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ORIGINAL ARTICLE

Frequency of Erectile Dysfunction in Type 2 Diabetic Male and its Association with Glycemic Status

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ABSTRACT

Background: *Erectile dysfunction (ED) has a high prevalence (20-85%) in men with diabetes, conferring a threefold increased risk. Its onset is age-dependent and occurs 10-15 years earlier in diabetic patients. In type 2 diabetes (T2DM), key risk factors include age, disease duration, sedentary lifestyle, and glycemic control. This study aims to determine the frequency of ED and its association with glycemic status in males with T2DM.* ***Methods & Materials:*** *This cross-sectional study was conducted in the Department of Dermatology and Venereology and Endocrinology at Bangabandhu Sheikh Mujib Medical University, Dhaka, with IRB approval. Enrolled were randomly selected married male T2DM patients, aged 21-59 years, with a stable spousal relationship. Erectile function was assessed using the validated Bengali IIEF-5 questionnaire. ED severity was classified into no ED (score ≥26), mild (17-25), moderate (11-16), and severe (≤10). Glycemic control was categorized as controlled (HbA1c <7.0%) and uncontrolled (HbA1c ≥7.0%).* ***Result:*** *Among 382 diabetic men, 41.4% had ED (17.8% mild, 13.4% moderate, 10.2% severe). Severe ED was most frequent (59.0%) in the 50-59-year age group. Men with ED had significantly higher glycemic parameters and triglycerides. A diabetes duration of over 10 years was associated with a threefold greater likelihood of ED. Diabetes duration was a key factor, as those with T2DM for more than 10 years were over three times more likely to have ED.* ***Conclusion:*** *Glycemic measures, BMI, age, and longer diabetes duration all showed a strong connection to ED severity, highlighting the need for targeted management.*

Keywords: *Erectile dysfunction, Type 2 diabetes mellitus, Glycemic control, HbA1c.*

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INTRODUCTION

Erectile dysfunction (ED) is defined as the persistent inability to achieve or maintain a penile erection for successful sexual intercourse, causing decreased quality of life in men [1,2]. DM is associated with multiple complications; ED is one of the chronic complications of diabetes in male patients [3]. ED is highly prevalent; it is estimated that by 2025 the prevalence will be approximately 322 million. The proposed mechanisms of ED in diabetic patients are represented by vasculopathy, neuropathy, visceral adiposity, insulin resistance, and hypogonadism [4]. The fundamental mechanisms are thought to be the same as for other diabetic complications: increased polyol pathway flux, intracellular accumulation of AGEs, activation of protein kinase C, and increased flux through the hexosamine pathway [5].

Erectile dysfunction has been a taboo topic in Asian countries, but related research has been increasing recently. The reported prevalence of ED in Asian countries varies greatly. The prevalence of ED among men with diabetes also varies widely, from 35% to 90% [6]. The risk of developing ED is about three times higher in diabetic men compared to those who do not have diabetes [7]. In a few studies, the frequency of ED was found to be 40% in the general population over 40 years of age and 65.3% in those with type 2 diabetes [8]. The prevalence of ED among patients with history of type 2 DM only shows the prevalence of ED severity, by international index of erectile function (IIEF), as 73.10%, 86.10% and 90% [9]. In Bangladesh, the overall frequency of ED was 53.98% [5]. The frequency of ED increased with age; ED frequency was 38.4% among the 60–69 years group, being 8 times more likely than in those aged 30–39 years. The frequency of ED increased with the duration of DM, ranging from 44.6% for DM lasting <5 years to 88.9% for DM >20 years. Patients with ED had a longer duration of DM than those without [5]. Diabetic men have almost a threefold higher probability to develop ED compared with non-diabetics [10]. However, it is still unclear whether ED in diabetic men is a consequence only of hyperglycaemia and microvascular complications or a collection of risk factors, as the patients often present with other ED risk factors, such as cardiovascular diseases, hypertension, smoking and obesity at the same time[11].

The importance of poor glycaemic control as an indicator of reduced erectile function in diabetic men is still unclear. Several studies have demonstrated a significant correlation between the two [12-14]. However, some studies have been mixed, showing only a borderline correlation or no correlation at all [15-18]. Mahbub et al. found that poor glycemic control had a significant association with the frequency of ED and its severity [1]. Only 3.5% of patients with well-controlled diabetes (HbA1c <7%) had ED, and all had mild ED. The

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frequency of ED increased to 71.6% in patients with uncontrolled diabetes (HbA1c ≥7%), and the frequency of severe ED was 28.4%. ED is almost ignored by the Bangladeshi researchers. But it can be easily detected by having male patients' complete standardized questionnaires IIEF-5 [19].

