

To Study Serum Testosterone Levels in Metabolic Syndrome

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ABSTRACT

Introduction: Metabolic syndrome (Metabolic syndrome) is a complex disorder with high socioeconomic cost that is considered a worldwide epidemic. Current research aimed to study serum testosterone levels in metabolic syndrome.

Material and methods: The present study was Prospective Observational study carried out at CSS Hospital, Subharti Medical College Meerut U.P. 100 patients of metabolic syndrome were included in the study who fulfilled the IDF criteria of metabolic syndrome these patients underwent general examination, anthropometry, systemic examination, bmi was calculated, different investigation (Fasting Lipid Profile, Serum Testosterone Levels, HbA1C, blood sugar levels). Descriptive analysis of the collected data was done. Correlation of serum testosterone with various components of metabolic syndrome was studied using SPSS software to calculate the level of significance

Results: This study confirmed the high prevalence of low testosterone levels in male patients with metabolic syndrome. The total number of patients who had BMI of more than 35 kg/m², were 18 and all those had low levels of testosterone which is significant (p value < 0.001). The total number of patients who had triglyceride level of >150, were 80 and all those had low levels of testosterone which is significant (p value < 0.001). The total number of patients with low testosterone levels in whom HbA1C was more than 7.5%, were 68. Patients with normal level of testosterone were 32 in whom HbA1C was 6.5-7.5% which is significant (p value < 0.001).

Conclusion: This study confirmed the high prevalence of low testosterone levels in male patients with metabolic syndrome. Multiple associations and predictors of low testosterone levels were identified by evaluating different demographic, clinical and other variables.

Keywords: Serum Testosterone, Metabolic Syndrome

syndrome was described with advancing age, although this entity remains controversial.^{3,4}

It is recommended that this diagnosis only be made in men with clear clinical symptoms and signs of androgen deficiency, and with unequivocally low serum testosterone levels.⁴

There has been debate as to whether low testosterone levels contribute to the development of Metabolic Syndrome, or whether low testosterone is only a biomarker which coexists with Metabolic Syndrome because of mutual risk factors, or whether it is a consequence of the metabolic syndrome.⁶

Men with obesity, the metabolic syndrome, and type 2 diabetes often have low total and free testosterone and low sex hormone binding globulin (SHBG).⁶ Hypogonadism seems to be a common finding in diabetic men, and the majority of these men have symptoms of hypogonadism.⁷ Studies over the last few years found that at least 25% of men with type 2 diabetes had subnormal testosterone levels with inappropriately low LH and FSH concentrations, indicative of hypogonadotropic hypogonadism.⁸ Another 4% had subnormal testosterone levels with elevated LH and FSH concentrations implying primary hypogonadism. One study found a prevalence of 33% of low free testosterone in type 2 diabetic men.⁹ Current study aimed to record serum testosterone levels in metabolic syndrome.

MATERIAL AND METHODS

This was a Prospective observational study which was conducted at CSS Hospital, Subharti Medical College Meerut U.P. Total 100 cases were enrolled in the study who fulfilled IDF criteria of metabolic syndrome and qualifying all inclusion and exclusion criteria were enrolled in the study after taking written and informed consent. All patients went under general examination, anthropometry, BMI was calculated

INTRODUCTION

Metabolic Syndrome is defined by a cluster of interconnected factors that directly increase the risk of coronary heart disease (CHD), other forms of cardiovascular atherosclerotic diseases (CVD), and diabetes mellitus type 2 (DMT2).¹ Its main components are dyslipidemia (elevated triglycerides and apolipoprotein B (apoB)-containing lipoproteins, and low high-density lipoproteins (HDL), elevation of arterial blood pressure (BP) and dysregulated glucose homeostasis, while abdominal obesity and/or insulin resistance (IR) have gained increasing attention as the core manifestations of the syndrome.²

Hypogonadism is a clinical condition consisting both of symptoms and biochemical evidence of low testosterone levels. A condition called testosterone or androgen deficiency

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IDF criteria for metabolic syndrome

The IDF defines Metabolic Syndrome as a combination of central obesity plus + 2 of the following.

