

Examine the Association between Testosterone and Hemoglobin Level in Normal Fertile Men Population

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ABSTRACT

Aim: To determine the relationship of testosterone with hemoglobin level in normal men population.

Methods: This cross-sectional/observational study was conducted at Ch. Rehmat Ali Memorial Trust Hospital Lahore from 1st January 2018 to 30th June 2018. One hundred and fifty men having good physiological condition (non smoker. no any drug user) were included. Participant's ages were ranging from 25 years to 60 years. After taking informed consent from all the participants, demographical detail were examined, including age, socio-economic status, literacy level, income status etc. Samples of serum total testosterone and blood were taken from all the participants at morning after examining detailed medical history and physical condition.

Results: There were 78(52%) men were ages between 25 to 40 years, 65(43.33%) men had an age 40 to 55 years and 7(4.67%) men were ages > 55 years. 60% participants had urban residency. 88(58.67%) were literate, 105(70%) participants had an income greater than 30000 PKR. The mean serum total testosterone (STT) was noted as 14.85 ± 7.25 nmol/L. 23(15.33%) males had low serum total testosterone. 8(5.33%) participants had resulted anemia. Hb level and mean corpuscular hemoglobin concentration was significantly associated with total testosterone.

Conclusions: Prevalence of low serum testosterone was resulted in male population having good physiological condition and mostly males were ages between 25 to 40 years. The relationship of testosterone with hemoglobin resulted that physiological changes in serum testosterone can effect and change the Hb status in males having ages 25 to 40 years.

Keywords: Serum total testosterone, anemia, hemoglobin

INTRODUCTION

Testosterone is directly associated with hemoglobin, it is a hormone produced by the human body. It's mainly produced in men by the testicles. Testosterone affects a man's appearance and sexual development. It stimulates sperm production as well as a man's sex drive. It also helps build muscle and bone mass and also effect erythropoiesis^{1,2,3}. The normal testosterone range in 270 to 1070ng/dl. Testosterone level is at peak in males having ages 18 to 20 years⁴. Testosterone production decreases with age. According to the American Urological Association, about 2/10 males having age greater than sixty years have low testosterone level. That increases slightly to 3/10 men in their 70s and 80s⁵⁻⁸. Testosterone is the main cause of anemia in male population because it tend to decrease as men age^{9,10}. Treatment used for low testosterone is testosterone therapy and it increases the hemoglobin level⁹. The study conducted by Wallen et al¹¹ and Farucci et al¹² reported that serum total testosterone is directly associated with hemoglobin level. Low hemoglobin level can cause anemia and it is the most frequently found feature for hypogonadism in male population¹³.

MATERIALS AND METHODS

This cross sectional/observational study was conducted at Ch. Rehmat Ali Memorial Trust Hospital Lahore from

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1st January 2018 to 30th June 2018. In this study, 150 men having good physiological condition (non smoker. no any drug user) were included. Participant's ages were ranging from 25 years to 60 years. After taking informed consent from all the participants, demographical detail were examined, including age, socio-economic status, literacy level, income status etc.

Samples of serum total testosterone and blood were taken from all the participants at morning because total testosterone level tend to decrease at evening, after examining detailed medical history and physical condition. All the samples and test were sent to laboratory for further examination. Individuals having diabetes mellitus, smoker, any drug users, ischemic heart disease, systemic diseases were excluded from this study. Data was analyzed by SPSS 21.0. P-Value <0.05 was significantly considered.

RESULTS

Out of all 150 participants, 78(52%) men were ages between 25 to 40 years, 65(43.33%) men had an age 40 to 55 years and 7(4.67%) men were ages >55 years. 60% participants had urban residency while 40% had rural residency. 88(58.67%) were literate while rest 41.33% were literate and literacy level was matric, 105(70%) participants had an income greater than 30000 PKR (Table 1). We observed the mean STT (serum total testosterone) was noted as 14.85 ± 7.25 nmol/L. 23(15.33%) males had low serum total testosterone. Mean hemoglobin level was noted as 13.85 ± 3.35 g/dl. 8(5.33%) participants had resulted anemia. Mean RBC count, packed cell volume, mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration was not as $4.33 \pm 1.58 \times 10^{12}/L$. $47.35 \pm 2.41\%$, 72.75 ± 4.35 fl,

26.44±3.71 pg and 31.10±2.26 g/dl hemoglobin level and mean corpuscular hemoglobin concentration was significantly associated with total testosterone while RBC, PCV, MCV, MCH and MCHC shows insignificant difference associated with total testosterone (Tables 2-4).

