

A Study of Erectile Dysfunction in Male Diabetes Patients and its Correlation with Platelet-Lymphocyte Ratio

MAHESH DAVE*, SAHIL KHARBANDA†, SANDEEP KANSARA‡, MANASVIN SAREEN†, YASH SHAH†, RAVI MANGLANI†, RAMGOPAL SAINI#, NAGARAJT†

ABSTRACT

Introduction: Erectile dysfunction (ED) constitutes a large burden on society given its high prevalence and impact on quality of life. Diabetes is a common cause of organic ED. Prevalence of ED in diabetes ranges from 35% to 85% depending on the study, versus 26% in general population. Platelet-lymphocyte ratio (PLR) has been detected as an important marker for inflammation. Some studies have identified its role in ED but more research is needed. **Material and methods:** It was a hospital-based prospective observational study. According to International Index of Erectile Function (IIEF)-5 questionnaire, patients were divided into 4 categories: mild ED with score 17 to 21, mild-to-moderate ED with score 12 to 16, moderate ED with score 8 to 11 and severe ED with score 1 to 7. Presence of ED and its severity was correlated with age, residence, duration of diabetes, glycemic status, lipid profile, PLR, complications, body mass index (BMI), etc. **Results:** Prevalence of ED in male diabetes patients was found to be 72.4%. Among 110 cases with ED, 8 had mild ED (7.2%), 27 had mild-to-moderate (24.5%), 27 had moderate ED (24.5%) and 48 had severe ED (43.6%). Prevalence of ED was found to be proportional to age. Majority of cases in ED group were those with long-standing diabetes. Correlation of ED with complication of diabetes, like nephropathy and retinopathy, was significant, whereas it was not significant with neuropathy. Significant correlation of ED was found with BMI and PLR. **Conclusion:** ED prevalence was high among the diabetes patients and it increased with age and duration of the disease. Presence of diabetic complications was significantly associated with ED. BMI was significantly associated with development of ED. PLR was significantly higher in ED group and closely related to severity of ED.

Keywords: Erectile dysfunction, diabetes, platelet-lymphocytic ratio

Erectile dysfunction (ED) is a medical problem characterized by getting or keeping an erection hard enough for satisfactory sexual performance.¹ The global prevalence of ED is estimated as 3% to 76.5%.² The screening tools used for ED in population-based studies are associated with discrepancies. Owing to its high prevalence and impact on quality of life, ED is a huge burden on the society. It is a risk factor for cardiovascular disease (CVD), dementia and all-cause mortality as well.²

Age is a major determinant of occurrence of ED. It is estimated that men aged between 50 and 59 years have a 3.6-fold higher risk of developing ED in comparison with 18- to 29-year-olds. However, when it comes to men above 70 years of age, the risk escalates to be 6 to 7 times higher.³

Diabetes is a common cause of organic ED. The pathophysiology of diabetes-induced ED is multifactorial. Both vascular and neurological mechanisms usually contribute in people with diabetes. Autonomic neuropathy has a key role to play in the high incidence of ED in diabetes patients.⁴ Psychological factors also contribute to ED in diabetes. Some drugs that are frequently used in diabetes patients, such as psychotropic drugs (especially antidepressants), antihypertensive treatment (particularly β -adrenergic-blocker, thiazide diuretics and spironolactone) and certain fibrates have all been associated with drug-related ED.⁵

Prevalence of ED in diabetes ranges from 35% to 85% depending on the various studies, versus 26% in general

*Senior Professor and Unit Head

†Resident Doctor

Dept. of Medicine

‡Professor and HOD, Dept. of Endocrinology

#Assistant Professor, Dept. of Medicine

RNT Medical College, Udaipur, Rajasthan

Address for correspondence

Dr Sahil Kharbanda

Resident Doctor

Dept. of Medicine, RNT Medical College, Udaipur, Rajasthan

E-mail: sahilkharbanda2010@gmail.com

population. Onset of ED is usually seen 10 to 15 years earlier in men with diabetes compared to sex-matched counterparts without diabetes.^{4,6}

In diabetes, ED is approximately 3.5-times more prevalent,⁷ has greater severity and is less responsive to phosphodiesterase-5 (PDE5) inhibitors⁸ than in men without diabetes.

