Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page:www.jamdsr.com doi:10.21276/jamdsr UGC approved journal no. 63854

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Serum testosterone levels in type II diabetic males

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ABSTRACT:

Background: Type-2 diabetes, a bipolar disorder characterized by inconsistent production and decreased insulin action, accounts for around 90% of all cases of diabetes. The present study was conducted to assess serum testosterone levels in type II diabetic males. **Materials & Methods:** 90 type II diabetic males and healthy control group was selected. Parameters such as waist-to-hip ratio and body mass index, serum total testosterone and blood SHBG levels were recorded. **Results:** The mean waist circumference (cm) was 86.4 and 74.2, waist-to-hip ratio was 0.91 and 0.87, FBG (mg/dL) was 158.4 and 92.6, triglyceride (mg/dL) was 148.2 and 114.4, total cholesterol (mg/dL) was 196.2 and 157.4, HDL- cholesterol (mg/dL) was 38.1 and 42.5, VLDL- cholesterol (mg/dL) was 29.4 and 23.6, LDL- cholesterol (mg/dL) was 126.2 and 92.4, glycated haemoglobin was 8.2% and 5.3%, total testosterone (nmol/L) was 10.4 and 17.4, serum SHBG (nmol/L) was 42.6 and 63.5, and free testosterone (nmol/L) was 0.26 and 0.32 in group I and II respectively. The difference was significant (P< 0.05).TT≤8nmol/L was seen in 81 diabetics and 12 non- diabetic and FT≤0.225nmol/Ls in 74 diabetics and11 non- diabetic subjects. The difference was significant (P< 0.05). **Conclusion:** Men's blood sugar status and testosterone levels indicated a potential role for testosterone in the development of type 2 diabetes. Men with type 2 diabetes had considerably lower serum testosterone and SHBG levels.

Keywords: Glucose, Testosterone, Diabetes

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This article may be cited as: Garg G. Serum testosterone levels in type II diabetic males. J Adv Med Dent Scie Res 2018;6(9):197-200.

INTRODUCTION

Type-2 diabetes, a bipolar disorder characterized by inconsistent production and decreased insulin action, accounts for around 90% of all cases of diabetes.[1,2] Through a well-coordinated set of actions that include promoting glucose absorption in peripheral tissues including muscle and fat, preventing the liver from producing glucose, and regulating lipid metabolism, insulin plays a significant role in maintaining glucose homeostasis.[3] In addition to insulin, catecholamines, growth hormone, cortisol, glucagon, and insulin-like growth factor-1 are other hormones that support the maintenance of glucose homeostasis. Medical researchers' interest in androgen deficiency has increased recently, as they have connected testosterone to both men's general health and certain serious systemic diseases, such as type 2 diabetes.[4]

A more favorable cardiovascular profile, which includes lower blood pressure, blood glucose, triglyceride concentrations, body mass index, and HDL cholesterol, has generally been associated with greater endogenous testosterone concentrations.[5] Excessive levels of exogenous testosterone or other anabolic steroids, however, have been connected to adverse health outcomes such liver damage and unexpected cardiac death.[6] The question of whether low testosterone contributes to the aetiology of diabetes or is a biomarker for the disease has been discussed on a number of occasions. There is a serious dearth of research in this field in India, especially in the northeast.[7,8]The present study was conducted to assess serum testosterone levels in type II diabetic males.

MATERIALS & METHODS

The present study was conducted on 90 type II diabetic males. All gave their written consent to participate in the study.

Data such as name, age, etc. was recorded. Patients were divided into 2 groups. Group I was diabetics and group II were healthy control group. Parameters such as waist-to-hip ratio and body mass index, were also collected.Following proper aseptic and antiseptic procedures, five milliliters of blood were drawn from the median cubital vein. Tests were performed using separated serum within eight hours of sample

collection; if not, the samples were kept for subsequent use at -20°C. Serum fasting glucose, total cholesterol, triglycerides, HDL, and glycosated hemoglobin were estimated using a MERCK microlab 300 serum analyzer. Calculations of LDL and VLDL values were made using Friedwald's algorithm. Serum total testosterone and blood SHBG levels were estimated using the ELISA microplate reader. The free testosterone calculator calculated serum free testosterone using the Vermeulen's formula for serum total testosterone, SHBG, and albumin. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Comparison of parameters

