Harsukh Educational Charitable Society
International Journal of Community Health and Medical Research
Journal home page:www.ijchmr.com doi: 10.21276/ijchmr
ISSN E: 2457-0117 **ISSN P:** 2581-5040 **Index Copernicus** ICV =62.61

Original ARTICLE

Comparative evaluation of testosterone levels in obese and non-obese patients

Vikram Sharma[1], Anil Gupta[2], Amber Alliya[3]

[1]Professor, [2]Professor & Head, [3]PG student, Internal Medicine, ASCOMS Hospital, Sidhra, Jammu

ABSTRACT
Background: It is well studied that obesity is linked with decreased serum testosterone levels and obese men are found to have increased estrogen levels, thus it can be assumed that testosterone to estradiol ratio in obese men should be less as compared to individuals with normal BMI. Hence; under the light of above mentioned data, the present study was undertaken for assessing the testosterone levels in obese non-obese patients. **Materials & methods:** A total of 25 obese patients and 25 non-obese patients were enrolled in the present study. Five millilitre of venous blood was collected in fasting state, drawn into plain and EDTA vacutainers, and then centrifuged and serum separated. The sera were used to measure the concentration of Testosterone by Chemiluminescence. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Student t test was used for assessment of level of significance. **Results:** Mean testosterone levels among the subjects of obese group and non-obese group was found to be 7642.81 picomol/L and 22341.85 picomol/L respectively. While comparing the mean testosterone levels among patients of both the study groups, significant results were obtained. **Conclusion:** Testosterone levels are significant correlated with BMI. Obese patients are associated with significantly lower testosterone levels.
Key words: Testosterone, Obesity

Corresponding author: Dr. Anil Gupta, Professor & Head, Internal Medicine, ASCOMS Hospital, Sidhra, Jammu

This article may be cited as: Sharma V, Gupta A, Alliya A. Comparative evaluation of testosterone levels in obese and non-obese patients. HECS Int J Comm Health Med Res 2020; 6(1): 21- 23.

INTRODUCTION

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health. In 1997, a WHO expert committee classified a BMI of 25.0 – 29.0kg/m^2 as overweight, 30 – 34.9 kg/m^2 as obesity and ≥ 35 kg/m^2 as morbid obesity.[1, 2] Ethnic specific BMI cut off values, especially for Asian populations, have been proposed to address the higher prevalence of diabetes and cardiovascular diseases and the differing associations of BMI with body fat in different populations.[3- 6] Guidelines for obesity and overweight based on body mass indices (BMI) for Asian Indians were revised based on consensus developed through discussions by a Prevention and Management of Obesity and Metabolic Syndrome group.[7] The revised guidelines categorize overweight as a BMI of 23.0 – 24.9 kg/m^2 and obesity as a BMI≥25 kg/m^2 using values lower than the ethnic specific BMI previously advocated for Asian Indians.[5- 7]

Over the past 2 decades, sex steroid deprivation in men has garnered increased attention as a key risk factor for metabolic disease. Thus, men with physiologic hypogonadism or those undergoing androgen deprivation treatment (ADT) for prostate cancer are at higher risk for the incident development of obesity and associated metabolic disorders including insulin resistance, nonalcoholic fatty liver disease, and T2DM. A contributory, causal role for testosterone deprivation in these metabolic disorders is supported by clinical data demonstrating that exogenous testosterone therapy reverses the increased adiposity evident in hypogonadal men and may improve insulin sensitivity in hypogonadal men with T2DM. It is well studied that obesity is linked with decreased serum testosterone levels and obese men are found to have increased estrogen levels, thus it can be assumed that testosterone to estradiol ratio in obese men should be less as compared to individuals with normal BMI.[4- 7]

Hence; under the light of above mentioned data, the present study was undertaken for assessing the testosterone levels in obese non-obese patients.

MATERIALS & METHODS

The present study was undertaken for assessing the the testosterone levels in obese non-obese patients. A total of 25 obese patients and 25 non-obese patients were enrolled in the present study. Written consent was obtained from all the patients after explaining in detail the entire research protocol.

