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Reassessment of serum level of testosterone in female with acne vulgaris

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Abstract

Background: Acne is a chronic inflammatory skin disease of pilosebaceous follicle. Acne primarily is seen in adolescent. The clinical lesions are non-inflammatory comedonal open (blackhead) and closed (whitehead) and/ or inflammatory papules, pustules and nodules. After puberty, in male and female, hormone called androgens appears to be a part of the underlying mechanism, by increased sebum production.

Aim of study: To identify the correlation between testosterone hormone and acne vulgaris in female compare it with healthy control.

Material and Methods: A case-control study was carried out from November 2019 to May 2020 in the consultation Department of Dermatology and Venerology at Salahaddin General Hospital. The researcher selected 60 female patients included 30 patients with acne vulgaris as a case and compared with 30 female without acne vulgaris then, testosterone test of cases was compared with that of equal number of age and sex matched healthy controls.

Results: The sixty female patients who were included in this study, are of age range (14-35years) mean \pm stander deviation (21.59 \pm 4.28) for case group and (21.34 \pm 3.31) for control group.

The result of the study showed that the mean of free testosterone among cases was (3.44 \pm 0.64) three time more than control group (1.79 \pm 0.41) with significant difference (p= 0.001), and serum total testosterone the result found that the mean is also more in case group than the control group (0.77, 0.22, SD = 0.16, and 0.22 respectively) with statically significant association (p=0.001).

Conclusions: Significant difference in hormonal level of Testosterone (free and total) and estradiol between acne group and control group.

Keywords: acne vulgaris, testosterone, blackhead, whitehead, estradiol

Introduction

Acne vulgaris is a common inflammatory skin disease of pilosebaceous follicles, which runs a chronic course. While the course of acne may be self-limiting the sequelae can be lifelong with pitted or hypertrophic scar. Acne seen primarily in adolescents. The skin commensal *Cutibacterium acnes* has been implicated in the pathogenesis of acne. Acne can present as non-inflammatory lesions comedonal (open black head and closed white head), and/or inflammatory lesions (papule, pustules, and nodules), and varying degree of scarring. Acne affecting mainly the face but also upper arm, upper part of trunk and back^[1].

Four main pathogenic factors have been attributed to the formation of acne lesions (alteration of follicular keratinization results in the formation of microcomedo, stimulation of sebaceous gland secretion by androgen, follicular colonization by *Propionibacterium acnes*, and perifollicular inflammation). Hormonal effect on sebum production is a key in development of acne. Androgens are produced by the gonads and adrenal, and locally within sebaceous gland through action of androgen metabolizing enzyme such as 17-hydroxysteroid-dehydrogenase, 3-hydroxysteroid-dehydrogenase and 5 α -re-ductase. Androgen receptors are founded in sebaceous gland and outer root sheath of hair follicle, are responsive to testosterone and 5 α - dihydrotestosterone. When your body starts to produce additional mount of testosterone than normal, it can trigger and rise in sebum production^[2].

Sebum is an oily, waxy substance produced by your body's sebaceous glands. Sebum composed of (triglycerides, wax esters, squalene, and cholesterol esters). It flows out from your hair follicles onto your skin.

Think of it as your body's natural source of hydration by reduce water loss from skin surface, so keeping your skin moist, soft and healthy. Sebum acts as a barrier to protect the skin from bacterial and fungal infections, and contributes to body odour. Normally, sebum production is a good thing. However, when your testosterone levels increase, the body can produce too much sebum, so the follicle become clogged and pimples can emerge. Over production of testosterone may lead to more sebum production. Testosterone's effect on sebaceous gland secretion is more obvious in people sensitive to the hormone, meaning some people will get more severe hormonal acne than others [3].

Aim of the study

To identify the correlation between testosterone hormone and acne vulgaris in female compare it with healthy control.

Patients and Method

This is a case-control study. This study was carried out from November 2019 to May 2020 in the consultation Department of Dermatology and Venereology at Salahuddin General Hospital. Female patients having acne vulgaris were selected as study case group. A healthy age and sex match control group was enrolled from the community. A total of sixty patients were enrolled in this study. Sixty patients were divided into 2 group; each one consists of thirty patients.

Group A: female patients with acne (case group).

Group B: female patients without acne (control group).

During the period of data collection patients were assigned purposively considering inclusion and exclusion criteria for selection of patients.

Inclusion criteria for cases include

1. Female older than 14 years.
2. Acne clinically diagnosed as acne vulgaris.

Exclusion criteria for case include

- 1- Pregnant and lactating mother.
- 2- patient use oral contraceptive pill.
- 3- Anti-androgen and patients use drug known to affect androgen.
- 4- Obese patient, and female with hirsutism.

Criteria for controls included age matched eumenorrheic healthy female without acne.