Parameters	Group I	Group II	P value
Waist circumference (cm)	86.4	74.2	0.05
Waist-to-hip ratio	0.91	0.87	0.03
FBG (mg/dL)	158.4	92.6	0.02
Triglyceride (mg/dL)	148.2	114.4	0.01
Total cholesterol (mg/dL)	196.2	157.4	0.03
HDL- cholesterol (mg/dL)	38.1	42.5	0.75
VLDL- cholesterol (mg/dL)	29.4	23.6	0.05
LDL- cholesterol (mg/dL)	126.2	92.4	0.01
Glycated haemoglobin (%)	8.2	5.3	0.02
Total testosterone (nmol/L)	10.4	17.4	0.02
Serum SHBG (nmol/L)	42.6	63.5	0.05
Free testosterone (nmol/L)	0.26	0.32	0.05

Table II, graph I shows that mean waist circumference (cm) was 86.4 and 74.2, waist-to-hip ratio was 0.91 and 0.87, FBG (mg/dL) was 158.4 and 92.6, triglyceride (mg/dL) was 148.2 and 114.4, total cholesterol (mg/dL) was 196.2 and 157.4, HDL-cholesterol (mg/dL) was 38.1 and 42.5, VLDL-cholesterol (mg/dL) was 29.4 and 23.6, LDL-cholesterol (mg/dL) was 126.2 and 92.4, glycated haemoglobin was 8.2% and 5.3%, total testosterone (nmol/L) was 10.4 and 17.4, serum SHBG (nmol/L) was 42.6 and 63.5, and free testosterone (nmol/L) was 0.26 and 0.32 in group I and II respectively. The difference was significant (P< 0.05).

Graph IComparison of parameters

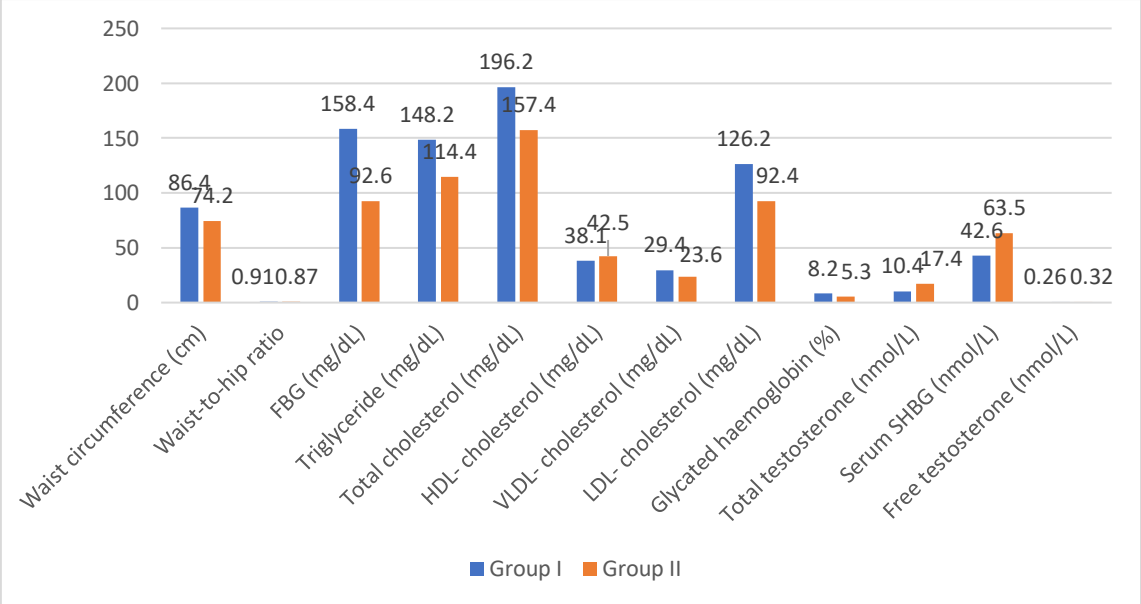

Table II Low testosterone levels in patients

Testosterone levels	Total	DM present	DM absent	P value
TT≤8nmol/L	90	81	12	0.01
FT≤0.225nmol/Ls	85	74	11	0.02

Table II shows that TT≤8nmol/L was seen in 81 diabetics and 12 non- diabetic and FT≤0.225nmol/Ls in 74 diabetics and11 non- diabetic subjects. The difference was significant (P< 0.05).

