



Original Research Article

Prevalence of hypogonadism in type 2 diabetes mellitus associated with or without obesity: An observational study

Suwendu Jana¹, Snehasis Ghosh¹, Anjan Debnath², Arup Ghosh^{3*}, Partha Sarathi Karmakar⁴, Purba Halder⁵

¹Dept. of General Medicine, Rampurhat Government Medical College & Hospital, Rampurhat, West Bengal, India

²Dept. of Neurology, Bankura Sammilani Medical College & Hospital, Bankura, West Bengal, India

³Dept of Anaesthesiology, Rampurhat Government Medical College and Hospital, Rampurhat, West Bengal, India

⁴Dept. of General Medicine, College of Medicine & Sagore Dutta Hospital, Kolkata, West Bengal, India

⁵Dept. of Anaesthesiology, Bankura Sammilani Medical College & Hospital, Bankura, West Bengal, India



ARTICLE INFO

Article history:

Received 07-01-2024

Accepted 13-02-2024

Available online 13-08-2024

Keywords:

Hypogonadism

Type 2 diabetes mellitus

Obesity

Adult male

ABSTRACT

Background: Hypogonadism is associated with type 2 Diabetes Mellitus & obesity in a substantial/sizeable number of men. But studies on prevalence of hypogonadism, major cause of low testosterone in diabetes and/or obesity are very scanty. Recognition of prevalence of hypogonadism in diabetic & obese population could be a very important determinant for proper management with better outcome & wellbeing.

Aims & Objectives: the study was conducted to determine the prevalence of hypogonadism in adult men with diabetes mellitus with or without obesity & to assess the impact of diabetes & increased Body Mass Index on development of hypogonadism in adult males.

Materials and Methods: For operational purpose blood levels of testosterone & gonadotrophins (FSH & LH) were determined in diabetic & obese individuals & also in age matched controls. Detailed history, clinical examination & biochemical investigation helped to exclude other causes of hypogonadism, while anonymous questionnaire based on “The Saint Louis University Androgen Deficiency in Aging Males (ADAM) Questionnaire” & biochemical examination viz. sex hormone binding globulin (SHBG) & total testosterone in serum were used to detect presence of hypogonadism in the cases & controls.

Result: Prevalence of hypogonadism in diabetic subjects was 24.07%, whereas in age matched control population it was only 5.5%. In our study the subjects who had > 10 years duration of diabetes had increased prevalence of hypogonadism (66.6%). The study also revealed that increased age is associated with increased prevalence of hypogonadism. Subjects who were > 50 years old were associated with increased prevalence of hypogonadism (36.6%). It was also observed that obese or overweight person had increased prevalence of hypogonadism.

Conclusion: Prevalence of hypogonadism is significantly more in diabetic subjects & increased duration of diabetes is associated with increased prevalence of hypogonadism. It was also found that in addition to diabetes, persons who were obese or overweight had increased prevalence of hypogonadism.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/), which allows others to remix, and build upon the work. The licensor cannot revoke these freedoms as long as you follow the license terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Sexual health & capability are significant determinants of personal satisfaction. Sexual issues are distressingly normal in men with type 2 diabetes Mellitus (DM).

* Corresponding author.

E-mail address: arupghosh.dr@gmail.com (A. Ghosh).

A few overviews have shown halfway or complete disappointment of erection in 30 to 60% of patients¹⁻⁴ with ejaculatory irregularities in more modest proportion.⁵ Erectile brokenness (ED) in diabetic men might be because of vascular illness, autonomic neuropathy, hypogonadism, drugs, mental causes, genital diseases (regularly contagious) or a mix of these. Hypogonadism is a clinical term which portrays a lessened utilitarian action of the balls for example the testicles & ovaries in guys & females, separately. That might bring about lessened sex chemical biosynthesis & weakened gamete creation & additionally guideline. Low androgen (for example testosterone) levels are alluded to as hypoandrogenism & low estrogen (for example estradiol) as hypoestrogenism, & may happen as side effects of hypogonadism in the two genders. It is overall progressively perceived as a significant health concern & connected with extensive variety of clinical, psychosocial issues, & relational relationship. Male hypogonadism is a nonexclusive term used to depict an assortment of confusion of male regenerative framework. Male hypogonadism ought to be analyzed exclusively in men who have clinical signs & side effects that are predictable with androgen lack, & biochemical androgen lack affirmed by unequivocally low serum testosterone levels.⁶ Polls like The Holy person Louis College Androgen Lack in the Maturing Male (ADAM) questionnaire⁷ have been created to evaluate androgen inadequacy. These surveys, notwithstanding, need explicitness yet have sensible responsiveness within the sight of a low testosterone level.

