

# THE TESTOSTERONE STATUS IN OVERWEIGHT YOUNG ADULTS OF PESHAWAR

Ubaid ur Rehman, Sadaf Durrani, Ubaidullah, Sabia Ali, Muddassir Ahmad Khan, Saif Ur Rahman Wazir

Department of Biochemistry, Khyber Medical College, Peshawar - Pakistan

## ABSTRACT

**Objective:** To see whether obesity decreases the testosterone concentration in young male adults, who have no other cause of decreased testosterone.

**Material & Methods:** This was a comparative, case control and cross sectional study conducted in the Department of Biochemistry, Khyber Medical College, Peshawar - Pakistan. The study period was from January 2016 to December 2016, consisting of two groups, A and B, each having 32 subjects. Group A had BMI of  $>25$  Kg/m<sup>2</sup> while the control group B had BMI of  $< 25$  Kg/m<sup>2</sup>. Their testosterone concentrations were compared keeping other confounding factors like age, sex, educational status and socioeconomic conditions constant. The weight in Kg and height in meters were measured for each subject and then BMI was calculated. A blood sample of approximately 5-ml was collected from each participant. The sera were prepared and stored in labeled tubes which were then properly sealed, placed in racks and were stored in a freezer at  $-20^{\circ}\text{C}$  till further analysis. The samples were analyzed for serum Testosterone level by Radioimmunoassay (RIA) method.

**Results:** Group A had 32 obese subjects having a BMI 26.9 Kg/m<sup>2</sup> with a SD of 1.501. The testosterone concentration of group A is compared with that of control group B having a normal BMI of 21.7 with a SD of 1.557. Testosterone concentrations of the two study groups revealed a significant difference ( $P < 0.001$ ) when compared by the independent sample t-test.

**Conclusion:** The increase trend of obesity in elderly people and now in young adults should be prevented as it lower serum testosterone concentrations, apart from other hazards like diabetes, hypertension, CVD and osteoarthritis.

**Key Words:** Testosterone, overweight, obesity, young adults.

---

**This article may be cited as:** Rehman UU, Durrani S, Ubaidullah, Ali S, Khan MA, Wazir SUR. The testosterone status in overweight young adults of Peshawar. *J Med Sci* 2017; 25: (2) 80-83.

---

## INTRODUCTION

Obesity is defined as excess accumulation of body fat and is a disorder of regulatory systems of body weight. The direct measurement of the amount of body fat is not easy thus an indirect measure, called the "body mass index (BMI)", is used for the purpose<sup>1</sup>.

Body mass index or BMI is the ratio of weight in Kg to the height in meter<sup>2</sup>. The normal value for this index is 19.5-25 Kg /m<sup>2</sup>. Subjects who have a BMI of 25-29.9 are termed as Obese (overweight) while those

having BMI  $\geq 30$  are termed as massively obese. Lean body mass rises to a plateau in the 3<sup>rd</sup> decade of life, then in men it declines at an accelerated rate with advancing age. Consequently, if food is not reduced with advancing age, obesity will result. Most alarming is the increase of obesity in children or young adults under the age of 25 years, the prevalence of which has elevated by three folds in the previous two decades. There has been a global increase in obesity with the number of obese individuals being estimated to be more than the undernourished people. Obesity is a risk factor for common diseases such as type 2 diabetes mellitus (T2DM), cardiovascular disease (CVD), cancers and erectile dysfunction (ED). Adipose tissue produces factors known as the adipokines and cytokines, these affect the metabolic and endothelial functions of a body leading to insulin resistance and metabolic syndrome (risks factor for CVD). The reduction in body mass index (BMI) results in the improvement in erectile dysfunction as well as metabolic syndrome. A complex

---

**Ubaid ur Rehman** (Corresponding Author)  
Associate Professor  
Department of Biochemistry, Khyber Medical College,  
Peshawar - Pakistan  
Cell: +92-322-9950198  
Email: ubaidndio@gmail.com

**Date Received:** December 17, 2016

**Date Revised:** January 30, 2017

**Date Accepted:** February 10, 2017

## The testosterone status in overweight young adults of Peshawar

and confusing relationship exists among obesity, ED, the metabolic syndrome, serum sex hormone-binding globulin (SHBG) and total and free testosterone levels. BMI is inversely related to circulating total testosterone levels<sup>2</sup>.

