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Serum Testosterone Level in Female Patients with Adult Acne and Its Correlation with Acne Severity

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Abstract

Introduction: Acne is one of the common problems in adult female population. Androgen excess, indicated by high serum testosterone levels, has been implicated as a cause for adult-onset acne, though studies correlating testosterone levels with acne severity have shown varying results.

Objectives: To assess serum testosterone level in adult acne patients and correlate it with acne severity.

Materials and Methods: This was a single-center, hospital-based, cross-sectional, descriptive study conducted in the Department of Dermatology and Venereology, Tribhuvan University Teaching Hospital (TUTH) from June 2023 to May 2024. All the adult female acne patients fulfilling the inclusion criteria visiting the Outpatient Department (OPD) were included in the study. Acne severity was assessed using the Adult Female Acne Scoring Tool (AFAST: score A and score B). Serum testosterone was measured using a chemiluminescent assay (CMIA), and the correlation of serum testosterone levels with the severity of acne was analyzed.

Results: Among 51 female adult acne participants, the mean age of participants was 30.56 ± 0.74 years, median duration of acne was 7 months (1-180 months). The majority of participants had late onset acne at 72.5% (n=37). Grade 2 acne was the most common, with the cheeks being the most frequently affected area. The mean serum testosterone level was 42.30 ± 15.71 ng/dl; none of the participants exceeded the normal range(5.17-77ng/dl). No significant correlation was observed between serum testosterone levels and acne severity according to the AFAST Score A (p=0.643) and Score B (p=0.830). The study's findings should be interpreted cautiously due to its small sample size and lack of control group resulting from financial limitations.

Conclusion: Serum testosterone levels are not a reliable marker of androgen excess in adult females with acne and there is no significant correlation between serum testosterone levels and acne severity in this sub population.

Key words: Acne severity, Female adult acne; Serum testosterone

Introduction

Adult acne is defined as the presence of acne after the age of 25 years, regardless of the age at onset. It can be either persistent acne, acne that continues or recurs beyond 25 years or late-onset acne, i.e., acne which occurs after 25 years without prior diagnosis.[1]

Adult acne affects about 0.74% to 0.83% of women visiting skin clinics in India.[1,2] In comparison, it affects 14% of adults in the UK[3] and 41% in France.[4] The number of adults seeking treatment is constantly on the rise and the quality of life in older patients is more adversely affected by acne than their age and severity-matched younger counterparts.[5]

Adult female acne is considered a potential sign of androgen excess, with hyperandrogenism possibly

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promoting acne by increasing sebum production and altering its composition. Androgen enhances the inflammatory responses of innate cells and promotes inflammation that drives the progression of acne.[6] To assess androgen excess, measuring serum level of total testosterone, free testosterone, and DHEAS is often recommended in women with adult acne.[7] This study aims to assess serum total testosterone as a possible guide to hormonal therapy in female adult acne patients. This study hopes to offers valuable regional data from a South Asian population, contributing to a broader understanding of epidemiological and biochemical variations across different ethnic groups.

Materials and Methods

This hospital-based cross-sectional study was conducted from June 2023 to May 2024 at the Dermatology Out Patient Department (OPD) of Tribhuvan University Teaching Hospital(TUTH), Kathmandu, Nepal, after taking ethical approval from the Institutional Review Committee, Ref no. 541(6-11) E2 079/080. The study included 51 female patients with acne aged 25 years and above, selected through a convenience sampling method. The sample size was considered after analyzing the registry for the number of patients attending OPD in the past 6 months with complaints of adult acne. Patients using hormonal therapy, pregnant, or lactating women were excluded. Study variables included age of onset, duration of acne, distribution and grading of acne, body mass index, and level of serum testosterone.

Acne severity was assessed using the Adult Female Acne Scoring Tool (AFAST), which includes separate scores for facial (Score A) and submandibular acne (Score B).[8] The facial region includes cheeks, forehead, nose, and chin, which is separated from the submandibular zone via a line drawn across the face extending from the ear to the chin. The submandibular zone consists of the neck, jawline and submental region. Score A ranges from 0 to 5, where a score of 0 indicates an almost clear face with only residual pigmentation. The severity of acne gradually increases with a score of 5, reflecting very severe acne characterized by widespread inflammatory lesions and the presence of nodules. Score B, on the other hand, ranges from 0 to 3, with 0 denoting the absence of active lesions and only post-inflammatory hyperpigmentation, and 3 representing the presence of numerous papules, pustules, and/or comedones covering at least 25% of the evaluated area, or the presence of two or more nodules or cysts. Both scores are assessed independently and are not combined.