Inclusion criteria

1. Subjects aged 18-50 years
2. Subjects who were willing to sign the written consent form prior to participation in the study.

Exclusion criteria

1. Patients with Type 1 Diabetes Mellitus
2. Known cases of Chronic liver disease or Chronic kidney disease
3. Patients on hormonal supplements or hormonal antagonists
4. Patients of testicular or prostatic malignancy

Five milliliter of venous blood was collected in fasting state, drawn into plain and EDTA vacutainers, and then centrifuged and serum separated. The sera were used to measure the concentration of Testosterone by Chemiluminescence. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Student t test was used for assessment of level of significance.

RESULTS

In the present study, a total of 25 obese and 25 non-obese subjects were enrolled. Mean age of the patients of the obese and non-obese group was 37.48 years and 39.36 years respectively. Majority of the patients of both the study groups belonged to the age group of 31 to 50 years. Mean BMI of the patients of the obese and non-obese group was 29.13 and 23.66 Kg/m^2 respectively. In the present study, mean testosterone levels among the subjects of obese group and non-obese group was found to be 7642.81 picomol/L and 22341.85 picomol/L respectively. While comparing the mean testosterone levels among patients of both the study groups, significant results were obtained.

Table 1: Age-wise distribution of subjects in different groups

Age group (years)	Non-obese patients		Obese patients	
	n	%	N	%
18 to 30	4	16	3	12
31 to 40	11	44	11	44
41 to 50	10	40	11	44
Total	25	100	25	100
Mean ± SD	39.36 ± 8.98		37.48 ± 8.33	

Table 2: Mean BMI in different groups in different groups

Descriptive parameter	Non-obese patients		Obese patients	
	Mean	SD	Mean	SD
Mean BMI (Kg/m^2)	23.66	1.36	29.13	2.75

DISCUSSION

Obesity is associated with multiple alterations of the endocrine systems, including abnormal circulating blood hormone concentrations, due to changes in their pattern of secretion and/or metabolism, altered hormone transport, and/or action at the level of target tissues. Although it was thought for a long time that these alterations were secondary to obesity, usually being improved after weight loss, it has recently become evident that they may conversely play a cardinal role in the development of different obesity phenotypes and associated metabolic abnormalities. Spermatogenesis and fertility are not impaired in the majority of obese men. However, these parameters have been described as being reduced in subjects with massive obesity.[8, 9] Hence; under the light of above mentioned data, the present study was undertaken for assessing the testosterone levels in obese non-obese patients.

Table 3: Mean serum Testosterone levels in different groups

Descriptive parameter	Non-obese patients		Obese patients	
	Mean	SD	Mean	SD
Testosterone levels (picomol/L)	22341.85	652.71	7642.81	1246.96
p- value	0.00 (Significant)			

In the present study, mean age of the patients of the obese and non-obese group was 37.48 years and 39.36 years respectively. Majority of the patients of both the study groups belonged to the age group of 31 to 50 years. Mean BMI of the patients of the obese and non-obese group was 29.13 and 23.66 Kg/m^2 respectively. Yao QM et al in 2018 investigated the association of testosterone level with diabetes risk in men. PubMed, EMBASE and Web of Science were searched for eligible cohort or nested case–control studies published up to August 15, 2017. Meta-analysis was used to calculate the pooled relative risk (RR) of type 2 diabetes associated with higher testosterone level. Thirteen cohort or nested case–control studies with 16,709 participants were included. Meta-analysis showed that higher total testosterone level could significantly decrease the risk of type 2 diabetes in men, and higher free testosterone level could also decrease the risk of type II diabetes in men. After excluding two studies that did not calculate RRs by quartiles of testosterone levels, both higher total testosterone and free testosterone levels could decrease the risk of type II diabetes in men, and the pooled RRs were 0.62 and 0.77, respectively. This meta-analysis suggests that higher testosterone level can significantly decrease the risk of type 2 diabetes in men. Therefore, combined with previous researches, the findings above suggest a reverse-causality scenario in the relation between testosterone deficiency and risk of type 2 diabetes in men.[10]

