



To evaluate correlation of serum testosterone concentration with micro and macrovascular complications in type 2 diabetic men at tertiary care hospital Bikaner

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Introduction

Background: Testosterone is the major male androgen and is produced by the leydig cells in the male testis and in smaller amounts by the adrenal glands. It is responsible for male secondary sexual characteristics and sperm production. The effects of low testosterone levels include low sex drive, changes in mood, loss of muscle and bone strength, and increase body fat.

Materials and Methods: This was a cross sectional study. 150 cases of type 2 diabetes mellitus and 50 cases without type 2 diabetes mellitus matched for confounding factors were taken as controls. Serum total testosterone level is assessed by chemiluminiscence metod.

Results : In present study, no significant difference were found as we compared complications like neuropathy, nephropathy and retinopathy with total serum testosterone levels ($p>0.05$) while CAD had a significant relation with low total testosterone ($p<0.05$).

Conclusions: No correlation was found between diabetic complications and serum total testosterone except cardiovascular disease.

Keywords: Type 2 Diabetes Mellitus, serum total testosterone, complication.

Introduction

Testosterone is the major male androgen and is produced by the leydig cells in the male testis and in smaller amounts by the adrenal glands. It is responsible for male secondary sexual characteristics and sperm production. The effects of low testosterone levels include low sex drive, changes in mood, loss of muscle and bone strength, and increase body fat¹. The amount of testosterone synthesized is regulated by the hypothalamic-pituitary-testicular axis. When testosterone levels are low, gonadotropin-releasing hormone (GnRH) is released by the hypothalamus which in turn stimulates the pituitary gland to release FSH and LH. These latter two hormones stimulate the testis to synthesize testosterone². This means that when the feedback mechanism is functioning properly, low testosterone level will induce secretion of high FSH and LH levels.

Like other steroid and thyroid hormones, testosterone secreted into the circulation by leydig cells is mostly bound to plasma proteins, primarily to sex hormone binding globulin (sex hormone binding globulin) and albumin. In the circulation, total testosterone is composed of 0.5% to 3.0% free testosterone unbound to plasma

proteins, 30% to 44% sex hormone binding globulin-bound testosterone, and 54% to 68% albumin bound Testosterone³.

Material & Methods

The Cross sectional study was carried out in the department of medicine and diabetes care and research Centre, S.P. Medical College, Bikaner.

Inclusion Criteria

- Healthy subjects (free from any other disease).
- Type 2 diabetic male.
- Patients giving informed consent.

Exclusion Criteria

- Significant comorbidities like liver disease, tuberculosis, smoking, alcoholics, HIV etc.
- Any acute illness.
- Men on hormonal therapy.
- Men who had a surgical or chemical castration (for prostatic cancer)
- Type 1 diabetic male.
- Patients not willing to participate in the study or not giving consent.

Diagnostic criteria for diabetes mellitus¹:

1. Fasting blood sugar > 7.0mmol/L (126mg/dl) or
2. HbA_{1c} > 6.5% or
3. Two hour plasma glucose >11.1mmol/L (200mg/dL) during an oral glucose tolerance test or
4. Symptoms of diabetes plus random blood glucose concentration >11.1 mmol/L(200mg/dL).

Methods

Testosterone Assay- total testosterone level done by chemiluminiscence method.

Methods of data collection

The data were collected on a specially designed proforma describing baseline demography and participants were undergo detailed physical and laboratory testing. Written and informed consent was taken from the patients.

Participants were asked to provide information about their age, occupation, medical history, smoking status, alcohol consumption habits, and participation in regular physical exercise.

Statistical analysis

All data were analyzed on SPSS 17.0 version of statistical software. Pearson’s coefficient level of significance i.e., p value <0.05 kept as significant whereas <0.001 kept highly significant.

Observations

Table 1

Distribution of cases according to neuropathy in relation to serum total testosterone (ng/dl) in diabetic patients (n=150)

Neuropathy	Serum Total Testosterone (ng/dl)					
	<241 (Low)		241-400 (Low Normal)		>400 Normal	
	No.	%	No.	%	No.	%
Present	4	8.2	10	10.2	0	-
NAD	45	91.8	88	89.8	3	100.0
Total	49		98		3	
χ^2	0.476					
P	0.788					

According to above table, neuropathy was present in only 14 cases and out of them 4 and 10 belonged to serum total testosterone (ng/dl) level <241 and 241-400 groups respectively. On applying chi square test, the difference was found statistically insignificant (p>0.05).

Table 2

Distribution of cases according to retinopathy in relation to serum total testosterone (ng/dl) in diabetic patients (n=150).

Retinopathy	Serum Total Testosterone (ng/dl)					
	<241 (Low)		241-400 (Low Normal)		>400 Normal	
	N o.	%	No.	%	N o.	%
Present	6	12.2	12	12.2	1	33.3
NAD	43	87.8	86	87.8	2	66.7
Total	49		98		3	
χ^2	1.182					
P	0.554					

Retinopathy was present in total 19 cases and out of them 6, 12 and 1 case had their serum total testosterone (ng/dl) levels <241, 241-400 and >400 respectively and this difference was found statistically insignificant (p>0.05).

Table 3

Distribution of cases according to nephropathy in relation to serum total testosterone (ng/dl) in diabetic patients (n=150)

Nephropathy	Serum Total Testosterone (ng/dl)					
	<241 (Low)		241-400 (Low Normal)		>400 Normal	
	No.	%	No.	%	No.	%
Present	6	12.2	13	13.3	0	-
NAD	43	87.8	85	6.7	3	100
Total	49		98		3	
χ^2	0.475					
P	0.789					

According to above table, nephropathy was present in 19 cases and out of them 6 and 13 cases had their serum total testosterone (ng/dl) level <241, 241-400 respectively and this difference was also found statistically insignificant (p>0.05).

Table 4

Distribution of cases according to CAD in relation to serum total testosterone (ng/dl) in diabetic patients (n=150)

CAD	Serum Total Testosterone (ng/dl)					
	<241 (Low)		241-400 (Low Normal)		>400 Normal	
	No.	%	No.	%	No.	%
Present	7	14.3	12	12.2	2	66.7
NAD	42	85.7	86	87.8	53	100
Total	49		98		3	
χ^2	7.165					
P	0.028					

CAD was present in total 21 cases and out of them 4, 12 and 2 cases had their serum total testosterone (ng/dl) level <241, 241-400 and >400 respectively while out of total 200 cases, 179 cases had no CAD and out of them 42, 86 and 53 had their serum total testosterone level <241, 241-400 and >400 respectively and this difference was found statistically significant (p<0.05).

Discussion

In present study, no significant difference were found as we compared complications like neuropathy, nephropathy and retinopathy with total serum testosterone levels (p>0.05) while CAD had a significant relation with low total testosterone (p<0.05). Similar results were observed by Daka et al⁴. A number of epidemiological studies have suggested an association of obesity, metabolic syndrome, and dysglycemia with low serum testosterone and poor quality of life in type 2 diabetes⁵⁻¹⁰. This association is of clinical significance because low total testosterone in men has been reported to be associated with increased cardiometabolic risk factor burden, including a greater prevalence of dyslipidemia⁹ and atherosclerosis¹⁰.

Conclusion

In present study, no significant difference were found as we compared complications like neuropathy, nephropathy and retinopathy with total serum testosterone levels

($p>0.05$) while CAD had a significant relation with low total testosterone ($p<0.05$).

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