The IDF defines Metabolic Syndrome as a combination of central obesity plus + 2 of the following.
Central Obesity Male >90cm
(waist circumference) Female > 80cm
Triglyceride > 150mg/dl
HDL cholesterolmen < 40mg/dL
Women<50mg/dl
Blood pressure >130 (systolic) mmHg > 85(diastolic) mmHg
Fasting glucose >5.6 mmol/L
>100 mg/dL

Inclusion criteria

All male patients falling under IDF criteria for Metabolic Syndrome, Patients more than 18 years of age and less than 60yrs of age

Exclusion criteria

Patients on Testosterone therapy, Known cases of CNS disorders, Known cases of Tumours including Craniopharyngioma, Germinoma or Hypothalamic Gliomas,

Astrocytoma, Pituitary tumours., Patients on Chemotherapy, Patients on Radiation Therapy, Patients with developmental anomalies (hypospadias, micropenis, cryptorchidism), Patients on agents that interfere with testicular functions like spironolactone, Marijuana, Anabolic steroids, Alcoholics, Chronic kidney disease

Investigations: CBC, LFT, KFT, ESR, blood sugar (fasting, postprandial), urine R/M, fasting lipid profile, HBA1C, serum testosterone levels.

STATISTICAL ANALYSIS

Descriptive analysis of the collected data was done. Correlation of serum testosterone with various components of metabolic syndrome was studied using SPSS software to calculate the level of significance.

RESULTS

Patients with low level of testosterone (less than 3 ng/ml) were 27 in the age group of 40 -50 years and 26 were in the age group 50-60 years. There were 15 patients in the age group of more than 60 years which is significant (p

Age	No. of patients	Total testosterone level (ng/ml)		Total	P value
		Less than 3	More than 3		
40-50	No. of patients	27	23	50	0.001
		54.0%	46.0%	100.0%	
50-60	No. of patients	26	7	33	
		78.8%	21.2%	100.0%	
More than 60	No. of patients	15	0	15	
		100.0%	0.0%	100.0%	
Total	No. of patients	68	30	98	
		69.4%	30.6%	100.0%	

Table-1: Age and total testosterone level

BMI(kg/m ²)	No. of patients	Total testosterone level (ng/ml)		Total	P value
		Less than 3	More than 3		
Less than 25	No. of patients	10	23	33	0.000
		30.3%	69.7%	100.0%	
25-35	No. of patients	32	7	39	
		82.1%	17.9%	100.0%	
More than 35	No. of patients	26	0	26	
		100.0%	0.0%	100.0%	
Total	No. of patients	68	30	98	
		69.4%	30.6%	100.0%	

Table-2: BMI and total testosterone level

Triglyceride levels(mg/dl)	No. of patients	Total testosterone level (ng/ml)		Total	P value
		Less than 3	More than 3		
Borderline	No. of patients	10	1	11	0.205
		90.9%	9.1%	100.0%	
Borderline-high	No. of patients	40	22	62	
		64.5%	35.5%	100.0%	
High	No. of patients	18	7	25	
		72.0%	28.0%	100.0%	
Total	No. of patients	68	30	98	
		69.4%	30.6%	100.0%	

Table-3: Triglyceride and total testosterone level

HbA1C (%)	No. of patients	Total testosterone level (ng/ml)		Total	P value
		Less than 3	More than 3		
6.5 - 7.5	No. of patients	0	30	30	0.000
		0.0%	100.0%	100.0%	
More than 7.5	No. of patients	68	0	68	
		100.0%	0.0%	100.0%	
Total	No. of patients	68	30	98	
		69.4%	30.6%	100.0%	

Table-4: HbA1C and total testosterone level

value<0.001) (Table-1).

The total number of patients who had BMI less than 25 kg/m² were 35 and out of this, 10 patients had low levels of testosterone. The total number of patients who had BMI of 25-35 kg/m² were 40 and out of this 31 patients had low levels of testosterone. The total number of patients who had BMI of more than 35 kg/m², were 18 and all those had low levels of testosterone which is significant (p value<0.001) (table- 2).

