42; d=Absolute error=7.5.

Therefore,

$n=4 \times 58 \times 42 / (7.5)^2 = 173.22$

Considering 20% loss of follow up or not willing

$n=20 \times 173.22 / 100=34.64$

Hence effective size = 173.22 + 34.64 = 207.86

$n \approx 208$

Selection criteria

Inclusion criteria

Inclusion criteria were patients greater than 30 years of Age diagnosed as type 1 or 2 diabetes mellitus (self-reported diabetes patients who are on treatment); sexually active, stable heterosexual relation for at least two years.

Exclusion criteria

Exclusion criteria were patients diagnosed as type 1 or type 2 diabetes mellitus with; other endocrine disorders; sexually inactive; hepatic disorders; renal disorders; psychiatric disorders; pelvic or spinal trauma / surgery; men with unfavourable penile anatomy; drugs eg-5α reductase inhibitor, antidepressants, antipsychotics; hypotension; significant cardiovascular disease within past 3 months.

Ethical clearance

The study was approved from the Ethical and Research Committee, Jawaharlal Nehru Medical College, Belgaum.

Informed consent

The patients fulfilling selection criteria were informed in detail about the risks and benefits of the procedure and a written informed consent was obtained before enrolment

Method of collection of data

Demographic data such as age and sex were recorded. Patients were interviewed for the history including diabetic history (duration and treatment), other comorbid conditions, drugs intake, previous surgery, libido, erectile dysfunction and personal history. Further these patients were subjected to thorough clinical examination for anthropometry, waist hip ratio and vitals and genital examination was performed. These findings were recorded on a predesigned and pretested pro-forma.

Investigations

The patients were subjected to the following routine investigations

Complete blood count (CBC), urine – routine and microscopy, blood sugar levels (fasting or post prandial or random), glycosylated haemoglobin, fasting lipid profile, renal function test - urea, serum creatinine, liver function test - SGOT, SGPT

The following investigations were carried out in specific patients after evaluation. Serum testosterone, serum prolactin, thyroid function - T3, T4, TSH

In patients with history of reduced libido and if testosterone levels were subnormal then only prolactin levels were estimated.

Outcome variables

Erectile dysfunction

National Institutes of Health (NIH) approved questionnaire for International Index of Erectile Function (IIEF), printed in different local languages – Hindi, Kannada, Marathi, was used to interview each patient to assess for ED.[1]

Risk factors

Based on the history and investigations the patients were evaluated for various risk factors.

Statistical analysis

The data obtained was coded and entered in Microsoft Excel spread sheet. The categorical data was expressed as rates, ratios and percentages and comparison was done using chi-square test. Continuous data was expressed as mean±standard deviation. A ‘p’ value of less than or equal to 0.05 was considered as statistically significant.

RESULTS

This one year hospital based cross-sectional study was conducted on a total of 208 patients with type 1 or 2 diabetes in the Department of General Surgery, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum over a period, from January 2012 to December 2012.

Table 1: Interpretation of ED score (n=208).

Interpretation (scores)	Distribution	
	No.	Percentage (%)
Severe (6 or less)	7	3.37
Moderate (7-12)	13	6.25
Mild to moderate (13-18)	27	12.98
Mild (19-24)	20	9.62
25 (No ED)	141	67.79
Total	208	100.00

In the present study 12.98% of patients had erectile dysfunction score between 13 to 18 suggestive of mild to moderate erectile dysfunction and 9.62% with 19 to 24 scores suggestive of mild degree. A score of <6 and 7 to 12 was seen in 3.37% and 6.25% of patients. However, 67% of the patients had no erectile dysfunction (score of 25).

Table 2: Incidence of ED (n=208).

Erectile dysfunction	Distribution	
	No.	Percentage (%)
Present	67	32.21
Absent	141	67.79
Total	208	100.00

In this study the prevalence of erectile dysfunction was 32.21%.

In the present study the prevalence of erectile dysfunction was significantly high in 71 to 80 years age group (75%) and 61 to 70 years (35.90%) (p<0.001).

Table 3: Association of age with ED.

Age group (years)	Erectile dysfunction				Total (n=208)	
	Present (n=67)		Absent (n=141)			
	No	%	No	%	No	%
31 to 40	3	10.34	26	89.66	29	100.00
41 to 50	13	22.81	44	77.19	57	100.00
51 to 60	25	37.31	42	62.69	67	100.00
61 to 70	14	35.90	25	64.10	39	100.00
71 to 80	12	75.00	4	25.00	16	100.00
Total	67	32.21	141	67.79	208	100.00

p<0.001.

Table 4: Comparison of mean age in patients with ED and non ED.

Erectile dysfunction	Mean age (years)	
	Mean	SD
Present	58.40	10.96
Absent	51.00	11.16

p<0.001.