The diagnosis was done clinically by dermatologist; sixty patients were included in this study. Their age range (14-35 year) mean 21.59, standard deviation (4.28) for case group and mean 21.43, standard deviation (3.31) for control group.

Questionnaire form was designed and the data were collected from patients by direct interview including name, age, residence, onset, grading and duration, location and other sign of virilizing such as (excess facial and body hair, hair loss (baldness), infertility and obesity). The verbal consent was obtained from all patients and control before being enrolled into the study. All case group and control group were subjected to the same experimental protocol. Method of estimation: Testosterone and Estradiol enzyme immunoassay test kit was used to determine serum total, free testosterone and estradiol. Serum testosterone (free and total), also estradiol level was analyzed according to the

result of laboratory tests ordered in outpatient department of dermatology of Salahuddin General Hospital.

Statistical Analysis

The collected data via a designed questionnaire (**Error! Reference source not found.**) were translated into a computerized database structure. Statistical analyses were done using SPSS (Statistical Package for Social Sciences). Version 20 computer software for windows. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and mean and standard deviation (SD) for quantitative variables. Statistical significance was assessed by student t-test, with considered P. Value of ≤ 0.05 was statistically significant.

Results

The current study included 60 females, 30 of them were suffering from acne to be compared with 30 normal females (without acne), in both groups the most prevalent age group was 21 years, while the least was more than 24 years, the mean age of cases was 21.59 with standard deviation 4.28 while the mean age among control group was 21.43 with standard deviation 3.31 and no significant difference in age was shown between the cases and controls groups ($p=0.872$).

Regarding to Serum free testosterone; the result of current study showed the mean of free testosterone among cases was 3.44 with standard deviation (0.64) while the mean of free testosterone among control group was 1.79 with standard deviation (0.41) with significant difference was shown between the cases and controls ($p=0.001$). Concerning to serum total testosterone the result found the mean of total serum testosterone more in case group than the control group (mean=0.77, SD=0.16 and mean=0.22, SD=0.10 respectively) with statically significant association ($p=0.001$) as shown in

Table

Regarding to serum estradiol; the result of current study showed the mean of serum estradiol among cases was 77.66 with stander deviation (39.3) while the mean of serum estradiol level among control group was 111.6 with stander deviation (23.3) with statically significant difference was shown between the cases and controls ($p= 0.021$), as shown in

Table

Regarding clinical features of acne (63.3%) of patients had face involvement alone, while (36.7%) had back, chest and arm involvement. The current study also showed (36.6%) of patients had mild disease and (50%) of cases have moderate disease while only (13.3%) had sever disease as seen in Table.

In comparison of patient's characteristics between study groups, the recent study found that; (36.6%) of case groups were have irregular menstrual cycles and (63.3%) have regular menstrual cycle, as shown in Table 3

Table 1: Comparison Between Case and Control Group: Age, Free and Total

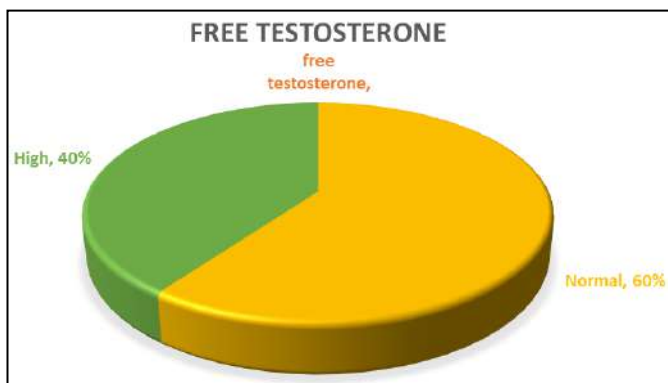
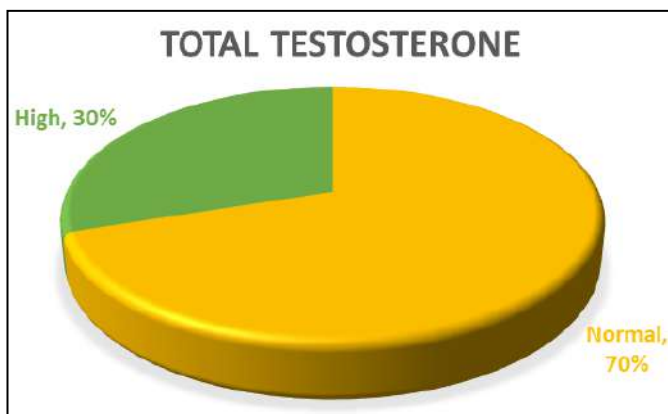
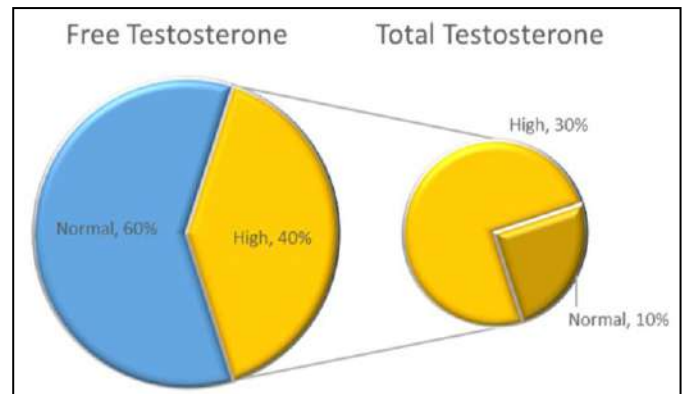
	Groups	N	Mean	Std. Deviation	p value
Age	Case	30	21.59	4.28	0.872
	control	30	21.43	3.31	
Independent t-test = 0.161, * significant at 0.05 (two tailed)					
Free	Case	30	3.44	0.64	0.001*
	control	30	1.79	0.41	
Independent t-test= 11.18, * significant at 0.05 (two tailed)					
Total	Case	30	0.77	0.16	0.001*
	control	30	0.22	0.10	
Independent t-test= 9.68, * significant at 0.05 (two tailed)					
Estradiol	Case	30	77.66	39.3	0.021*
	Control	30	111.6	23.3	
Independent t-test= 2.37 , * significant at 0.05 (two tailed)					