In men with diabetes, the severity of ED increases with age, diabetes duration, poor glycemic control and the presence of micro- or macrovascular complications.⁹

Erectile dysfunction is now regarded as a major health problem for the increasingly healthy aging population. Despite ample evidence that ED is among the major complications in diabetes mellitus in men, its presence remains poorly evaluated in routine clinical practice.

The emergence and severity of ED are associated with inflammatory mediators and endothelial dysfunction.¹⁰ No specific marker has been identified so far that could identify this.

Platelet-lymphocyte ratio (PLR) has been detected as an important marker for inflammation. The normal PLR range in males is 36.63 to 149.¹¹ Some studies have identified its role in ED but it needs more research. PLR calculated from complete blood count is a simple, cheap and easily obtainable test.

India is a country where conversations about ED are often a taboo and left unspoken. ED is a problem that can impact the patient's quality of life and adversely affect his relationship with his partner. So, more and more research is needed in this area. India being considered the diabetes and impotence capital of the world, and due to lack of any blood parameter showing ED, this study was conducted to evaluate ED in male diabetes patients and its correlation with PLR. This will help us understand the importance of diabetes as a cause of ED and we can have a blood-based marker to detect ED.

MATERIAL AND METHODS

Study Design

Hospital-based prospective observational study.

Study Population

Male diabetes patients attending medical and endocrinology OPD as well as those admitted in these wards were enrolled in the study after taking informed consent.

Study Period

January 2021 to October 2021.

Inclusion Criteria

All male diabetes patients of age >18 years who were sexually active.

Exclusion Criteria

All patients suffering from ischemic heart disease, chronic kidney disease, any endocrine disorder, spinal cord injury, chronic debilitating disease, any inflammatory or hematologic disease to rule out other causes of leukocytosis and thrombocytopenia.

The prevalence period was 10 months and sampling took place over 4 days, randomly selected per month. Detailed history, general physical examination and systemic examination were done.

Patients were divided using International Index of Erectile Function (IIEF)-5 questionnaire into 4 categories: mild ED with score 17 to 21, mild-to-moderate ED with score 12 to 16, moderate ED with score 8 to 11 and severe ED with score 1 to 7. After this, blood investigations were done. Then, the presence of ED and its severity was correlated with age, duration of diabetes, glycemic status, lipid profile, PLR, complications, body mass index (BMI), etc.

OBSERVATIONS AND RESULTS

This study was done in Maharana Bhupal Hospital, Udaipur, Rajasthan, from January 2021 to October 2021. A total of 450 patients were screened, and 184 of them were eligible for the study after applying the exclusion criteria. Out of them, 152 were screened for ED as 32 of them either didn't give consent or didn't complete the questionnaire.

Out of 152 cases, 110 were found to have ED, whereas 42 had no ED. Therefore, prevalence of ED in male diabetes patients was found to be 72.4%. Among 110 cases with ED, 8 had mild ED (7.2%), 27 cases had mild-to-moderate (24.5%), 27 cases had moderate ED (24.5%) and 48 had severe ED (43.6%).

Table 1 depicts that in the ED group, maximum patients were in the elderly age group, i.e., >60 years (43.6%) and in the non-ED group, maximum patients were in the younger age group, i.e., ≤40 years (45.2%). Prevalence of ED in <40 years group was 40.6%, whereas in 51 to 60 years age group, it was 86.4% and in >60 years age group, it was 81.4%. P value was found to be significant. As age increased, risk of having ED increased.

Table 2 depicts that a majority of cases in ED group were those with long-standing diabetes, i.e., >10 years (40.9%), whereas non-ED group was formed mainly by cases with short history of diabetes, i.e., <5 years (54.8%). This correlation was found to be statistically significant ($p = 0.018$).

Table 3 depicts that 24 out of 110 ED (21.8%) cases had nephropathy as a complication, whereas in non-ED group only 3 out of 42 cases had nephropathy (7.1%). This correlation was found to be statistically significant ($p = 0.034$). Thirty-six out of 110 ED (32.7%) cases had neuropathy as a complication, whereas in non-ED group 9 out of 42 cases had neuropathy (21.4%). This correlation was not found to be statistically significant ($p = 0.172$). Fourteen out of 110 ED (12.7%) cases had retinopathy as a complication, whereas in non-ED group no case was found to have retinopathy (0.0%). This correlation was found to be statistically significant ($p = 0.015$). ED group had more cases with hypertension, i.e., 8.2%, while 7.1% in non-ED group had hypertension, but this correlation was not found to

be significant ($p = 0.832$). ED group had more proportion of cases who were smokers, i.e., 25.5%, as opposed to non-ED group which had 21.4% of smokers, but this correlation was not found to be statistically significant ($p = 0.605$).