In this study, the International Index for Erectile Function Questionnaire (IIEF-5), an internationally accepted and practical measure, will be used to estimate the prevalence of ED and investigate its associated factors among Bangladeshi men with diabetes. The aim of the study will be to conduct research to find out the Frequency of Erectile Dysfunction in Type 2 Diabetic Male and its Association with Glycemic Status.

OBJECTIVE

- To evaluate the frequency of erectile dysfunction among Bangladeshi Type 2 diabetic male at BSMMU and its association with glycemic status.

METHODS & MATERIALS

This observational type of cross-sectional study was conducted in the Department of Dermatology and Venereology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from March 2019 to July 2020. The study population consists of 382 patients and these patients were selected from both the outpatient and inpatient departments of the hospital including having established stable relationships with their wives spanning at least the last 6 months. The selection criteria are given below.

Inclusion Criteria

- Men with type 2 diabetes who are sexually active and attending the study clinics will be considered eligible to participate
- Age of 21 years to 59 years
- Active sexual relationship for at least the past 6 months
- Capable to answer a self-applied questionnaire

Exclusion Criteria

- Past lower urinary tract or urethral/penile surgery
- History of pelvic fracture and spine injury or surgery
- Patients on medications that affect erectile function.
- Any known disease of the male genitalia
- Uncontrolled hypertension and dyslipidemia
- Patients taking different medications like beta-blocker, diuretics etc.
- Psychological cause- anxiety, depressive disorders etc.
- Known major medical illness (e.g. renal, hepatic or cardiovascular disease)
- Thyroid and other gonadal hormone deficiency.

The protocol was approved by the Institutional Review Board (IRB) of Bangabandhu Sheikh Mujib Medical University (BSMMU) in Dhaka. All respondents were informed about the study's objectives, procedures, risks, and benefits. They were also informed about the researcher's name.

Statistical analysis was carried out using the Statistical Package for the Social Sciences (SPSS) software version 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Continuous data were expressed as the mean ± standard deviation (SD), and categorical variables were expressed as percentages. Student's t-test, Chi-square test, and ANOVA were performed to compare the variables between different groups. Multiple regression analysis was conducted to determine the independent effects of different variables on the presence of erectile dysfunction (ED) and to calculate the odds ratio. A p-value of ≤0.05 was considered statistically significant.

RESULTS

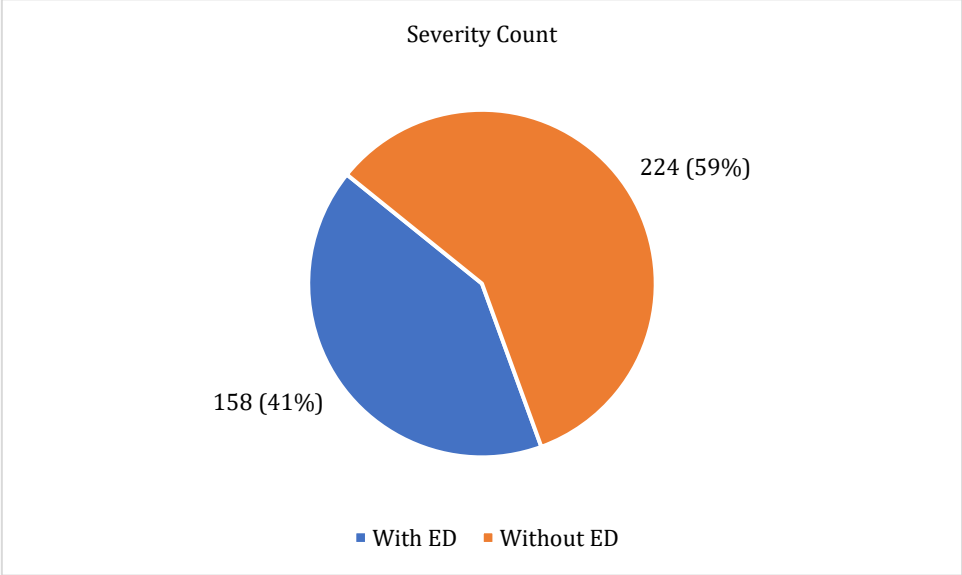

Figure – 1: Pie diagram showing the ED frequency among the study respondents

Among study population, 41% suffer from ED, whereas 59% have no complain of ED (Figure 1).