In the present study, mean testosterone levels among the subjects of obese group and non-obese group was found to be 7642.81 picomol/L and 22341.85 picomol/L respectively. While comparing the mean testosterone levels among patients of both the study groups, significant results were obtained. Wu A et al in 2018 determined five-year changes in serum estradiol and the association with testosterone and fat mass in Australian men. At baseline and five-year follow-up, socio-demographic and health-related data including behaviors, chronic conditions, and medication use were collected by questionnaire. Estradiol and testosterone were assayed by liquid chromatography-tandem mass spectrometry and sex hormone-binding globulin by immunochemiluminescent assay. Fat mass was assessed by dual-energy X-ray absorptiometry. Community-dwelling men aged 35 years and older at enrollment, resident in the northern and western suburbs of Adelaide without established disease of, or medications affecting, the hypothalamus-pituitary-gonadal axis (n

= 725) were included in the study. At baseline, mean age was 53.0 ± 10.8 years. Mean serum estradiol levels at baseline and five-year follow-up were 94.9 ± 34.8 and 89.4 ± 30.4 pmol/L respectively (-1.1 pmol/L/year). On multivariable analyses, estradiol change was associated with changes in testosterone, but not age or total fat mass. Change in testosterone/estradiol ratio was inversely associated with change in fat mass, and this was consistent across quartiles of fat mass change. They concluded that in healthy men, circulating estradiol is primarily dependent on testosterone. With increasing fat mass, estradiol decreases less than testosterone. From a clinical standpoint these data indicate that obesity is associated with a change in the testosterone to estradiol ratio, but a change in estradiol does not occur unless some patholopgy is present.[11]

CONCLUSION

From the above results, the authors conclude that Testosterone levels is significant correlated with BMI. Obese patients are associated with significantly lower testosterone levels. Therefore; testosterone levels present risk for development of metabolic disorder.

REFERENCES

1. World Health Organization. Obesity: preventing and managing the global epidemic. World Health Organization; 2000.
2. The International Diabetes Institute, Regional Office for the Western Pacific (World Health Organization), International Association for the Study of Obesity, International Obesity Task Force. The Asia - Pacific Perspective: Redefining Obesity and Its Treatment. Melbourne, Australia: Health Communications Australia; 2000:15-8.
3. James WP, Chunming C, Inoue S. Appropriate Asian body mass indices?. Obesity Reviews. 2002;3(3):139.
4. WHO EC. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004;363(9403):157.
5. Duncan JS, Duncan EK, Schofield G. Ethnic-specific body mass index cut-off points for overweight and obesity in girls. The New Zealand Medical Journal (Online). 2010;123(1311).
6. Dudeja V, Misra A, Pandey RM, Devina G, Kumar G, Vikram NK. BMI does not accurately predict overweight in Asian Indians in northern India. British Journal of Nutrition. 2001;86(1):105-12.
7. Misra A, Chowbey P, Makkar BM, et al. Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asian Indians and Recommendations for Physical Activity, Medical and Surgical Management. J Assoc Physicians India 2009;57:163-70.
8. Raatikainen K, Heiskanen N, Heinonen S. Transition from overweight to obesity worsens pregnancy outcome in a BMI-dependent manner. Obesity. 2006;14(1):165-71.
9. Agbecha A, Usoro CA. Serum testosterone and insulin resistance in type 2 male diabetics attending University of Calabar teaching hospital, Nigeria. J Med Soc 2017;31:178-84
10. Yao QM, Wang B, An XF, Zhang JA, Ding L. Testosterone level and risk of type 2 diabetes in men: a systematic review and meta-analysis. Endocr Connect. 2018;7(1):220–231.
11. Wu A, Shi Z, Martin S, Vincent A, Heilbronn L, Wittert G. Age-related changes in estradiol and longitudinal associations with fat mass in men. PLoS One. 2018;13(8):e0201912.