The total number of patients who had triglyceride level 150-199 were 62 and out of this, 40 patients had low levels of testosterone. The total number of patients who had triglyceride level of >199 were 25 and out of this 18 patients had low levels of testosterone. The total number of patients who had triglyceride level of >150, were 80 and all those had low levels of testosterone which is significant (pvalue <0.001) (Table-3).

The total number of patients with low testosterone levels in whom HbA1C was more than 7.5%, were 68. Patients with normal level of testosterone were 32 in whom HbA1C was 6.5-7.5% which is significant (p value<0.001) (Table-4).

DISCUSSION

100 Metabolic Syndrome patients with age above 40 years were enrolled in this study to look for serum testosterone level. These patients were divided into 2 groups, one group had low testosterone level and the second had normal testosterone level (table 1). erectile dysfunction were observed in both these groups. although now there is convincing evidence that Metabolic Syndrome lead to hypogonadism. The prevalence of hypogonadism was around 68% in our study which is quite similar to another study by Ganesh et al.¹⁰ This study was the first study to determine the prevalence of hypogonadism in Indian population. This was done in one center and quoted a prevalence of 15% of hypogonadal patients. Albeit the definition of hypogonadism used in that study was that the patients with calculated free testosterone < 64.8 pg/mL were considered hypogonadal. For every 1 year increase age, there is 1.056 times more chance of getting hypogonadism in Metabolic Syndrome patients as compared to Metabolic Syndrome patients not suffering from hypogonadism.

For every unit increase in BMI, there is 1.053 times more chance of getting hypogonadism in Metabolic Syndrome patients. There is 1.77 times more chance of getting hypogonadal patients with age group of 40-49 as compared to patients with age group of 30-39, which is statistically significant at 5% level of significance and there is 2.96 times

more chance of getting hypogonadal patients with age group of 50-59 as compared to patients with age group of 30-39, which is statistically significant at 5% level of significance. In the Baltimore longitudinal study of aging,¹¹ the magnitude of the reduction in total testosterone averaged 0.03 ng/mL/year. The study found a prevalence of androgen deficiency of in 20s, 30s, and 40s, respectively, using a cutoff of 3.25 ng/mL. Their findings clearly support the fact that effect of aging to lower circulating total and free testosterone levels at a fairly constant rate, independent of any other lifestyle factors. These findings corroborate the findings in our study wherein the age-wise prevalence suggests that 51.1% prevalence was found in age group 40-50 years, 75% prevalence was found in 50-60 years, and 100% in more than 60 years age cohorts, respectively.

AI Hayek AA et al¹² in 2013 conducted a study among 1089 men (aged 30-70 years) with type 2 diabetes mellitus who consecutively attended a major diabetes centre in Amman, Jordan, between August 2008 and February 2009. An observed that Overall, 36.5% of patients with diabetes had Total testosterone level < 3 ng/ml and 29% had symptoms of androgen deficiency. Of those with serum testosterone level < 3 ng/ml, 80.2% had symptoms of androgen deficiency, 16.9% had primary hypogonadism (HG), and 83.1% had secondary hypogonadism (HG). The prevalence of low serum testosterone (LST) among men with type 2 diabetes mellitus is high. But in our study the overall 68% of patients with diabetes had testosterone level less than 3 ng/ml.

Result of our study concordant with Sachinverma et al¹³ who performed a study in 2013 to evaluate serum testosterone level in male patients with Metabolic Syndrome and concluded that serum testosterone level are significantly lower in Metabolic Syndrome

Our results are also concordant with Grossmann M et al¹⁴ who conducted a study in 2008 surveying 580 men with type 2 diabetes mellitus and concluded that testosterone deficiency is common in men with diabetes.

CONCLUSION

This study confirmed the high prevalence of low testosterone levels in male patients with metabolic syndrome. Multiple associations and predictors of low testosterone levels were identified by evaluating different demographic, clinical and other variables.

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