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Table I shows the demographic characteristics of the study participants. There is a significant association between age and ED, with a higher prevalence of ED in the 50-59 age group among those with ED compared to the no-ED group (41.8% vs. 28.6%) and a statistically significant difference in mean ages between the two groups (48.7 years vs. 44.3 years, p = 0.015). Similarly, BMI is also significantly associated with ED, as a larger proportion of individuals with ED are classified as overweight (63.3% vs. 49.1% in the no-ED group), and the mean BMI is significantly higher in the ED group (26.5 kg/m2 vs. 25.9 kg/m2, p= 0.042). The data reveals that higher secondary education is the most common level in both groups. Businessmen are more prevalent among participants with ED (46.8%), while the no-ED group has a slightly higher percentage of businessmen (55.4%). The service and unemployed categories show higher proportions in the no-ED group. There were no significant differences in terms demographic variables between with or without ED group (p>0.05).

Table – I: Demographic characteristics of the study subjects (*n*=382)

Variables	With ED (n=158) No. (%)	Without ED (n=224) No. (%)	p-value
Age group (years)			
30–39	42 (26.6)	28 (12.5)	0.015
40–49	50 (31.6)	132 (58.9)	
50–59	66 (41.8)	64 (28.6)	
Mean ± SD	48.7 ± 7.39	44.3 ± 6.25	
Range	32–59	30–59	
BMI (kg/m^2)			
Normal weight (18.5-24.99)	42 (26.6)	95 (42.4)	0.042
Overweight (25–29.99)	100 (63.3)	110 (49.1)	
Obese (>30)	16 (10.1)	19 (8.5)	
Mean ± SD	26.5 ± 2.70	25.9 ± 2.89	
Level of education			
Illiterate	15 (9.5)	17 (7.6)	0.326
Primary	18 (11.4)	33 (14.7)	
Secondary	51 (32.3)	56 (25.0)	
Higher secondary	44 (27.8)	79 (35.3)	
Graduate & above	30 (19.0)	39 (17.4)	
Occupational status			
Farmer	8 (5.1)	18 (8.0)	0.163
Businessman	74 (46.8)	124 (55.4)	
Service	54 (34.2)	52 (23.2)	
Unemployed	17 (10.8)	23 (10.3)	
Other	5 (3.2)	7 (3.1)	

Data were expressed as frequency (%) and mean ± SD Unpaired t-test and Chi-square test p<0.05 considered as a level of significant

The data in Table II reveals a strong and statistically significant association between age and the severity of Erectile Dysfunction (ED). In the 30-39 age group, younger individuals are found to have a relatively lower prevalence of severe ED (15.4%) compared to the older age groups, with a substantial 38.2% experiencing mild ED. In the 40-49 age group, the distribution is more balanced, but the percentage of severe ED remains notable (25.6%). In the 50-59 age group, a significantly higher proportion of individuals experience moderate (45.1%) and severe (59.0%) ED, pointing to age as a clear risk factor for the severity of ED. The analysis demonstrates a statistically significant association between BMI and the severity of Erectile Dysfunction (ED). Among normal-weight individuals (BMI 18.5-24.9), a lower prevalence of moderate and severe ED is observed, with 43.6% experiencing severe ED. This suggests that maintaining a normal weight may be associated with a lower risk of developing moderate and severe ED. In contrast, among overweight individuals (BMI 25-29.9), a higher proportion of experiences mild (58.8%) and moderate (78.4%) ED.

Table – II: Association of ED severity with age and BMI (*n*=382)

Variable	ED measured by IIEF-5				
	Mild ED (n=68)	Moderate ED (n=51)	Severe ED (n=39)	No ED (n=224)	p-value
Age group (years)					
30-39	26(38.2%)	10(19.6%)	6(15.4%)	28(12.5%)	<0.001
40-49	22(32.4%)	18(35.3%)	10(25.6%)	132(58.9%)	
50-59	20(29.4%)	23(45.1%)	23(59.0%)	64(28.6%)	
BMI (kg/m2)					
Normal weight (18.5-24.9)	21(30.9%)	4(7.8%)	17(43.6%)	95(42.4%)	0.001
Overweight (25-29.9)	40(58.8%)	40(78.4%)	20(51.3%)	110(49.1%)	
Obese (>30)	7(10.3%)	7(13.7%)	2(5.1%)	19(8.5%)	