The proportion of patients who consumed alcohol was more in the ED group (20.9%), as opposed to non-ED group which had 9.5% of alcohol consumers, but this correlation was not found to be statistically significant ($p = 0.101$).

Table 4 shows the comparison of mean values of different biochemical and hematological parameters among ED and non-ED group. Correlation for absolute lymphocyte count (ALC), platelet count (PC), PLR and BMI was found to be statistically significant.

Table 5 shows the correlation of PLR and severity of ED. This correlation was found to be statistically significant ($p = 0.003$). As the severity increased, PLR values also increased.

Table 1. Distribution of ED with Respect to Age

Age (Years)	Non-ED N (%)	ED N (%)	Total N (%)	Prevalence (%)
≤40	19 (45.2)	13 (11.8)	32 (21.1)	40.6
41-50	7 (16.7)	17 (15.5)	24 (15.8)	70.8
51-60	5 (11.9)	32 (29.1)	37 (24.3)	86.4
>60	11 (26.2)	48 (43.6)	59 (38.8)	81.4
Total	42 (100.0)	110 (100.0)	152 (100.0)	72.4
P value				0.00

Table 2. Distribution of Groups According to Duration of Diabetes

Duration of diabetes (Years)	Non-ED N (%)	ED N (%)	Total N (%)
<5	23 (54.8)	34 (30.9)	57 (37.5)
5-10	10 (23.8)	31 (28.2)	41 (27.0)
>10	9 (21.4)	45 (40.9)	54 (35.5)
Total	42 (100.0)	110 (100.0)	152 (100.0)
P value	0.018		

Table 3. Comparison on the Basis of Diabetic Complications, Hypertension and Substance Abuse

Variables	Non-ED (n = 42) N (%)	ED (n = 110) N (%)	Total (n = 152) N (%)	P value
Nephropathy				
Present	3 (7.1)	24 (21.8)	27 (17.8)	0.034
Absent	39 (92.9)	86 (78.2)	125 (82.2)	
Neuropathy				
Present	9 (21.4)	36 (32.7)	45 (29.6)	0.172
Absent	33 (78.6)	74 (67.3)	107 (70.4)	
Retinopathy				
Present	0 (0.0)	14 (12.7)	14 (9.2)	0.015
Absent	42 (100.0)	96 (87.3)	138 (90.8)	
Hypertension				
Present	3 (7.1)	9 (8.2)	12 (7.9)	0.832
Absent	39 (92.9)	101 (91.8)	140 (92.1)	
Smoking				
Present	9 (21.4)	28 (25.5)	37 (24.3)	0.605
Absent	33 (78.6)	82 (74.5)	115 (75.7)	
Alcohol intake				
Present	4 (9.5)	23 (20.9)	27 (17.8)	0.101
Absent	38 (90.5)	87 (79.1)	125 (82.2)	

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Table 4. Comparison on the Basis of Biochemical and Hematological Parameters

Parameter	Groups	Mean	SD	P value
TLC	Non-ED	8.6	2.6	0.131
	ED	9.4	3.0	
ALC	Non-ED	2.3	0.8	0.020
	ED	2.0	0.8	
PC	Non-ED	2.4	1.0	0.006
	ED	3.1	1.3	
PLR	Non-ED	122.1	68.2	0.003
	ED	166.9	87.4	
FBS	Non-ED	133.0	27.0	0.196
	ED	141.1	36.8	
PPBS	Non-ED	193.3	53.5	0.674
	ED	197.2	51.2	
HbA1c	Non-ED	8.5	2.5	0.057
	ED	9.6	3.2	
BMI	Non-ED	21.4	2.1	0.021
	ED	22.6	2.9	
TG	Non-ED	143.7	44.8	0.379
	ED	153.6	67.6	
LDL	Non-ED	105.3	41.9	0.560
	ED	110.7	53.2	
HDL	Non-ED	42.7	10.3	0.492
	ED	41.2	11.8	
TC	Non-ED	176.7	48.7	0.637
	ED	181.9	63.7	

TLC = Total leukocyte count; SD = Standard deviation; ALC = Absolute lymphocyte count; PC = Platelet count; PLR = Platelet-lymphocyte ratio; FBS = Fasting blood sugar; PPBS = Postprandial blood sugar; HbA1c = Glycated hemoglobin; BMI = Body mass index; TG = Triglyceride; LDL = Low-density lipoprotein; HDL = High-density lipoprotein; TC = Total cholesterol.

