ORIGINAL ARTICLE

Prevalence of Sexual Dysfunction and Hypogonadism in Male Patients with Type 2 Diabetes Mellitus from a Tertiary Care Center in North India

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ABSTRACT

Introduction: Diabetes is one of the most common chronic metabolic diseases resulting in sexual dysfunction (SD) in men. There is limited data regarding SD and testosterone deficiency (hypogonadism) in subjects with type 2 diabetes (T2D) from India. This study aims to determine the prevalence of SD and hypogonadism, and the correlation of hypogonadism with complications of diabetes among adult males with T2D from North India. **Methods:** In this prospective observational study, people aged 18 to 70 years with T2D (diagnosed for at least 1 year) were evaluated for SD using the International Index of Erectile Function (IIEF) questionnaire. The demographic, anthropometry, biochemical parameters, and history of microvascular and macrovascular complications were recorded. In participants with low IIEF score (≤3), serum total testosterone (TT) was measured twice 4 weeks apart and those with both values <280 ng/dL were defined to have hypogonadism. **Results:** Among the 253 patients (55.82 ± 8.42 years) enrolled, the prevalence of SD and hypogonadism was 27.7% and 18.6%, respectively. Patient on insulin treatment had more odds of hypogonadism likely because of more advanced diseases. Hypogonadism was significantly associated with the presence of neuropathy and nephropathy ($p < 0.0001$ and $p = 0.0013$, respectively). There was also significant association of hypogonadism with cerebrovascular events and coronary artery disease ($p < 0.0001$). **Conclusion:** There is a high prevalence of SD and hypogonadism in adult males with T2D. Hypogonadism was significantly correlated with insulin treatment and associated diabetes complications.

Keywords: Sexual dysfunction, hypogonadism, erectile dysfunction, testosterone, type 2 diabetes

Type 2 diabetes (T2D) is a prevalent metabolic disorder causing microvascular and macrovascular complications, impacting the quality of life and increasing morbidity and mortality[1]. Sexual dysfunction (SD) and hypogonadism are common but underdiagnosed and undertreated conditions in male patients with diabetes, exacerbated by chronic hyperglycemia, insulin resistance, diabetes complications, obesity, and systemic inflammation[2]. They are an outcome of a complex interplay of metabolic, hormonal, vascular, and neurological factors[3]. The two conditions often get ignored because people are unable to discuss these sensitive issues with the physician for fear of embarrassment. Many times, people often do not get privacy in hospitals/clinic during the consultation to discuss these issues, which is very common in the Indian set up. It can further cause disharmony with the partner, life dissatisfaction, impaired well-being, marital conflicts, separation, and even divorce[4].

Sexual dysfunction primarily manifests as erectile dysfunction (ED), reduced libido, and premature ejaculation. The risk factors for ED include higher age, poor glycemic control, longer diabetes duration, presence of diabetic neuropathy, cardiovascular disease, hypertension and nephropathy, and treatment with

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certain drugs, including diuretics[5]. Hypogonadism characterized by low testosterone levels can lead to sexual symptoms, obesity, insulin resistance, and low bone mineral density[6]. A systematic review conducted recently in 2025 highlighted a prevalence range ED as 28.1% to 94.7% and associated psychological and relationship challenges in males with diabetes[7]. Hypogonadism increases the susceptibility to SD in males with T2D as compared to T2D males without hypogonadism[8]. The literature indicates a strong link between SD, hypogonadism, and glycemic control in T2D, significantly influencing diabetes complications. Recent studies have highlighted the intricate interplay between metabolic dysfunction, hormonal imbalances, and sexual health. Poor glycemic control itself can lead to SD, increased risk of ED, and lower testosterone levels. On the contrary, testosterone deficiency not only worsens SD but also contributes to other diabetes-related complications like cardiovascular disease, obesity, and neuropathy.

The relationship between SD and hypogonadism in T2D patients has not been thoroughly studied in the Indian context. This study aimed to assess the prevalence of SD and hypogonadism in male patients with T2D from a tertiary care center in India. It also aimed to assess the association of hypogonadism with complications of diabetes in these patients.

METHODS

Study Design and Settings

This cross-sectional, prospective study was conducted in Maharaja Agrasen Hospital, New Delhi, India which is a 400-bed, teaching, super-specialty hospital serving both urban and rural population. The study was approved by the Institutional Ethics Committee (IRB No.: MAH/ADMN/IEC/2018/March/7). The data was collected after obtaining written informed consent from all participants.

Study Population

All consecutive male patients with T2D who attended the endocrinology OPD were screened and invited to participate in the study. Those who fulfilled the inclusion criteria and were willing to participate were recruited in the study. The participants were enrolled between March and August 2018.