Data were expressed as frequency and percentage and p-value measured by Unpaired t-test, p<0.05 considered as a level of significant

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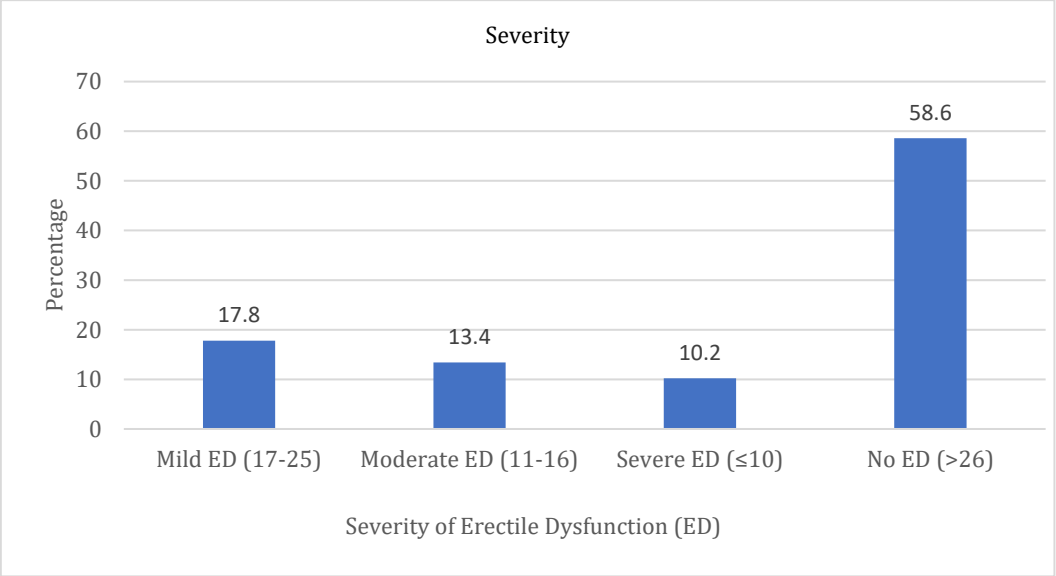

Figure – 2: Bar Chart Illustrating the Severity of Erectile Dysfunction (ED) in Type 2 Diabetic Patients

Figure 2 shows the Severity of Erectile Dysfunction (ED) in Type 2 Diabetic Patients. Table III shows the presence of ED among hypertensive and normotensive participants. Of the 158 participants with ED, 31 (19.6%) were hypertensive, while 127 (80.4%) were normotensive. Among the 224 participants without ED, 49 (21.9%) were hypertensive, while 175 (78.1%) were normotensive. There was no statistically significant difference between hypertension with or without ED group (p>0.05)

Table – III: Presence of ED among hypertensive and normotensive individuals

Hypertension	With ED (n=158) No. (%)	Without ED (n=224) No. (%)	p-value
Hypertensive	31(19.6%)	49(21.9%)	0.594
Normotensive	127(80.4%)	175(78.1%)	
Total	158(100.0%)	224(100.0%)	

Data were expressed as frequency and percentage and p-value measured by Chi-square test, p<0.05 considered as a level of significant

Table IV shows that the mean FBS level was 7.84±2.04 among participants with ED, which was significantly higher than the mean FBS level of 6.41±1.56 among participants without ED (p<0.001). The mean blood sugar level 2 hours after FBS was also significantly higher among participants with ED (11.44±3.50) compared to those without ED (9.45±2.59) (p<0.001). The mean HbA1c level was significantly higher among participants with ED (8.21±0.82) compared to those without ED (7.95±0.91), and this difference was statistically significant (p=0.005). These results suggest that there is a significant association between glycemic status and the presence of ED in this population.