Total Serum testosterone levels were assessed using CMIA with the Architect 2nd Generation Testosterone Assay (Abbott Laboratories), processed on the ARCHITECT i1000SR system.[9] The reference range serum testosterone for female population was (5.17–77 ng/dL) adopted in accordance with the institutional laboratory protocol. The reference range was generic and not specified according to different age group. Although DHEAS, SHBG, and free testosterone enhance the reliability of diagnosing androgen excess, due to financial constraints and the unavailability of these tests in the hospital laboratory, serum testosterone, which is commonly used in clinical practice, was selected as the marker for assessing hyperandrogenemia in this study. Data were analyzed using descriptive statistics and Spearman's correlation (ρ) was applied to assess the correlation between testosterone levels and acne severity.

Results

A total of 51 female participants between 25 and 42 years were enrolled in the study, with a mean age of 30.56 ± 0.74 years. The majority, 45% (n=23) were within the 25–30 age group. Most participants were homemakers, 39.2% (n=20), followed by students at 15.7% (n=8). The mean age of acne onset was 28.04 ± 7.15 years. Late-onset acne was more common, observed in 72.5% (n=37) of participants, while 27.5% (n=14) had persistent acne. The median duration of acne was 7 months, ranging from 1 month to 15 years, with most patients seeking treatment within 12 months of onset.

The cheeks were the most commonly affected site as seen in 96.1%(n=49), followed by the jawline in 68.6%(n-=35) and the forehead in 41.2%(n=21). (Table 1)

Based on AFAST, the majority of patients had facial acne severity (Score A) graded as Grade 2 in 43.1%(n=22) followed by Grade 3 in 35.3%(n=18). In the submandibular and trunk region (Score B), the highest percentages of cases were observed at Grade 0 and Grade 1, each accounting for 29.4%(n=15). (Table 1) (Figure 1, 2).

Table 1: Demographic and Clinical Characteristics

Distribution of Acne	**N (%)**
Cheek	49 (96.1)
Jawline	35 (68.6)
Forehead	21 (41.2)
Neck	6 (11.8)
Chest	5 (9.8)
Back	4 (7.8)
Upper arm	0 (0)
Adult Female Acne Scoring Tool	**N (%)**
SCORE A	
Grade 0	2 (3.9)
Grade 1	3 (5.9)
Grade 2	22 (43.1)
Grade 3	18 (35.3)
Grade 4	5 (9.8)
Grade 5	1 (2)
SCORE B	
Grade 0	15 (29.4)
Grade 1	15 (29.4)
Grade 2	11 (21.6)
Grade 3	10 (19.6)

Figure 1: Adult acne showing AFAST Score A: Grade 3 and Score B: Grade 2

Figure 2. Adult acne showing AFAST Score A: Grade 2 and Score B: Grade 3

In terms of body mass index (BMI), 43.13%(n=22) had BMI within the normal range, 37.25%(n=19) were overweight, and 19.6%(n=10) were obese. The mean BMI was 24 ± 3.4. Menstrual irregularities were reported by only 31.4%(n=16) of the participants. The mean serum testosterone level among the patients was 42.30 ± 15.71 ng/dl with values ranging from 18.85 to 76.19 ng/dl. All levels were within the normal reference range (5.17–77 ng/dL). Statistical analysis using Spearman's correlation showed no significant association between serum testosterone levels and acne severity, neither in facial involvement (Score A: $\rho = 0.06$, $p = 0.643$) nor submandibular/trunk involvement (Score B: $\rho = 0.031$, $p = 0.830$).

A post hoc power analysis was performed for the correlation analysis. With a sample size of 51 and $\alpha = 0.05$, the study had 80% power to detect a correlation coefficient of at least $\rho = 0.38$. The observed effect sizes ($\rho = 0.06$ for AFAST Score A and $\rho = 0.031$ for Score B) correspond to post hoc powers of <10%, indicating the study was adequately powered to detect moderate-to-large correlations but not small correlations.