It has been accounted for that testosterone levels are lower in diabetic men contrasted & nondiabetic subjects.^{8,9} It has likewise been accounted for that hypogonadism is related with type 2 DM & expanded weight & corpulence in a significant number of men.¹⁰ Yet, there are not many examinations about the amount it is predominant in subjects with diabetes or expanded weight or both. Acknowledgment of predominance of hypogonadism in these two issues might assist us with chalking out the anticipation the executives methodologies before it advanced to irreversible stage.

2. Aims & Objectives

1. To determine the prevalence of hypogonadism in adult men with type 2 diabetes mellitus with or without obesity.
2. To determine the prevalence of hypogonadism in age-matched non diabetic, nonobese individuals
3. To assess the impact of duration of diabetes on development of hypogonadism.

3. Materials and Methods

It was a cross sectional observational comparative study, conducted at inpatient & outpatient departments of Medicine & inpatient department of Departments of

Endocrinology & Cardio-Diabetes clinic in IPGME&R & SSKM Hospital, Kolkata after getting approval of Institutional Ethics Committee.

A total of 108 male subjects within the age group 30-65 were included in the study after taking proper consent. Among them 54 were cases those were known to have type 2 diabetes mellitus & associated with or without overweight / obesity. The rest were controls, age & sex matched subjects without any known history of type 2 diabetes mellitus & non-obese. Criteria for diagnosis of diabetes were taken from ADA Guidelines 2010 & obesity or overweight was defined according to guidelines of BMI in Asian Indian population.

3.1. Inclusion criteria

1. Age- 30-65 years.
2. Presence of diabetes
3. Obese / overweight.
4. Patients consenting to answer to questionnaire related to their sexual matters.

3.2. Exclusion criteria

1. Acutely ill patients.
2. Alcoholic subjects.
3. History of surgery at lower abdominal or inguinal region
4. History of following drug intake in last 6 months: ketoconazole, corticosteroids, anabolic steroid, spironolactone, cimetidine, phenytoin, flutamide, cancer chemotherapy, GnRH agonist, androgens.
5. History of mumps orchitis.
6. Hypothyroidism.

Detailed history, clinical examination, biochemical investigations (Serum FT4 & TSH, Serum LH & FSH, Serum urea, creatinine, Liver function test, HIV serology) done in all the subjects. Questionnaire based on “The Saint Louis University Androgen Deficiency in Aging Males (ADAM) Questionnaire” & biochemical examination viz. sex hormone binding globulin (SHBG) & total testosterone in serum were used to detect presence of hypogonadism in the included cases & controls.

St Louis ADAM questionnaire proposed by Morley et al.

1. Do you have a decrease in libido (sex drive)?
2. Do you have a lack of energy?
3. Do you have a decrease in strength and/or endurance?
4. Have you lost height?
5. Have you noticed a decreased enjoyment of life?
6. Are you sad and/or grumpy?
7. Are your erections less strong?
8. Have you noticed a recent deterioration in your ability to play sports?
9. Are you falling asleep after dinner?

10. Has there been a recent deterioration in your work performance?

All questions are answered ‘yes’ or ‘no’.

Hypogonadism was defined by the presence of at least three sexual symptoms associated with a low total testosterone level of < 11nmol/l (3.2ng/ml) & a free testosterone level of < 220pmol/l (64pg/ml).¹¹ SHBG measurement reflects free testosterone & bioavailable testosterone. For the determination of SHBG, the assay used is a solid phase enzyme-linked immunosorbent assay (ELISA) based on the sandwich principle.¹² Statistical analysis was performed after taking the data for prevalence of male hypogonadism in diabetes with or without obesity / overweight with standard statistical software (SPSS) version 16.