DISCUSSION

Men with type 2 diabetes, obesity, and the metabolic syndrome have reduced levels of total and free testosterone as well as sex hormone-binding globulin (SHBG).[9,10] Conversely, low levels of SHBG and/or testosterone are linked to an increased risk of metabolic syndrome and type 2 diabetes.[11] Visceral obesity, which is common in men with low testosterone, the metabolic syndrome, and/or type 2 diabetes, is influenced by proinflammatory factors.[12] By compromising arterial endothelial function, these inflammatory markers increase the risk of erectile dysfunction and cardiovascular disease (CVD).[13,14]The present study was conducted to assess serum testosterone levels in type II diabetic males.

We found that mean waist circumference (cm) was 86.4 and 74.2, waist-to-hip ratio was 0.91 and 0.87, FBG (mg/dL) was 158.4 and 92.6, triglyceride (mg/dL) was 148.2 and 114.4, total cholesterol (mg/dL) was 196.2 and 157.4, HDL- cholesterol (mg/dL) was 38.1 and 42.5, VLDL- cholesterol (mg/dL) was 29.4 and 23.6, LDL- cholesterol (mg/dL) was 126.2 and 92.4, glycated haemoglobin was 8.2% and 5.3%, total testosterone (nmol/L) was 10.4 and 17.4, serum SHBG (nmol/L) was 42.6 and 63.5, and free testosterone (nmol/L) was 0.26 and 0.32 in group I and II respectively. Li C et al[15]assessed the associations of testosterones and sex hormone–binding globulin (SHBG) with metabolic syndrome and insulin resistance in men. After adjustment for age, race/ethnicity, smoking status, alcohol intake, physical activity level, LDL cholesterol, C-reactive protein, and insulin resistance, men in the first quartile (lowest) (prevalence ratio 2.16 [95% CI 1.53–3.06]) and second quartile of total testosterone (2.51 [1.86–3.37]) were more likely to have metabolic syndrome than men in the fourth quartile (highest, referent group) (P- 0.001 for linear trend). Similarly, men in the first quartile of SHBG (2.17 [1.32–3.56]) were more likely to have metabolic syndrome than men in the fourth quartile (P- 0.02 for linear trend). No significant associations of calculated free testosterone (P- 0.31 for linear trend) and bioavailable testosterone (P- 0.11 for linear trend) with metabolic syndrome were detected after adjustment for all possible confounders.

We observed that TT≤8nmol/L was seen in 81 diabetics and 12 non- diabetic and FT≤0.225nmol/Ls in 74 diabetics and11 non- diabetic subjects. Mattack et al[16] evaluated the relationship between lipid profile and testosterone levels and type 2 diabetes mellitus. Forty men with type 2 diabetes and forty age-matched, healthy men without diabetes made up the case control study. Both groups' lipid profiles, testosterone, and SHBG levels were assessed. Sex Hormone Binding Globulin and serum levels of both free and total testosterone were considerably lower in the test group than in the control group. Men with total testosterone levels below 8 nmol/L had a five-fold greater prevalence of type 2 diabetes, while men with free testosterone levels below 0.225 nmol/L had a five-seven-fold higher prevalence. There was a significant negative connection between total and free testosterone and fasting blood glucose. There was a negative connection between glycated hemoglobin and SHBG, but not between total or free testosterone. While there was no significant link with free testosterone, there was a significant negative correlation with total testosterone and SHBG for both serum total and LDL cholesterol. There was no discernible relationship between total or free testosterone and SHBG levels and serum VLDL, HDL, or triglycerides.

The limitation of the study is the small sample size.

CONCLUSION

Authors found that testosterone levels and blood sugar levels in men suggested that testosterone may play a part in the onset of type 2 diabetes. Serum levels of SHBG and testosterone were significantly lower in men with type 2 diabetes.

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