While our data argue against moderate or large correlations between total serum testosterone and acne severity, the sample size was insufficient to exclude small correlations. The lack of significant association, therefore, suggests that serum testosterone is unlikely to have a clinically meaningful correlation with acne severity in this population.

Discussion

In our study, the average age of women with adult-onset acne was 30.56 ± 0.74 years, with most cases i.e. 45%, occurring in the 25–30 age group. Similar findings were reported in India, with a mean age of around 30 years and a peak occurrence between 26–30 years.[2,9] In contrast, a study in the United States found that 26.3% of adult acne occurred in 40–49 years and 15.3% in women over 50.[10] This suggests that, while acne is most common in younger adults in South Asia, it remains a

concern for older women in Western countries, possibly due to greater aesthetic awareness, healthcare access, or differences in diet and environment.

The majority of adult acne patients in our study were of late-onset acne, comprising 72.5%, while only 27.5% of patients reported persistent acne. Sardana et al. reported similar results, with 56.6% late-onset cases and 43.3% persistent.[11] However, studies by Bansal et al, Rajegowda et al, and Shah et al. found persistent acne to be more common.[1,2,12] This discrepancy may be attributed to patients' limited recall of adolescent acne, particularly if it was perceived as mild or less distressing compared to their current late-onset acne.

Regarding the severity of acne, the grading tools used to assess severity were not uniform across all studies. In our study, AFAST was used. According to Score A, grade 2 was the most common on the face, while Score B, grades 0 and 1 were equally noted in the submandible and trunk regions. Overall, both Score A and B clinically indicate that patients presented predominantly with comedones and a few papules and pustules. This aligns with findings from other studies, despite using different grading systems. For instance Dreno et al., Shah et al., also concluded that the majority of adult female patients had acne clinically representing a few inflammatory papules and pustules.[1,13,14]

Body mass index was significantly high in the study population with 37.25% overweight and 19.60% obese patients. Similar results were observed by Rajegowda et al. with 38.7% overweight and 16% obese.[2] Obesity can lead to reduced production of sex hormone-binding globulin (SHBG) by the liver, which in turn affects the levels of total circulating testosterone. Lower SHBG levels can result in falsely low or altered testosterone readings, even when androgen excess is present.[15]

In our study, none of the participants exhibited serum testosterone levels above the normal reference range, which aligns with the findings by Seirafi et al.[16] while differing with findings of Ozkur et al..[17] Many descriptive studies show prevalence of elevated serum testosterone: Shrestha et al. found it in 12.8% of cases, Rajegowda et al. in 12%, and Meena et al. in 6.7%[2,16,18] The discrepancy in the findings may be due to the different diagnostic methods and that, chemiluminescent assays are often noted to be inaccurate at serum levels <300ng/ml; and commercially available kits being tailored for analyzing samples from men may not deliver the accuracy and precision needed for women.[19] Braunstein et al. demonstrated age-related variations in serum testosterone levels in premenopausal women using a validated radioimmunoassay. In his study, the reference range for a 30-year-old woman was 15–46 ng/dl. The reference range used in our study was generic and not specific to any age group. This raises the question of whether hyperandrogenemia is grossly underreported when relying solely on serum testosterone as the biochemical parameter calculated using commercial kits.[19]

In our study, the level of serum testosterone did not correlate with the severity of acne. Meena et al., Shrestha et al. and Bansal et al. demonstrated similar findings.[12,18,20] While this particular study didn't find a strong link between testosterone levels and acne, a rise in testosterone could still justify using anti-androgen medications like spironolactone for adult acne. This is because other clinical factors beyond a blood test result can support the use of this therapy, The findings of the study should be interpreted keeping in mind its limitations. It is a single-center study with a small sample size that lacks a control group due to financial restrains. A comprehensive evaluation incorporating other clinical signs of hyperandrogenemia—like hirsutism, androgenetic alopecia, and hyperseborrhea and biochemical markers such as free testosterone which is more biologically active form alongside assessing end-organ sensitivity, may provide a more accurate understanding of androgen excess rather than relying solely on serum testosterone. Furthermore obesity was not adjusted while calculating correlation which could have underreported our findings.

Future studies addressing these gaps could provide a clearer understanding of the role of androgens in adult acne and correlate better with acne severity.

Conclusion

This study concludes there to be no significant rise in serum testosterone in females with adult acne and no correlation of serum testosterone with acne severity.

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