Table – IV: Comparison of FBS, 2hrs after FBS and HbA1c between with or without ED (*n*=382)

Glycemic status	With ED (n=158)	Without ED (n=224)	p-value
	Mean ± SD	Mean ± SD	
FBS	7.84±2.04	6.41±1.56	<0.001
2 hours after BF	11.44±3.50	9.45±2.59	<0.001
HbA1c	8.21±0.82	7.95±0.91	0.005

Data were expressed as Mean ± SD and p-value measured by Unpaired t-test, p<0.05 considered as a level of Significant

Table V shows the correlation of the International Index of Erectile Function-5 (IIF- 5) score with age, BMI, HbA1c, and duration of disease. The results indicate that age had a weak negative correlation with IIF-5 score (r=-0.131, p=0.011), while BMI had a weak negative correlation that was not statistically significant (r=-0.085, p=0.095). HbA1c had significant negative correlation with IIF-5 score (r=-0.242, p<0.001), indicating that higher HbA1c levels were associated with lower IIF-5 scores. Duration of disease had significant negative correlation with IIF-5 score (r=-0.359, p<0.001), suggesting that a longer duration of disease was associated with lower IIF-5 scores. Overall, these results suggest that HbA1c and duration of disease are important factors to consider when evaluating the IIF-5 score in this population.

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Table – V: Correlation of IIF-5 score with age, BMI, HbA1c and duration of disease (*n*=382)

Pearson Correlation Test	r-value	p-value
Age (in years)	-0.131	0.011
BMI (kg/m2)	-0.085	0.095
HbA1c	-0.242	<0.001
Duration of disease (years)	-0.359	<0.001

Table VI shows the association of the duration of type 2 diabetes mellitus (T2DM) with ED. Of the 158 participants with ED, 105 (66.5%) had T2DM for 5-9 years, while 23 (14.6%) had T2DM for less than 5 years and 30 (19.0%) had T2DM for 10-15 years. Among the 224 participants without ED, 146 (65.2%) had T2DM for 5-9 years, while 61 (27.2%) had T2DM for less than 5 years and 17 (7.6%) had T2DM for 10-15 years. The mean duration of T2DM was significantly higher among participants with ED (7.14±2.68 years) compared to those without ED (5.95±2.54 years) (p<0.001). These results suggest that there is a significant association between the duration of T2DM and the presence of ED in this population, with a longer duration of T2DM being associated with a higher likelihood of ED.

Table – VI: Association of duration of T2DM with ED (*n*=382)

Duration of T2DM (years)	With ED (n=158)	Without ED (n=224)	p-value
	Mean ± SD	Mean ± SD	
<5	23(14.6%)	61(27.2%)	<0.001
9-May	105(66.5%)	146(65.2%)	
15-Oct	30(19.0%)	17(7.6%)	
Total	158(100.0%)	224(100.0%)	
Mean ± SD (years)	7.14 ± 2.68	5.95 ± 2.54	

Data were expressed as frequency (%) and p-value measured by Unpaired t-test, p<0.05 considered as a level of significant

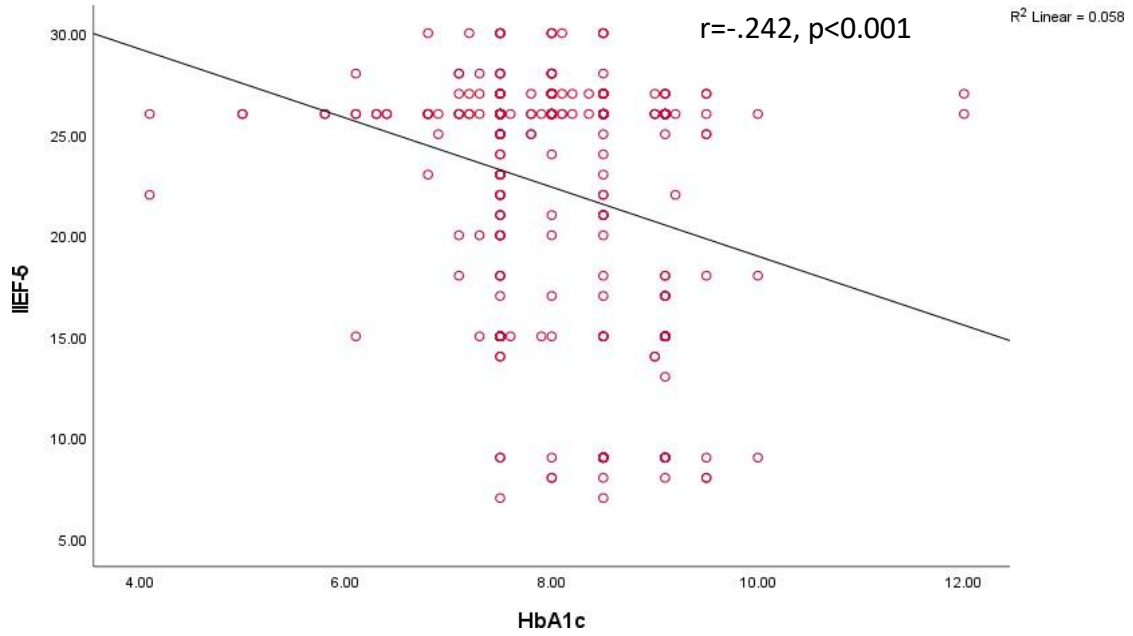

Figure – 3: Scatter diagram showing the correlation of IIEF-5 score with HbA1c of the study subjects