In this study the mean age in patients with erectile dysfunction was significantly high (58.40±10.96 years) compared to those without erectile dysfunction (51.00±11.16 years) (p<0.001).

Table 5: Duration of diabetes and ED.

Duration (years)	ED				Total (n=208)	
	Present (n=67)		Absent (n=141)			
	No	%	No	%	No	%
<1	15	17.44	71	82.56	86	100.00
1 to 5	50	42.02	69	57.98	119	100.00
>5	2	66.67	1	33.33	3	100.00
Total	67	32.21	141	67.79	208	100.00

p<0.001.

In this study of the 119 patients with duration of diabetes between one to five years 42.02% had erectile dysfunction and of the 3 patients with duration of more than five years 66.67% had erectile dysfunction (p<0.001).

In the present study prevalence of erectile dysfunction was higher in patients with HbA1c levels between 7.0 to 8.5 (32.76%) and >8.5 (37.07%) compared to those who had HbA1c <7.0 (14.71%). This difference was statistically significant (p=0.049).

Table 6: Glycaemic control and ED.

HbA1c	ED				Total (n=208)	
	Present (n=67)		Absent (n=141)			
	No	%	No	%	No	%
< 7.0	5	14.71	29	85.29	34	100.00
7.0 to 8.5	19	32.76	39	67.24	58	100.00
> 8.5	43	37.07	73	62.93	116	100.00
Total	67	32.21	141	67.79	208	100.00

p=0.049.

In the present study prevalence of erectile dysfunction was higher in patients with history of smoking (63.64%). This difference was statistically significant (p<0.001) (Table 7).

In the present study 27 patients reported alcohol intake. Among them, 51.85% of patients had erectile

dysfunction. This difference was statistically significant (p=0.019) (Table 8).

Table 7: Association of smoking with ED.

Smoking	ED				Total (n=208)	
	Present (n=67)		Absent (n=141)			
	No	%	No	%	No	%
Present	21	63.64	12	36.36	33	100.00
Absent	46	26.29	129	73.71	175	100.00
Total	67	32.21	141	67.79	208	100.00

p<0.001.

Table 8: Association of alcohol intake with ED.

Alcohol intake	ED				Total (n=208)	
	Present (n=67)		Absent (n=141)			
	No	%	No	%	No	%
Present	14	51.85	13	48.15	27	100.00
Absent	53	29.28	128	70.72	181	100.00
Total	67	32.21	141	67.79	208	100.00

p=0.019.

Table 9: Association of hypertension with ED.

ED	Hypertension	
	Number	Percentage (%)
Present	40	59.70
Absent	22	15.60

p<0.001.

Table 10: Association of cardiovascular disease with ED.

ED	CVD	
	Number	Percentage (%)
Present	22	32.80
Absent	19	13.50

p=0.011.

Table 11: Characteristics of study population with and without ED.

Components	ED				P value
	Present (n=67)		Absent (n=141)		
	Mean	SD	Mean	SD	
HbA1c	12.40	14.74	9.80	9.53	0.133
Cholesterol	172.10	44.30	162.80	36.40	0.113
Triglycerides	160.10	63.88	130.40	47.75	0.001
BMI	25.4	4.08	24.4	3.78	0.081
WHR	1.12	1.04	1.01	0.1	0.414
Plasma Glucose	171.8	64.97	165.8	66.47	0.545
Hb	12.09	1.32	13.10	8.18	0.318

In the present study the prevalence of erectile dysfunction was significantly higher in patients with history of hypertension (59.7%) (p<0.001) (Table 9).

In this study the prevalence of erectile dysfunction was significantly higher in patients with history of cardiovascular disease (32.80%) (p=0.011) (Table 10).

In this study, the qualitative analysis of risk factors showed significantly raised mean triglycerides in patients with erectile dysfunction (p=0.001).

DISCUSSION

ED is an extremely distressing and demoralizing disease of male as feeling of lack of man hood sends a shiver of fear down the spine in most of men.[31] One of the independent risk factor for ED is diabetes mellitus. People with diabetes have an increased risk of sexual dysfunction.

In the present study the prevalence of ED was 32.21% (score<25) and 67.79% of the patients had normal ED (score of >25). Among those with ED, 12.98% of patients mild to moderate ED, 9.62% had mild, 6.25% had moderate and 3.37% had severe erectile dysfunction. ED affects approximately 1 in 10 men worldwide.[32] The prevalence of ED has been reported in various studies as ranging from 20% to greater than 70%.[14,19] A similar study from Kochi reported 58% (85/147) subjects, who reported to have history of ED.[15] Another study from Rajasthan on 50 type-2 diabetic patients using international index of ED (IIEF-5) reported the prevalence of erectile dysfunction as 78% (mild, moderate and severe ED was present in 6, 36 and 36%, respectively).[33]

