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ORIGINAL ARTICLE

ANALYSIS OF SERUM TESTOSTERONE LEVELS BY GENDER AND AGE GROUP IN A SAMPLE POPULATION ATTENDED AT A TERTIARY CENTRE, BANGLADESH

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Abstract

Background: *Testosterone is an important androgen influencing reproductive and metabolic health. This study describes serum testosterone levels by gender and age group among individuals attending Institute of Nuclear Medicine and Allied Sciences(INMAS), Sylhet, Bangladesh.* ***Methods:*** *A cross-sectional analysis of anonymized data of total 420 patients were included in this study who were referred to INMAS, Sylhet for serum testosterone levels assay from July 2023 to June 2025. Variables were age, gender, and serum testosterone level. Serum testosterone levels weremeasured in ng/dL unit. Descriptive statistics, group means, and Pearson correlation were computed.* ***Results:*** *Mean age was 32.47 ± 11.87 years (range 6–70). Mean testosterone was 339.63± 243.82 (range 0.10–1052.72). Males showed higher mean testosterone than females. Mean testosterone by age group (mean ± SD):<20: 132.41 (n=50), 20-39: 359.69 (n=262), 40-59: 390.90 (n=97), >=60: 351.64 (n=11). Correlation between age and testosterone: r = 0.29.* ***Conclusion:*** *Testosterone levels vary by gender and age group in this sample. These descriptive data support establishing local reference values and further analytic studies in the Bangladeshi population.*

Keywords: *Testosterone, Gender, Age Group, INMAS*

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Introduction:

Testosterone is a crucial androgenic hormone that plays a vital role in the development and maintenance of male reproductive tissues, secondary sexual traits, muscle mass, bone density, and general well-being. Although circulating levels are lower in females, testosterone plays a role in energy balance, libido, and bone health. Testosterone, which is mainly secreted by the ovaries and adrenal glands in females and the Leydig cells of the testes in males, has physiological effects by both direct action and conversion to either estradiol or dihydrotestosterone (DHT).[1,2]

Individual differences in serum testosterone levels can be attributed to a number of factors, including age, gender, diurnal rhythm, and underlying endocrine or systemic illnesses. Testosterone levels in men usually increase after adolescence, reach their peak in early adulthood, and then progressively decrease as they get older.[3-5] Although levels are generally steady in females, they can vary depending on menopausal status or the period of the menstrual cycle.[6] Because of these differences, testosterone is a crucial biomarker in urology, clinical endocrinology, and reproductive medicine.

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In nuclear medicine and diagnostic imaging, assessing biochemical markers such as testosterone frequently supplements imaging results in the evaluation of gonadal and adrenal function. Therefore, demographic and physiological factors like age and gender must be taken into account when interpreting blood testosterone.[7,8] However, there is still a dearth of published information on testosterone distribution patterns specific to populations, especially those from South Asian groups. The majority of reference ranges that are currently available are from Western populations, which could not accurately represent the environmental, dietary, or ethnic traits of Bangladeshi cohorts.[4,5,9]

The purpose of this study was to characterize the spectrum of serum testosterone levels among patients attended at the Institute of Nuclear Medicine and Allied Sciences (INMAS), Sylhet. This study was designed to gather local descriptive data that could be helpful in more accurate interpretation of hormonal assays in clinical practice across Bangladesh by investigating the relationship between testosterone levels, age, and gender.

Methods:

This was a cross-sectional study using anonymized laboratory data from INMAS, Sylhet. Data of total 420 patients (both male and female) were included in this study who were referred to INMAS, Sylhet for serum testosterone levels assay from July 2023 to June 2025. Serum testosterone levels were determined by Siemens ADVIA Centaur XPT chemiluminescence immunoassay System. Serum testosterone levels were measured in ng/dL unit.Data handling: The dataset included age, gender, and serum testosterone values. Age groups were predefined as <20, 20–39, 40–59, and e"60 years.

Statistical analysis: Continuous variables are presented as mean ± standard deviation (SD) and range. Group means were computed for gender and age groups. Pearson correlation was used to assess the relationship between age and testosterone. Data were analyzed using standard statistical software (SPSS 25).

Results:

Data of total of 420 participants were included in the analysis.

Table I

Shows summary of demographic statistics.

Variable	Summary
Number of participants	420
Age (mean ± SD)	32.47 ± 11.87
Age range (years)	6–70
Testosterone (mean ± SD)	339.63 ± 243.82
Testosterone range	0.10–1052.72

Table II

Shows mean testosterone levels by gender.

Gender	n	Mean	SD
Female	101	77.58	151.57
Male	319	422.60	205.89

Table II demonstrates that mean testosterone levels were substantially higher in males (422.60 ± 205.89) compared to females (77.58 ± 151.57), with males comprising the larger proportion of participants (n=319 vs. n=101).

Table III

Shows mean testosterone by age group.

Age Group	n	Mean	SD
<20	50	132.41	245.92
20-39	262	359.69	248.77
40-59	97	390.90	175.14
>=60	11	351.64	184.43

Table III shows that mean testosterone levels were lowest in participants <20 years and increased through mid-adulthood, peaking in the 40–59 year group, with a slight decline in those ≥60 years.