Figure 3 Scatter diagram showed that HbA1c had negative correlation with IIF-5 score (r=- 0.242, p<0.001), indicating that higher HbA1c levels were associated with lower IIF-5 scores.

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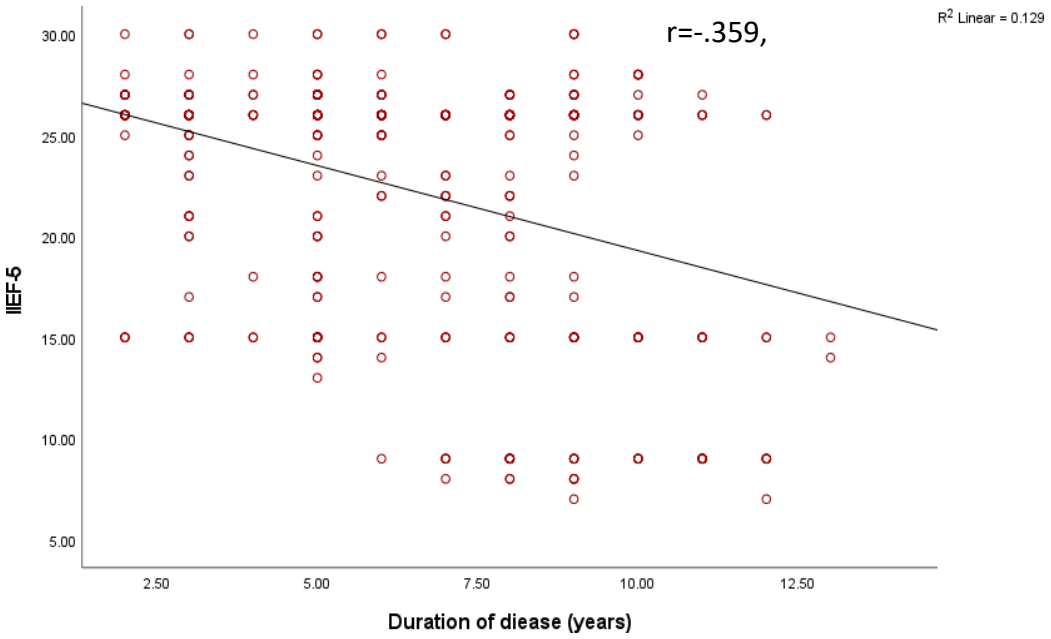

Figure – 4: Scatter diagram showing the correlation of IIEF-5 score with duration of T2DM of study subjects

Figure 4 Scatter diagram shows that the duration of disease had negative correlation with IIF-5 score (r=-0.359, p<0.001), suggesting that a longer duration of disease was associated with lower IIF-5 scores.

DISCUSSION

This cross-sectional study was conducted at the Department of Dermatology and Venereology and Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. It included 382 male patients with type 2 diabetes. The frequency of erectile dysfunction (ED) and its associated factors were investigated using the International Index of Erectile Function Questionnaire (IIEF-5). The purpose was to determine the frequency of ED and investigate its association with glycemic status.

The present study showed that out of 382 patients, 68 (17.8%) had mild ED, 51 (13.4%) had moderate ED, and 39 (10.2%) suffered from severe ED. 224 (58.6%) of respondents reported no ED. In accordance with this, Selim et al. reported that 53.98% of participants had ED [5]. The present study showed a significant association between age and ED, with a higher frequency in the 50-59 age group among those with ED (41.8% vs. 28.6%). The mean age was significantly higher in the ED group (48.7±7.39 years vs. 44.3±6.25 years, p=0.015). BMI was also significantly associated with ED, with a larger proportion of individuals with ED being overweight (63.3% vs. 49.1%). The mean BMI was higher in the ED group (26.5 kg/m^2 vs. 25.9 kg/m^2, p=0.042). Consistent with this, Selim et al. found ED to be significantly associated with age [5]. Previous studies demonstrate a strong age-related increase of ED (Khoa et al., 2014) [8]. De Berardis et al. reported that among type 2 DM patients, 34% reported frequent ED [2]. Mahbub et al. reported that among 508 participants, 306 (60.2%) had ED [1].