Inclusion and Exclusion Criteria

Male patients aged 18 to 70 years, having T2D for at least 1 year at the time of enrollment, and of Indian origin were eligible for the study. The diagnosis of diabetes mellitus was established using the American Diabetes Association (ADA) criteria[9].

Males with age less than 18 years and more than 70 years, those suffering from other than T2D, those with previously treated with androgens, those already diagnosed with other causes of hypogonadism and those with other significant medical diseases such as chronic liver disease, renal disease, advanced malignancy, debilitating diseases such as tuberculosis, malabsorption, inflammatory bowel disease, pyrexia of unknown origin, acquired immunodeficiency syndrome, sickle cell disease, autoimmune diseases such as rheumatoid arthritis, ankylosing spondylitis, any inflammatory disease or infection, and patient with severe psychological problem were excluded.

Data Collection

After consenting, the assessments were conducted in accordance with the regular clinical practice and institutional protocols. The flow chart of the study is shown in Figure 1.

A predesigned proforma was used to collect data related to medical history like the duration of diabetes, smoking habits, and presence of diabetes complications. The data and questionnaires were filled by one of the male authors using an interview sheet. The demographic parameters were recorded using standard procedures e.g., height and weight were measured in lightweight clothing without shoes. Body mass index (BMI) was calculated as weight (kg)/height $(m)^2$. SD was assessed in all participants using the International Index of Erectile Function (IIEF) Questionnaire. This is a 15-question, validated, multidimensional, self-administered investigation used in the clinical assessment of ED and treatment outcomes in clinical trials. A score of 0 to 5 is awarded to each of the 15 questions that examine the four main domains of male sexual function: erectile function, orgasmic function, sexual desire, and intercourse satisfaction. The tool defines sexual activity (intercourse, caressing, foreplay and masturbation), sexual intercourse (sexual penetration of your partner), sexual stimulation (situation such as foreplay, erotic pictures, etc.), ejaculation (ejection of semen from the penis or the feeling of this), and orgasm (fulfilment or climax following sexual stimulation or intercourse). The enrolled patients were screened for SD through the IIEF score. If the score of all the questions was >3, they were considered as not having SD. If the score of all questions was ≤3, their serum total testosterone (TT) was checked in fasting condition (between 8 and 9 AM).