Figure 1: *Distribution of testosterone values by gender.*

The boxplot (figure 1) demonstrates a marked difference in testosterone levels between males and females. Males show substantially higher testosterone values, with a wide distribution and several high outliers extending above 1000 units. In contrast, females exhibit very low testosterone levels, tightly clustered near the lower end of the scale, though a few outliers are present. Overall, the figure highlights a pronounced gender-based disparity, with males having significantly higher and more variable testosterone concentrations compared to females.

Figure 2: *Mean testosterone by predefined age groups.*

The mean testosterone levels varied noticeably across age groups. The <20 years group showed the lowest mean value (≈30), whereas testosterone levels increased substantially in adults, peaking in the 40–59 years group (≈390). The 20–39 years and ≥60 years groups demonstrated moderately high mean testosterone values (≈360 and ≈350, respectively). Overall, the chart indicates a progressive rise in testosterone from adolescence to mid-adulthood, followed by a slight decline in older adults.

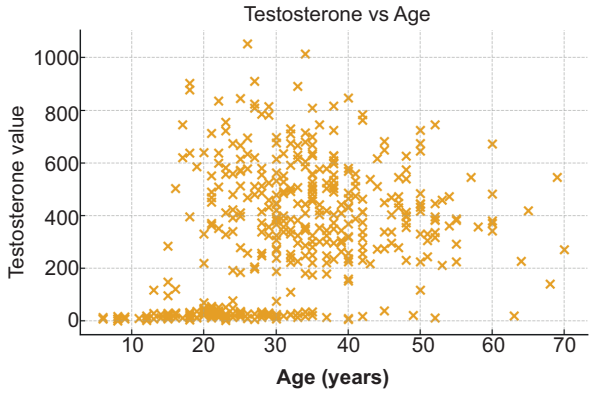

Figure 3: *Scatter plot of testosterone values versus age.*

The scatter plot shows a wide dispersion of testosterone values across the age range, with no strong visual linear trend. Testosterone levels appear low and tightly clustered among individuals below 20 years, whereas adults display markedly higher and more variable values. Although some increase in testosterone is seen with advancing age—particularly from adolescence into young and middle adulthood—the overall pattern remains heterogeneous. This visual distribution is consistent with the **weak positive correlation** quantified by the Pearson coefficient (r H" 0.297), indicating only a modest association between age and testosterone levels.

Discussion:

In this descriptive analysis of serum testosterone levels among attendees of INMAS, Sylhet, we observed variability in testosterone concentrations across both gender and age groups. Males showed higher mean testosterone compared with females, consistent with established physiology and prior literature.[1,3] The weak positive correlation between age and testosterone observed in our dataset (r = 0.297) contrasts with many classical longitudinal studies that report a decline with age[1,2], suggesting possible cohort effects or sampling differences in our population.

Regional data from South Asia indicate notable ethnic and population-specific differences in androgen levels. Studies from the Indian subcontinent and neighboring regions have reported lower total or free testosterone compared to Western cohorts[4,5] and Bangladeshi studies have linked testosterone levels with metabolic and cardiovascular conditions.[6,7] Our findings support the need for locally derived reference intervals and caution against uncritical application of Western-derived cut-offs for clinical decision-making in Bangladesh.

Methodological differences such as assay type, timing of blood sampling, and sample selection may account for discrepancies between studies. Endocrine Society guidelines emphasize standardization in testosterone measurement and clinical correlation with symptoms before labeling hypogonadism.[3] The cross-sectional nature of our data precludes causal inferences; longitudinal data would better define age-related trajectories. Nonetheless, the present descriptive data provide an initial, clinically useful snapshot for clinicians.

Limitations of this study include a relatively small sample size, lack of information on time of blood draw (diurnal variation), and absence of free testosterone/SHBG measurements which can refine androgen status assessment.[9] Future work should expand sample size, include biochemical assay standardization, and explore associations with metabolic and reproductive outcomes in Bangladesh to inform local clinical practice and guidelines.

Conclusion:

In this study, serum testosterone levels varied by gender and age group. The data highlights the need for locally derived reference values and further longitudinal and analytical studies in Bangladesh to guide clinical practice.

Limitations:

The study was done in single center, so that the results may not reflect the exact picture of the country.

The method of sampling was purposive. Small sample size was also a limitation of the study. Further multi-center studies with longer follow-up periods would provide more comprehensive insights.

Data Availability:

The datasets analysed during the current study are not publicly available due to the continuation of analyses but are available from the corresponding author on reasonable request.

Conflict of Interest:

There is no conflict of interest in this study.

Funding:

The research received no external funding.

Ethical consideration:

The study was approved by the Institute of Nuclear Medicine and Allied Sciences (INMAS), Sylhet, Bangladesh. Informed consent was obtained from each participant or relatives of the patients.

Author Contributions:

All authors made a significant contribution to the work reported, whether that is in the conception,study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article ; gave final approval of the version to be published ; have agreed on the journal to which the article has been submitted ; and agree to be accountable for all aspects of the work.

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