Table 1: Demographical information of the patients (n=150)

Characteristics	No.	%
Age (years)		
25 – 40	78	52.00
40 -55	65	43.33
>55	7	4.67
Residency		
Urban	90	60.00
Rural	60	40.00
Education		
Literate	88	58.67
Illiterate	62	41.33
Income (PKR)		
>30000	105	70.00
<30000	45	30.00

Table 2: Frequency of deficiencies

Deficiency	No.	%
Low serum total testosterone	23	15.33
Anemia	8	5.33

Table 3: Findings of tests by mean values

Characteristics	Mean±SD
TT	14.85±7.25
HB Level (d/dl)	13.85±3.35
Red blood cells count (x10 ¹² / L)	4.33±1.58
Packed cell volume (%)	47.35±2.41
Corpuscular volume (fl)	72.75±4.35
Corpuscular hemoglobin (pg)	26.44±3.71
Corpuscular hemoglobin concentration (g/dl)	31.10±2.26

Table 4: Association between testosterone and hemoglobin variables

Characteristics	Correlation	P-value
Hemoglobin	0.151	0.022
Red Blood Cell Count	0.033	0.532
Packed cell volume	0.083	0.212
Corpuscular volume	0.042	0.537
Corpuscular hemoglobin	0.146	0.06
Corpuscular hemoglobin concentration	0.226	0.003

DISCUSSION

Worldwide, Total Testosterone (TT) level has examined due to infertility in men and women. In Pakistan testosterone test is frequently performing in medical and health care centers due to infertility in men population. Middle age males 25 to 45 years found low testosterone level because testosterone level tend to decrease as age increases¹⁴ and resulted a longitudinal decrease of about 1.6% per annum¹⁵.

In this study we included one hundred and fifty men who were willing to participate in this research. Out of all 150 participants, 78(52%) men were ages between 25 to 40 years, 65(43.33%) men had an age 40 to 55 years and 7(4.67%) men were ages > 55 years. In this research we observed low testosterone level in 23(15.33%) healthy men

and mostly were ages 40 to 60. A study conducted by Harman, et al resulted that frequency of low STT (serum total testosterone) in 20% male individuals had ages greater than sixty years.¹⁶ Another study regarding Testosterone in India reported 24.2% prevalence of low testosterone level in men ages 40-60years.^{17,18} Our study shows a little difference to study conducted in India and the overall difference may be due to the healthy population and methods of studies. A study conducted by Orwoll et al¹⁹ reported 20% higher levels in healthy male population living in Japan and Hong Kong as compared to Asians population who were living in USA, and he resulted geographic and environment as a great factor of low testosterone level rate. In our study, we observed the mean STT (serum total testosterone) was noted as 14.85±7.25 nmol/L. These results shows similarity to the study conducted by Heald et al resulted low testosterone level as 14.6 nmol/L²⁰.

In this current study, the mean hemoglobin level was noted as 13.85±3.35 g/dl these results shows a difference to the study conducted regarding testosterone examination in which 15.91g/dl Hb level was resulted.²¹ Another study shows similarity to the our study in which the hemoglobin mean value was reported as 13.04 g/dl²².

In our study we found 8 (5.33%) participants had anemia. The frequency of anemia in the present study was 3.0%. Our results shows high prevalence of anemia as compared to some other studies in which 3.7% and 1.7% individuals had found anemia. The difference may be due to the number of population or environmental changes^{23,24}. In current research we observed Mean RBC count, packed cell volume, mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration was not as 4.33±1.58 x10¹²/L, 47.35±2.41%, 72.75±4.35 fl, 26.44±3.71pg and 31.10±2.26g/dl our results were higher as compared to the study conducted by Usman et al²² in which mean RBC count (5.3x 10¹² /L), PCV (39%), MCV (76.30 fl), MCH (25.54 pg) and MCHC (32.27 g/dl).

It has been well established that the anemia due to testosterone deficiency is mild and normocytic normochromic.²⁵ In our study the Hb level and mean corpuscular hemoglobin concentration was significantly associated with total testosterone while RBC, PCV, MCV, MCH and MCHC shows insignificant difference associated with total testosterone. These results were difference to other study in which RBC, PVC, MCV, MCH and MCHC shows no significant difference²⁴. Moreover, this study was conducted on Pakistani healthy male population in limited area. The significant difference to the other studies may be due to the number of population. Also this is not a sufficient research because of limitation; we should have to do more work for better results and to provide the better treatment.

CONCLUSION

It is concluded that prevalence of low serum testosterone was resulted in male population having good physiological condition and mostly males were ages between 40 to 60 years. The relationship of testosterone with hemoglobin resulted that physiological changes in serum testosterone can effect and change the Hb status in males having ages

40 to 60 years and low testosterone level can cause the anemia in male population.

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