4. Result

4.1. Age related hypogonadism in cases & controls

The study population had 54 cases. Among those 24 were ≤ 50 years old, out of which 2 cases (8.3%) had hypogonadism. 30 cases were > 50 years old, out of which 11 cases (36.6%) had hypogonadism. Fisher’s Exact test showed it is statistically significant (Table 1). Among controls 27 were ≤ 50 years old, out of which 1 case (3.7%) had hypogonadism, rest were > 50 years old, out of which 2 cases (7.4%) had hypogonadism. It was not significant.

Table 1:

Hypogonadism	≤50 years	>50 years	Total
Absent	22	19	41
Present	2	11	13
Total	24	30	54

4.2. Association of hypogonadism with duration of diabetes

During analyzing the duration of diabetes mellitus of the cases (diabetics), it was seen that among 54 diabetic cases 24 cases had less than 5 years duration, 15 cases had 5-10 years duration, & 15 cases had more than 10 years duration (Table 2).

Table 2:

Duration of diabetes	No. of cases	Percentage
<5 years	24	44.4
5-10 years	15	27.8
>10 years	15	27.8
Total	54	100

It was again seen that among the 15 cases who had > 10 years duration of diabetes, 10 cases (66.6%) had hypogonadism. In 2 tailed Pearson’s correlation it is significant (0.001) but weakly correlated (Figure 1).

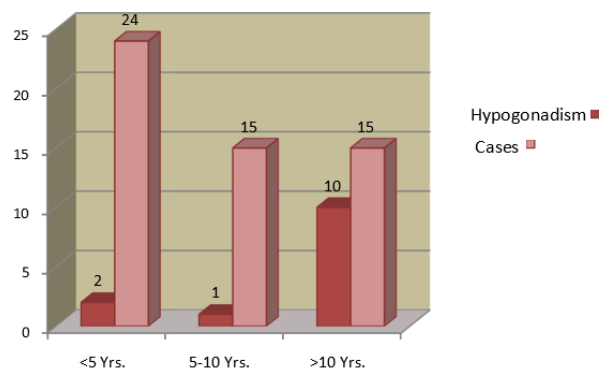


Figure 1:

4.3. Association of hypogonadism with BMI

The study showed among the cases 26 had increased BMI (≥23), out of which 10 cases (38.46%) had hypogonadism, which is statistically significant (0.026) (Table 3).

Table 3:

Hypogonadism	BMI < 23	BMI ≥ 23	Total
Absent	25	16	41
Present	3	10	13
Total	28	26	54

4.4. Comparison of hypogonadism in cases & controls

The study shows that out of 54 diabetic cases, hypogonadism was found in 13 (24.07%) subjects. Whereas in control group (54 subjects), hypogonadism was present in only 3 (5.5%) (Table 2).

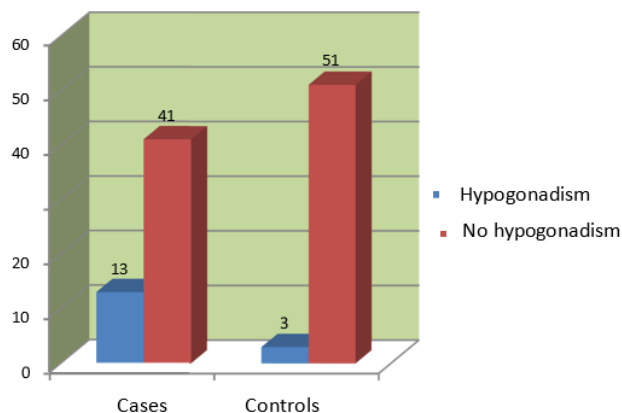


Figure 2:

4.5. Total testosterone in cases

In our study out of 54 cases, 12 subjects (22.2%) had total testosterone <3.2ng/ml; 3 cases (5.5%) had total testosterone 3.2-4.0 ng/ml & 39 cases (72.2%) had total testosterone >4.0 ng/ml (Figure 3).

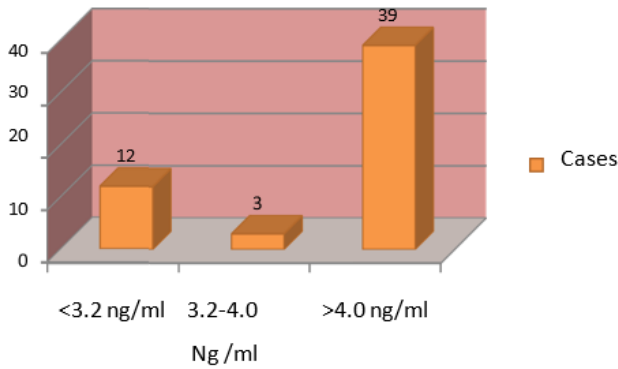


Figure 3: Total testosterone

4.6. Free testosterone in cases

In our study out of 54 cases, 13 cases had free T level <64pg/ml whereas 41 cases had free T level ≥64pg/ml (Figure 4).