Research studies have reported inverse effect of low serum testosterone on muscle strength and visceral body fat distribution with aging<sup>3-8</sup>. These studies have been mostly carried out on middle aged or elderly male subjects. Increase in age is a key factor in the decrease of plasma testosterone levels due to one of the following reasons: i. a decrease in LH dependent testicular steroidogenesis ii. Age-related decline in LH output at hypothalamic level iii. Increased sensitivity to the negative feedback effect of testosterone on the hypothalamic-pituitary axis<sup>9</sup>. The patterns of testosterone levels in these men were assumed to have been determined by obesity. Studies have confirmed the role of increasing age and abdominal obesity in the reduction of serum testosterone level<sup>10,11</sup>. The present study analyzed a possible relationship between testosterone levels and obesity, the obesity being the independent factor. The distinguishing feature of our study is that all male subjects included in it were young having less than 25 years age, thus omitting age-related factors in the testosterone secretion.

### MATERIAL & METHODS

Thirty two young male adults of age between 18 and 25 years with overweight BMI i.e 25 to 30 Kg/m<sup>2</sup> were included in this study from various educational institutions of Peshawar. the study was conducted from January 2016 to December 2016. Exclusion criteria for this group were diabetes mellitus, hypogonadism, hyperthyroidism, hypothyroidism, mental illness like depression and epilepsy, hypertension, recent surgery under general anesthesia i.e., within 7 days, unilateral or bilateral Cryptorchidism who underwent post pubertal surgery, fasting for the last 5 days, Varicocele, severe liver and kidney disease and the subjects who had received hormonal therapy at any point in the previous three months. Thirty two men, 18–25 years of age having normal BMI were selected randomly from the above stated institutions as the control group. Informed consent was obtained from all participants of the study. The weight in Kg and height in meters were measured for each subject. Height was measured using a Height Chart by Stretch Stature method. The study subjects stood with feet together while their heels, buttocks and the upper back touched wall. The heads of participants were placed in the Frankfort plane with lower edge of eye socket lying in the same horizontal plane as the notch which is superior to the tragus of the ear. The

participants were asked to inhale deeply at the end of which the measurement was taken. BMI was calculated from internet at the website by putting the weight and height of each subject. A blood sample of approximately 5-ml was drawn from the antecubital vein of each participant. For this purpose 5-ml disposable B.D. syringes were used with all the aseptic conditions. The needle as well as piston was removed from the syringe and blood was poured just by the action of gravity into the sterilized tubes, on which the name, record number and date (on which the collection was made) had been written. After the formation of blood clot it was striped gently with sterile tips and the tubes were immediately centrifuged (IEC Model DPR-6000 Centrifuge) at the rate of 1500-2000 rpm for 10 minutes. Then the serum was tipped out with micropipette into sterile plastic tubes labeled with the corresponding data. These tubes containing the sera were then properly sealed, placed in racks and were stored in a freezer at -20 °C till further analysis. These standard collection and handling procedures can keep testosterone levels stable till 6 months. The samples were analyzed for serum Testosterone level at the Institute of Radiotherapy and Nuclear Medicine (IRNUM), Peshawar. Radioimmunoassay (RIA) method was used for the analysis of serum Testosterone.

### RESULTS

We had two groups in our study. Group A had 32 subjects having BMI between 25-30 Kg/m<sup>2</sup> with BMI of  $26.9 \pm 1.501$ . This group had their mean testosterone concentration of 7.3 ng/ml with a SD of 3.178 as shown in Table 1. The parameters of the subjects of group A were compared with those of the subjects of group B having the control subjects with BMI <25 Kg/m<sup>2</sup>. The subjects of this control group had a BMI of  $21.7 \pm 1.557$ . Their mean T concentration was 10.9 ng/ml with a SD of 2.263. Other confounding variables like age, sex, educational status and socioeconomic conditions were constant, so there was no other confounding factor affecting T except the BMI. Independent sample t-test for BMI and T while comparing the two groups showed significant differences with P-value for BMI ( $P < 0.001$ ) and for T level ( $P=0.01$ ). Pearson and Spearman correlation were also performed showing significant P-values of  $< 0.01$ .