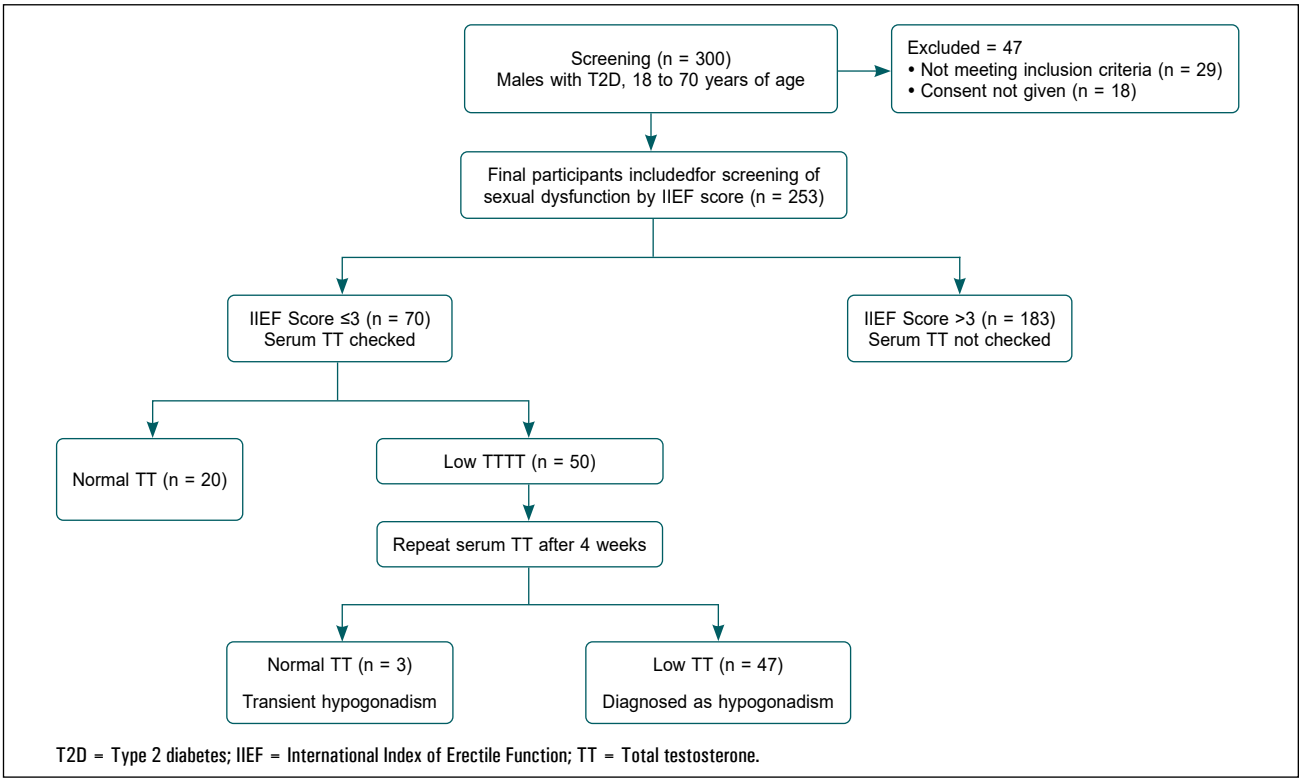

Figure 1. Flow chart of the study.

In our laboratory, the reference range of TT ranges between 280 and 1,100 ng/dL for adults. The TT values <280 ng/dL was defined as low. If the serum TT was low (<280 ng/dL), the test was repeated after 1 month and those with both low values of serum TT were labeled to have hypogonadism.

Laboratory investigations such as fasting blood glucose, glycated hemoglobin (HbA1c), and other investigations like renal function test, liver function test were done as a part of routine clinical practice. All laboratory investigations were done after ensuring minimum 8 hours of fasting in the morning. Plasma glucose by analyzed by glucose oxidase method, HbA1c by HPLC (high performance liquid chromatography) method and serum TT by immunoassay method.

Sample Size Calculation

Madhu et al found that hypogonadism was observed in 32% of the male patients with T2D. The sample size was determined manually using a formula ($n = 4\ pq/L^2$, where n = required sample size, p = 0.32 as per the study by Madhu et al, q = 1 – p and L = Loss % [Loss of information] = 18.34% ~18%)[10]. The number of subjects required for this study was 252.70 ~253 with power 82%. Thus the sample size was 253 with power 82%, assumptions of 95% confidence level and 5% margin of error. The study participants were recruited during their regular medical follow-up visit at the hospital. The patients were selected randomly. The random numbers were used from Kevin Conroy: 5120 Random Numbers (<5 k, 2002).

Statistical Analysis

Statistical analysis was performed with the help of Epi Info™ 7.2.2.2, which is a trademark of the Centers for Disease Control and Prevention (CDC). Using this software, basic cross-tabulation and frequency distributions were prepared. A corrected Chi-square (χ^2) test was used to test the association between different study variables. Z-test was used to test the significant difference between the two proportions. The odds ratio (OR) with 95% confidence interval (CI) was calculated to measure the different risk factors. The significance level was set at 0.05 and CIs were at 95% level. $P < 0.05$ was considered to be statistically significant.

RESULTS

The study participants (n = 253) had a mean age of 55.82 ± 8.42 years, with mean BMI of 26.95 ± 3.17 kg/m^2 and mean HbA1c of 8.16 ± 1.23% (Table 1). The mean duration of diabetes was 7.25 ± 2.95 years. All the participants were taking oral hypoglycemic

Table 1. Baseline Characteristics of the Patients

Parameters	Mean ± SD or n (%) (n = 253)
Age (in years)	55.82 ± 8.42
BMI (kg/m^2)	26.95 ± 3.17
HbA1c (%)	8.16 ± 1.23
Duration of diabetes (years)	7.25 ± 2.95
On OHAs	253 (100%)
On supplementary insulin regimen	59 (23%)
Retinopathy	26 (10%)
Neuropathy	111 (44%)
Nephropathy	30 (12%)
CAD	43 (17%)
CVA	36 (14%)

BMI = Body mass index; HbA1c = Glycosylated hemoglobin; OHA = Oral hypoglycemic agents; CAD = Coronary artery disease; CVA = Cerebrovascular accident.

agents (OHAs) for their diabetes management and 59 participants (23%) were also taking insulin regimen. Retinopathy was present among 26 participants (10%), neuropathy among 111 participants (44%), nephropathy among 30 participants (12%), coronary artery disease (CAD) was present among 43 participants (17%), while cerebrovascular accident (CVA) among 36 participants (14%) at baseline.

Prevalence of Hypogonadism and Sexual Dysfunction

SD was present in 70 (27.7%) participants, while hypogonadism was diagnosed in 47 (18.57%) of the study participants (Table 2). Significantly higher proportion of participants on insulin therapy had hypogonadism as compared to those without insulin therapy (OR −9.45 [4.67, 19.11]; p < 0.0001). This is likely because of more advanced diabetes in subjects with hypogonadism, which reflects a higher likelihood for requiring insulin for their diabetes control.