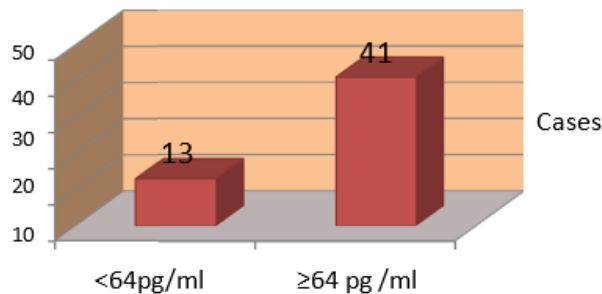


Figure 4: Free testosterone

5. Discussion

Diabetes mellitus (DM) is known to make serious ramifications on sexual capability due its consequences for both neurologic & vascular parts. Also, the presence of ineffectively controlled diabetes might build the dismalness related with the treatment of erectile brokenness.¹³ The etiology of erectile brokenness in diabetes is multi-factorial, including neuropathy, vascular illness, metabolic control, nourishment, endocrine problems, psychogenic elements, & hostile to diabetes drugs.¹⁴ In the current review, we contrasted 54 analyzed diabetic male & 54 non-diabetic men suitably coordinated. Our review exhibited

hypogonadism to be a typical complexity in type 2 diabetic men transcendently without miniature or large scale vascular confusions or whatever other condition that could cause sexual brokenness contrasted with age matched non-diabetic control populace. Hypogonadism in the review not entirely set in stone by estimating the Complete Testosterone (TT) level & the degree of Sex Chemical Restricting Globulin (SHBG). In this review it was seen that the Absolute Testosterone & free Testosterone levels were fundamentally lower in diabetic patients in contrast with control solid subjects. This shows the relationship of hypogonadism in patients of diabetes mellitus. Dhindsa et al (2004) had exhibited in their review, event of hypogonadotrophic hypogonadism in type-2 DM patients. The commonness of hypogonadism in their review was 33% & many were related with hypogonadotrophism 9. In our review the commonness of hypogonadism was 24.07% in diabetics in contrast with 5.5% in charge, who were non diabetic. In this examination, we observed that there is a tremendous distinction of sex steroid levels between type 2 DM men & control bunch. This exposes the significant job of hormonal change in the causation of sexual brokenness in diabetes mellitus. This is of specific significance on the grounds that viable treatment choices are accessible for such sexual problems. In our review it was likewise seen that a critical number of diabetic men had low aggregate & free testosterone levels. The numbers in the non-diabetic partners were altogether low. BMI was likewise estimated for all patients & there was critical relationship between high BMI & hypogonadism. Among the cases, the subjects with BMI ≥23, had expanded commonness of hypogonadism (38.46%). Hypogonadism likewise increments with longer length of diabetes. This is likewise as opposed to the concentrate by Dandona et al¹⁵ where no huge affiliation was found between span of diabetes & event of hypogonadism.

6. Conclusion

We conclude that prevalence of hypogonadism in diabetic subjects was significantly more than age matched control population. Increased duration of diabetes & increased age of the patients were associated with increased prevalence of hypogonadism. In our study it was also found that in addition to diabetes, persons who were also obese or overweight had increased prevalence of hypogonadism.

7. Limitations

1. Larger sample size would have been better for more representation
2. Follow-up studies are essential to establish trends in hypogonadism with increasing age & duration of type 2 diabetes mellitus.

8. Source of Funding

None.

9. Conflict of Interest

None.

10. Acknowledgement

Remaining grateful to the Department of General Medicine & Department of Endocrinology, IPGMER, Kolkata.