The present study showed a strong and statistically significant association between age and ED severity. In the 50-59 age group, a significantly higher proportion experienced moderate (45.1%) and severe (59.0%) ED. The analysis demonstrates a statistically significant association between BMI and ED severity. Among overweight individuals (BMI 25-29.9), a higher proportion experienced mild (58.8%) and moderate (78.4%) ED. In agreement, Selim et al. provided a comprehensive view of ED frequency and severity by age [5]. Ugwumba et al. reported overweight/obesity was a significant predictor of ED (OR 2.22) [20]. Hassan et al. showed obesity was a significant predictor of ED [21]. Similar observations have been made in other studies and providing a possible window for therapeutic intervention through lifestyle interventions such as exercise and dietary modification [22-26]. In contrast, Almigbal et al. reported that BMI did not show a significant association with ED (p=0.3) [27].

In the current study, no statistically significant association was found between hypertension and ED. This aligns with Ugwumba et al., Cho et al. and Lu et al. [20,28,29]. The present study showed a significant association between glycemic status and ED. Patients with ED exhibited higher mean FBS (7.84±2.04 mmol/L vs. 6.41±1.56 mmol/L) and 2-hour post-FBS (11.44±3.50 mmol/L vs. 9.45±2.59 mmol/L) (p<0.001). Mean HbA1c was also higher in the ED group (8.21±0.82% vs. 7.95±0.91%, p=0.005). Consistent with this, Mahbub et al. reported poor glycemic control had a significant association with ED [1]. Selim et al. reported similar results [5]. Ugwumba et al. (2018) reported poor glycemic control as a significant predictor [20]. This trend has been demonstrated by other studies [9,22,23,30]. Glycemic control measured by HbA1c is a significant predictor (OR 2.72). Other studies stress that poor metabolic control increases ED risk [31-33]. Weinberg et al. associated poor glycaemic control with a heightened risk of ED [30]. Awad et al. and Fedele et al. concluded that glycaemic control is independently and inversely associated with ED [34,35]. Viswanathan et al.found severe ED was associated with poor glycaemic control [36].

The present study showed a significant association between the duration of Type 2 Diabetes (T2DM) and ED. Patients with T2DM for 5-9 years had a 66.5% frequency of ED. Almigbal et al. reported that diabetes duration significantly influences ED (p<0.01) [27]. Mahbub et al. reported that patients with ED had a longer duration of DM (p=0.000) [1]. Many studies indicate that longer duration of diabetes increases ED risk [12,28].

The present study showed the relationship between the IIEF-5 score and various factors. The IIEF-5 score exhibits a negative correlation with age (r=-0.131, p=0.011). There is a significant negative correlation with both HbA1c levels (r=-0.242, p<0.001) and the duration of the disease (r=-0.359, p<0.001). The correlation between BMI and the IIEF-5 score is not statistically significant (r=-0.085, p=0.095). In agreement, Asaduzzaman et al. reported the IIEF-5 score showed a significant negative correlation with age, duration of DM, HbA1c, and fasting plasma glucose [37]. Sharifi et al. reported similar findings and Ghanem et al. also reported consistent results [31,38].

LIMITATIONS OF THE STUDY

The study had a few limitations:

- The cross-sectional design prevents causality.
- ED severity was self-reported, creating a risk of recall and social desirability bias.
- No objective clinical assessments of ED were used.
- The study was conducted in a single center, limiting generalizability.
- Psychological factors, lifestyle habits, and medication use were not fully examined.
- Unmeasured confounders may still influence the relationship between diabetes and ED.

CONCLUSION

More than one-third of the 382 diabetic patients had ED (17.8% mild, 13.4% moderate, 10.2% severe). Overweight individuals showed higher rates of mild and moderate ED, and those aged 50–59 had more moderate and severe ED. Patients with ED had higher mean FBS, 2-hour post-FBS, and HbA1c levels. They also had a longer duration of T2DM, and longer disease duration was linked to lower IIEF-5 scores. A T2DM duration of more than 10 years was a significant predictor of ED.

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Ethical approval: *This study was ethically approved*

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