Table 5. Correlation of PLR and Severity of ED

Severity of ED	Mean PLR
Mild	124.6
Mild-to-moderate	144.1
Moderate	162.4
Severe	189.2
P value	0.003

DISCUSSION

In our study, we evaluated 152 male diabetes patients who satisfied inclusion and exclusion criteria. The prevalence of ED in these patients was found to be

72.4%. Garg et al¹² in their study of 50 male diabetes patients noted that ED was present in 39 (78%) patients. Sasayama et al¹³ studied 6,112 Japanese male patients from 447 outpatient clinics and found that 81% had some degree of ED.

The differences in prevalence in different studies could be due to cultural differences in the perception and attitude towards ED among the studied populations. Variations in the methodology used in the studies could also account for the differences.

In our study, among 110 cases with ED, 7.2% had mild ED, 24.5% had mild-to-moderate ED, 24.5% cases had moderate ED and 43.6% had severe ED. Maximum cases had severe ED. Similar proportion of severity of ED was detected by Garg et al¹² in their study. They classified ED into 3 categories. Three patients (6%) had mild ED, 18 (36%) patients had moderate and another 18 (36%) patients had severe ED.

Among the socio-demographic variables, age was found to be statistically significant in our study. As age increased, risk of having ED increased.

Similar results were found by Garg et al¹² in their study, in which prevalence increased from 20% in age group of <40 years to 100% in 60 years age group. The effect of age on prevalence and severity of disease might be due to age-related changes occurring in the body and also various other complications that may coexist in diabetes patients.

Wing et al¹⁴ documented that duration of diabetes increases the risk of ED, which was confirmed by the results of our study.

In our study, presence of complications in the form of nephropathy and retinopathy were significantly associated with ED but no such significance was found between neuropathy and ED.

These results were similar to those reported by Garg et al¹² as they found that retinopathy and neuropathy was significantly associated with ED but no such significance was found between nephropathy and ED.

Hypertension was found to be associated with ED in the present study but results were not statistically significant. In contrast, statistically significant results were reported by Al-Hunayan et al.¹⁵

For smoking and alcohol intake, no statistical significance was found in the present study. However, statistically significant results were reported by Al-Hunayan et al for smoking.¹⁵ This study also showed that glycemic control, as assessed by fasting blood sugar (FBS), postprandial blood sugar (PPBS) and glycated hemoglobin (HbA1c)

level, was not significantly associated with ED in men with diabetes. In contrast, glycemic control was reported to be significantly associated with ED severity in a study by Cho et al.¹⁶

In our study, no significant correlation was found between dyslipidemia and ED. In contrast, Garg et al¹² reported in their study that mean lipid values (triglyceride [TG], low-density lipoprotein [LDL], high-density lipoprotein [HDL]) were significantly higher in patients with ED as compared to those without ED.

In our study, mean BMI in non-ED group was significantly associated with ED. This was supported by the study by Pizzol et al,¹⁷ but this was not in line with the finding of the study by Garg et al¹² in which BMI was not significantly associated with ED.

Among biochemical parameters, statistically significant correlation was found for absolute lymphocyte count, platelet count and PLR. Mean PLR value was high in ED group. As the severity increased, PLR values also increased. This was confirmed in a study by Akbas et al¹⁸ in which PLR values increased based on the severity of ED.

CONCLUSION

ED prevalence was high among men with diabetes and it increased with age and duration of the disease. Presence of diabetic complications was significantly associated with ED.

BMI was significantly associated with the development of ED; therefore, lifestyle modification should be recommended to all patients.

This study shows that PLR is higher in patients with ED than men without ED and is also associated with severity of ED. It appears that PLR and other inflammatory markers might play a role in the identification of patients with ED and developing a treatment approach.

ED in men with diabetes is likely to become a more serious problem in the future with the rapidly increasing prevalence and earlier onset of diabetes. We recommend screening of all men with diabetes for ED since it is a neglected medical problem and also a culturally sensitive matter.

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