References

1. Defeudis G, Mazzilli R, Tenuta M, Rossini G, Zamponi V, Olana S, et al. Erectile dysfunction & diabetes: A melting pot of circumstances & treatments. *Diabetes Metab Res Rev.* 2021;38(2):e3494. doi:10.1002/dmrr.3494.
2. Kang WH, Sithik MNM, Khoo JK, Ooi YG, Lim QH, Lim L, et al. Gaps in the management of diabetes in Asia: A need for improved awareness and strategies in men's sexual health. *J Diabetes Investig.* 2022;13(12):1945–57.
3. Mcculloch DK, Campbell IW, Wu FC, Prescott RJ, Clarke BF. The prevalence of diabetic impotence. *Diabetologia.* 1980;18(4):279–83.
4. Fedele D, Coscelli C, Santeusano F, Bortolotti A, Chatenoud L, Colli E, et al. Erectile dysfunction in diabetic subjects in Italy. Gruppo Italiano Studio Deficit Erettile nei Diabetici. *Diabetes Care.* 1998;21(11):1973–7.
5. Fairburn CG, Wu FC, Mcculloch DK, Borsley DQ, Ewing DJ, Clarke BF, et al. The clinical features of diabetic impotence: a preliminary study. *Br J Psychiatry.* 1982;140:447–52. doi:10.1192/bjp.140.5.447.
6. Bhasin S, Cunningham GR, Hayes FJ, Matsumoto AM, Snyder PJ, Swerdloff RS, et al. Testosterone therapy in adult men with androgen deficiency syndromes: An Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab.* 2006;91(6):1995–2010.
7. Morley JE, Charlton E, Patrick P, Kaiser FE, Cadeau P, Mccready D, et al. Validation of a screening questionnaire for androgen deficiency in aging males. *Metabolism.* 2000;49(9):1239–42.
8. Kapoor D, Malkin CJ, Channer KS, Jones TH. Androgens, insulin resistance and vascular disease in men. *Clin Endocrinol (Oxf).* 2005;63(3):239–50.
9. Dhindsa S, Prabhakar S, Sethi M, Bandyopadhyay A, Chaudhuri A, Dandona P, et al. Frequent occurrence of hypogonadotropic hypogonadism in type 2 diabetes. *J Clin Endocrinol Metab.* 2004;89(11):5462–8.
10. Saboor-Aftab SA, Kumar S, Barber TM. The role of obesity & type 2 diabetes mellitus in the development of male obesity-associated secondary hypogonadism. *Clin Endocrinol (Oxf).* 2013;78(3):330–7.
11. Frederick CW, Tajar A, Beynon JM, Pye SR, Silman AJ, Finn JD, et al. Identification of late-onset hypogonadism in middle-aged and elderly men. *N Engl J Med.* 2010;363(2):123–5.
12. Tawfeek MA, Alfadhli EM, Alayoubi AM, El-Beshbishy HA, Habib FA. Sex hormone binding globulin as a valuable biochemical marker in predicting gestational diabetes mellitus. *BMC Womens Health.* 2009;17(1):18. doi:10.1186/s12905-017-0373-3.
13. Brant WO, Bella AJ, Lue TF. Sexual Dysfunction in diabetes. In: Feingold K, Anawalt B, Blackman M, editors. *Endotext* [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2006.
14. Vinik AI, Maser RE, Mitchell BD, Freeman R. Diabetic autonomic neuropathy. *Diabetes Care.* 2003;26(5):1553–79.
15. Dandona P, Dhindsa S. Update: Hypogonadotropic Hypogonadism in Type 2 Diabetes and Obesity. *J Clin Endocrinol Metab.* 2011;96(9):2643–51.


Author biography

Suwendu Jana, Assistant Professor  <https://orcid.org/0009-0006-0692-6228>

Snehasis Ghosh, Assistant Professor  <https://orcid.org/0000-0001-5322-9149>

Anjan Debnath, Assistant Professor  <https://orcid.org/0009-0000-7071-0794>

Arup Ghosh, Assistant Professor  <https://orcid.org/0000-0003-2881-990X>

Partha Sarathi Karmakar, Professor  <https://orcid.org/0009-0002-8166-672X>

Purba Haldar, Professor  <https://orcid.org/0000-0003-2308-4959>

Cite this article: Jana S, Ghosh S, Debnath A, Ghosh A, Karmakar PS, Haldar P. Prevalence of hypogonadism in type 2 diabetes mellitus associated with or without obesity: An observational study. *Panacea J Med Sci* 2024;14(2):466-470.