The risk of ED increases with age. As the population continues to grow and age, the prevalence is expected to continue to increase, with an estimate that there will be 322 million men worldwide with ED by the year 2025.[34]

In the present study the prevalence of erectile dysfunction was significantly high in 71 to 80 years age group (75%) and 61 to 70 years (35.90%) (p<0.001). The mean age in patients with erectile dysfunction was also significantly high (58.40±10.96 years vs. 51.00±11.16 years; p<0.001) compared to those without erectile dysfunction. Epidemiologic studies have demonstrated the prevalence of 35% of men aged 40 to 70 years suffer from moderate or severe ED, and an additional 25% have milder forms of ED.[35] A similar study from Kochi reported 58% (85/147) subjects, who reported to have history of ED, were between 30–70 years with a mean 52±8 years and 89% (76/85) of them were above the age of 45 years.[15] Study also found that, as the age goes over 45 years there is significant increase in the prevalence of ED. A similar study from Rajasthan reported that, prevalence of erectile dysfunction increased with the increase in age.[20] Prevalence increased from 20% in age group of <40 to

100% in age group of >60 years. Similar trends have been shown in earlier studies also.[36] The findings of the present study were consistent with these studies. Most of the earlier studies had also reported significant correlation between ED and age. The effect of age on prevalence and severity of disease might be due to age-related changes occurring in body and also various other complications that may coexist in diabetic patients, but ultimately the accelerated atherosclerosis is the common denominator for increased prevalence of ED and cardiovascular disease in ageing population.[33]

In this study of the 119 patients with duration of diabetes between one to five years 42.02% had erectile dysfunction and of the 3 patients with duration of more than five years 66.67% had erectile dysfunction (p<0.001). These findings suggest that, the erectile dysfunction increased with the duration of diabetes. However, in a study from Kochi, India the duration of diabetes did not show any significant increase in the incidence of ED.[15]

In this study the prevalence of erectile dysfunction was higher in patients with HbA1c levels between 7.0 to 8.5 (32.76%) and >8.5 (37.07%) compared to those who had HbA1c <7.0 (14.71%). This difference was statistically significant (p<0.049). Similar findings were reported in a study from Kochi, India which stated that, in those patients with ED, the overall glycemic control was significantly worse than in the non-ED group, which reveals the relationship of poor glycemic control to ED.[15] Becon et al reported that, for men over age 50 years, increasing duration of diabetes was positively associated with increased risk of ED relative to non-diabetic subjects. This association persisted despite the higher prevalence of other comorbid conditions.[25]

In the present study the prevalence of ED was significantly higher in patients with history of hypertension (59.7%; p<0.001), cerebrovascular disease (32.80%; p<0.001), positive family history for erectile dysfunction (21.05%; p=0.025) and prostate surgery (83.58%; p=0.006). Giuliano et al in 1186 men with both hypertension and diabetes reported, ED in 77%.[37] In contrast, a study from Kochi reported that, comorbidities like hypertension, PVD and dyslipidemia were not statistically significant in those with ED and those without ED.[15]

In the present study prevalence of ED was higher in patients with history of smoking (63.64%; p<0.001) and alcohol consumption (51.85%; p<0.001) Fedele and associates have also shown that smoking habit of the patient acts as a risk factor for ED.[17] In contrast, a study reported that, alcohol and smoking habits in diabetic patients had not shown significant contribution to ED.[15]

Hyperlipidemia characterized by high cholesterol and/or low HDL-cholesterol levels, hypertension and obesity are conditions that often coexist with diabetes; all may be independent risk factors for ED among diabetic men.[38] In this study 23.40% of patients with abnormal liver function had erectile dysfunction (p=0.142). The qualitative analysis showed significantly raised mean triglycerides in patients with erectile dysfunction (p=0.001). It is noteworthy that in two population-based observational studies carried out in China and the United States on type 2 diabetic men, there was no significant association between circulating lipid levels (total cholesterol, LDLD-cholesterol, HDL-cholesterol and triglyceride) and the risk of ED, pointing to the apparent conclusion that dyslipidemia does not have a significant role in the risk of diabetic ED.[39,40] However, in this study the association was limited to only hypertriglyceraedimia which could be attributed to the smaller sample size.

This study had certain limitation that is, the study included all the age groups. Further studies with large sample size and age standardized selection criteria would determine the exact prevalence and associated risk factors.

CONCLUSION

The prevalence of ED in patients with diabetes mellitus was 32.21%. Among these, 12.98% of patients mild to moderate ED, 9.62% had mild, 6.25% had moderate and 3.37% had severe erectile dysfunction. The erectile dysfunction in patients with diabetes mellitus was significantly prevalent with age, diabetic duration of diabetes, history of hypertension, cardiovascular disease, glycemic control and hypertriglyceridemia.

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