**Table 1: Association of BMI and Serum Testosterone level**

Groups	BMI		Serum T conc.		P-value	Re-sult
	Mean	SD	Mean	SD		
Subjects	26.9	1.501	7.3	3.178	0.001	S
Controls	21.7	1.557	10.9	2.263	0.001	S

## DISCUSSION

The increased fat content of the body's adipose tissue leads to an increase in insulin secretion<sup>12</sup> suppressing sex hormone binding globulin synthesis<sup>13</sup> and thus lowering circulating testosterone level<sup>9</sup>. In turn the circulating testosterone causes feedback inhibition of hypothalamo-pituitary axis, so decreasing the total testosterone. The strength of LH signal to testis may also be affected by insulin<sup>14,15</sup>. Insulin may also have a suppressive effect on testicular steroidogenesis<sup>16</sup>. The most important factor is that there is an enzyme in the adipose tissues of specially in the abdominal fat called aromatase, which converts the testosterone to the estrogen, thereby decreasing its concentration<sup>17</sup>. There are reasons to suggest that adiposity plays a role in the etiology of testosterone reduction. In our study the obese subjects and the non-obese controls showed significant differences of testosterone level, a finding which is consistent with other studies<sup>18-23</sup>. All these studies were conducted on aged and elderly persons, but one study<sup>24</sup> in which this association was found in male subjects with age less than 40 years, is consistent with us. The peculiar point about our study is that it had still younger aged subjects in whom also testosterone decreases with obesity.

## CONCLUSION

Young adults need testosterone more than the elderly ones for their active charming reproductive life, so they have to control their weight and should prevent obesity.

## REFERENCES

1. Palmela C. Champe, R.A.H., Denis R. Ferrier, ed. "Lipponcott's Illustrated Reviews". 3rd ed. 2000, Lipponcott Williams & Wilkins. 347.
2. Diaz-Arjonilla, M., et al., Obesity, low testosterone levels and erectile dysfunction. *Int J Impot Res*, 2009. 21(2): 89-98.
3. Haffner, S.M., Valdez, R. A., Stern, M. P., Katz, M. S., "Obesity, body fat distribution and sex hormones in men.". *Int J Obes Relat Metab Disord*, 1993. 17: 643-49.
4. Laaksonen, D.E., Kainulainen, S., Rissanen, A., Niskanen, L., "Relationships between changes in abdominal fat distribution and insulin sensitivity during a very low calorie diet in abdominally obese men and women". *Nutr Metab Cardiovasc Dis*, 2003. 13: 349-56.
5. Blouin, K., Despres, J. P., Couillard, C., Tremblay, A., Prud'homme, D., Bouchard, C., Tchernof, A., Contribution of age and declining androgen levels to features of the metabolic syndrome in men. *Metabolism*, 2005. 54: 1034-40.
6. Kalme, T., Seppala, M., Qiao, Q., Koistinen, R., Nissinen, A., Harrela, M., Loukovaara, M., Leinonen, P., Tuomilehto, J., Sex hormone-binding globulin and insulin-like growth factor-binding protein-1 as indicators of metabolic syndrome, cardiovascular risk, and mortality in elderly men. *J Clin Endocrinol Metab*, 2005. 90: 1550-56.
7. Muller, M., Grobbee, D. E., den Tonkelaar, I., Lamberts, S. W., van der Schouw, Y. T., Endogenous sex hormones and metabolic syndrome in aging men. *J Clin Endocrinol Metab*, 2005. 90: 2618-23.
8. Kupelian V, P.S., Araujo AB, Travison TG, Bremner WJ, McKinlay JB, Low sex hormone-binding globulin, total testosterone, and symptomatic androgen deficiency are associated with development of the metabolic syndrome in nonobese men. *J Clin Endocrinol Metab*, 2006. 91: 843-50.
9. Kaufman, J.M., Vermeulen, A., The decline of androgen levels in elderly men and its clinical and therapeutic implications. *Endocr Rev*, 2005. 26: 833-76.
10. Gapstur, S.M., Gann, P. H., Kopp, P., Colangelo, L., Longcope, C., Liu, K., Serum androgen concentrations in young men: a longitudinal analysis of associations with age, obesity, and race. The CARDIA male hormone study. *Cancer Epidemiol Biomarkers Prev*, 2002. 11: 1041-47.
11. Couillard C, G.J., Bergeron J, Leon AS, Rao DC, Skinner JS, Wilmore JH, Despres JP, Bouchard C, Contribution of body fatness and adipose tissue distribution to the age variation in plasma steroid hormone concentrations in men: the HERITAGE Family Study. *J Clin Endocrinol Metab*, 2000. 85: 1026-31.
12. Folsom, A.R., Jacobs, D. R., Wagenknecht, L. E., Winkhart, S. P., Yunis, C., Hilner, J. E., Savage, P. J., Smith, D. E., and Flack, J. M., "Increase in fasting insulin and glucose over seven years with increasing weight and inactivity of young adults." The CARDIA Study. *Coronary Artery Risk Development in Young Adults*. "Increase in fasting insulin and glucose over seven years with increasing weight and inactivity of young adults." The CARDIA Study. *Coronary Artery Risk Development in Young Adults*., 1996. 144: 235-46.
13. Plymate, S.R., Matej, L. A., Jones, R. E., and Friedl, K. E. , "Inhibition of sex hormone-binding globulin production in the human hepatoma (Hep G2) cell line by insulin and prolactin." *J Clin Endocrinol Metab*, 1988. 67: 460-64.
14. Lima, N., Cavaliere, H., Knobe, I M., Halpern, A., Medeiros-Neto, G., Decreased androgen levels in massively obese men may be associated with impaired function of the gonadostat. *Int J Obes Relat Metab Disord*, 2000. 24: 1433-37.
15. Vermeulen, A., Kaufman, J. M., Deslypere, J. P., Thomas, G., Attenuated luteinizing hormone (LH) pulse amplitude but normal LH pulse frequency, and its relation to plasma androgens in hypogonadism of obese men. *J Clin Endocrinol Metab*, 1993. 76: 1140-46.