Presence of Retinopathy, Neuropathy, and Nephropathy

There was significant correlation of neuropathy and nephropathy with hypogonadism among study participants. The risk of hypogonadism was significantly more among the patients with neuropathy and nephropathy as compared to the patients without neuropathy and nephropathy (OR −7.69 [3.52, 16.79]; p < 0.0001 and OR −3.58 [1.58, 8.08]; p = 0.0013, respectively). However, hypogonadism was not significantly different in subjects with retinopathy as compared to those without retinopathy (OR −1.72 [0.67, 4.37]; p = 0.24) (Table 2).

Table 2. Comparison of the Patients with Hypogonadism and without Hypogonadism

Parameters	OR (95% CI)	P values
Insulin therapy	−9.45 (4.67, 19.11)	<0.0001
Retinopathy	−1.72 (0.67, 4.37)	0.24
Neuropathy	−7.69 (3.52,16.79)	<0.0001
Nephropathy	−3.58 (1.58, 8.08)	0.0013
CVA	−7.54 (3.50, 16.21)	<0.0001
CAD	−3.92 (1.91, 8.08)	<0.0001

HbA1c = Glycosylated hemoglobin; CVA = Cerebrovascular accident; CAD = Coronary artery disease.

Presence of CVA and CAD

The risk of hypogonadism was significantly higher among those with CVA and CAD as compared to the patients without CVA and CAD (OR −7.54 [3.50, 16.21]; p < 0.0001 and OR −3.92 [1.91, 8.08]; p < 0.0001, respectively) (Table 2).

DISCUSSION

The relation between low serum testosterone (hypogonadism) and diabetes has received substantial attention since last decade. The people with diabetes are more prone to SD and hypogonadism. This study assessed the prevalence of SD and hypogonadism in male patients with T2D, association of hypogonadism with glycemic control, and diabetes complications.

The prevalence of SD in male patients with T2D was found to be 27.7% according to IIEF in our study. Ugwu et al found that 71.1% of men with T2D had varying degrees of ED, with 58.3% suffering from moderate to severe forms[11]. However, few authors have reported a lower prevalence of ED in men with diabetes. In a study of 96 men with diabetes in Lagos, Nigeria, Ogbera, and Adedokun observed only 34% prevalence of ED[12]. Similarly, a multicenter study involving 9,756 diabetic men in Italy documented a lower prevalence of 37%[13].

The prevalence of hypogonadism in male people with T2D was found to be 18.6% in our study which was more or less equal to 26.9% shown by Gangwar et al, 2021[14]. A study conducted in India by Unnikrishnan et al in 2024 showed that hypogonadism was prevalent in 8.5%

of T2D patients, with the highest prevalence observed in those older than 50 years of age and those with a BMI >30 kg/m^2 [15]. These divergent prevalence rates might account for the heterogeneity in the populations studied owing to demographic characteristics, duration and severity of diabetes, and presence of other confounding comorbid conditions.

ED in patients with diabetes is a specific entity, with microvascular complications being more significant risk factors than macrovascular ones, and diabetic neuropathy being a more significant pathogenic factor[16]. The people with hypogonadism, have been earlier reported to have higher HbA1c, diabetic retinopathy, and neuropathy frequencies[14]. ED is linked to glycemic control, with peripheral neuropathy and HbA1c being independent predictors[17]. Our study found that patients with CAD had a 3.93 times higher risk of hypogonadism compared to those without CAD (OR −3.92 [1.91, 8.08]; $p < 0.0001$]. Significant risk has also been reported in the study conducted by Madhu et al, with 40% of patients with both T2D and CAD experiencing hypogonadism, as compared to patients with only T2D[10]. Early identification and screening programs for testosterone evaluation and seeking expert opinions are crucial for successful treatment, improved quality of life and to build a hormonal range for future studies[18].

This study had several strengths. It investigated an underexplored yet clinically significant topic of SD and hypogonadism in male people with T2D, providing regional insights from North India. A robust methodology and large sample size further solidify its impact. The study had few limitations as well. It was a hospital-based study, which did not permit inference on cause and effect, lack of control group, and inability to measure free testosterone owing to financial constraint. Also in our study, serum TT was checked only in participants with low IIEF score and that could have missed hypogonadism in few participants who reported normal IIEF scores.

CONCLUSION

Diabetes is one of the most common chronic metabolic diseases involving sexual dysfunction, both in men and women. This study showed that T2D has an important association with SD and testosterone deficiency (hypogonadism) in males with diabetes. Hypogonadism was associated with insulin treatment, likely reflecting advanced T2D. Hypogonadism was also associated with key microvascular and macrovascular complications including neuropathy, nephropathy, CAD and CVA.

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Conflict of Interest: Nil.

Compliance with Ethics: The study was performed in accordance with the principles of the Declaration of Helsinki and was approved by the institutional ethics committee of Maharaja Agrasen Hospital, Punjabi Bagh, Delhi, India (IRB No: MAH/ADMN/IEC/2018/March/7).

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