## The testosterone status in overweight young adults of Peshawar

16. Pitteloud, N., Hardin, M., Dwyer, A. A., Valass, E., Yialamas, M., Elahi, D., Hayes, F. J., "Increasing insulin resistance is associated with a decrease in Leydig cell testosterone secretion in men. J Clin Endocrinol Metab, 2005. 90:2636-41.
17. Shippen, E. (1998) Co-author of the Testosterone syndrome. Excerpts from his lecture presented at the American academy for anti-aging medicine conference in Dec 1998.
18. Wu A. H., W.A.S., Kolonel L.N., John E.M., Gallagher R. P., West D. W., Hankin J., The C.Z., Dreon D.M., Paffenbarger R.S., Jr, "Serum androgens & SHBG in relation to lifestyle factors in older African-American, White, & Asian men in the USA & Canada" Cancer Epidemio. Biomark Prev 1995. 4:735-41.
19. Field, A.E., Colditz, G. A., Willett, W. C., Longcope, C. and MC Kinlay, J.B. , "The relation of smoking, age, relative weight and dietary intake to serum adrenal steroids, sex hormones and sex hormone-binding globulin in middle-aged men. J Clin Endocrinol Metab, 1979:1310-16.
20. Gapstur, S.M., Gann, P. H., Kopp, P., Colangelo, L., Longcope, C. and Liu, K. , "Serum androgen concentrations in young men: a longitudinal analysis of association with age, obesity and race. The Cardia Male Hormone Study". Cancer Epidemiology, Biomarkers & Prevention, 2002. 11:1041-47.
21. Gray, A., Feldman, H. A., McKinlay, J. B., and Longcope, C., "Age, disease, and changing sex hormone levels in middle-aged men: results of the Massachusetts Male Aging Study." J Clin Endocrinol Metab, 1991. 73:1016-25.
22. Haffner, S.M., Karhapaa, P., Mykkanen, L., and Laakso, M., "Insulin resistance, body fat distribution, and sex hormones in men." Diabetes, 1994. 43: 212-19.
23. Pasaqui R., C.F., Cantobelli S., Melchionda N., Morselli Lobate A. M., Fabbri R., Capelli M., Bortoluzzi L, "Effects of obesity & body fat distribution on sex hormones & insulin in men." Metab Clin Expl 1991. 40:101-04.
24. Goncharov, N.P., Katsya, G. V., N. A. Chagina, N. A., & Gooren, L. J., Testosterone and obesity in men under the age of 40 years. Andrologia, 2009. 41: 76-83.

**CONFLICT OF INTEREST:** Authors declare no conflict of interest

**GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL**

### **AUTHOR'S CONTRIBUTION**

Following authors have made substantial contributions to the manuscript as under:

- Rehman uU:** Contributed to concept ,design acquisition of data  
**Durrani S:** Contributed to concept, design acquisition of data  
**Ubaidullah:** Drafting of Manuscript  
**Ali S:** Data analysis  
**Khan MA:** Bibliography Proof reading  
**Wazir SuR:** Laboratory help

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

The Journal of Medical Sciences, Peshawar is indexed with WHO IMEMR (World Health Organisation Index Medicus for Eastern Mediterranean Region) and can be accessed at the following URL.

<http://www.who.int/EMRJorList/details.aspx?docn=4468>