Table 2: Location and Severity of Acne Among Case Group.

Variable	No. (%)
Location of acne	
Face	(19) 63.3%
Back, chest, arm	(11) 36.7%
Severity of acne	
Mild	(11) 36.7
Moderate	(15) 50%
Sever	(4) 13.3%
Total	(30) 100%

Table 2: The Frequency of Irregular Cycles Among Case.

Menstrual cycle		Case
Menstrual	Irregular	11 (36.6%)
	Regular	19 (63.3%)
Total		30 (100%)

**Fig 1:** Distribution of Study Sample (Cases) According to Serum Free testosterone. N=30**Fig 2:** Distribution of Study Sample (cases) According to Serum Total Testosterone. N=30**Fig 3:** Distribution of Study Sample (cases) According to Serum Free and Total Testosterone. N=30**Fig 4:** Distribution of Study Sample (cases) According to Serum Estradiol. N=30

Discussion

This study included thirty female patients with acne vulgaris and thirty females without acne with matching age. The serum level of testosterone (free and total) among patients' group was significantly higher than control group, see table (1). This case control study and any condition interfere with serum level of testosterone (patient use oral contraceptive, antiandrogen, pregnant, lactating, and patients used drug known to affect androgen) have been excluded in both control and study groups, also we found low serum level of estradiol in female with acne compare to control group. Regarding severity of acne, 13.3% have severe acne, 50% have moderate acne and 36.7% have mild acne. This agrees with study in Erbil city, 2016 (case- control) included two groups, the control and study group. The study showed the serum testosterone (total) level was a significantly higher among patients with acne in comparison to control group. The study in Erbil only measured total testosterone [4].

A study from Hila city, 2008Dec-2009 Sep. That included seventy-three patients (38 males and 35 female) at age around 20 years, different hormones have been measured and concluded that serum testosterone level higher in patients' group than control groups^[5], which similar to our finding. A study from Dhaka Bangladesh on 70 female patients with acne vulgaris and 70 females without acne, that estimated serum total testosterone had finding similar to this study^[6].

In a study done in Brazil, 835 women included in this study founded 54.56% of patients with acne vulgaris had hyper androgensim but the most elevated hormone was dehydroepiandrosterone, however free, total testosterone are high and estradiol level was low. The Brazilian study was (retrospective study)^[7].

High level of testosterone and low level of estrogen also founded according to article by Arora Mk *et al.* from New Delhi^[8]. Low level of estradiol has been correlated with severity of acne, in another study done in Egypt by Baker *et al.*, that also concluded higher level serum free testosterone and cholesterol in such patients^[9].

In a study done in Turkey, 2017. Retrospective study. A total of 136 patients; 68 (male 21 and female 47) with acne vulgaris and 68 (male 21 and female 47) age and sex-matched controls. showed low serum estradiol levels in female with acne vulgaris. Which agree with our study. But total testosterone level did not show any association with acne. This disagrees with our study^[10].

In a study done in Islamabad-Pakistan, 2016. Cross sectional study. Five hundred and thirty-one adult females were enrolled into study. Showed there was no association of serum testosterone and sex hormone binding -globulin (SHBG) levels in female with acne on its severity^[11].

It is clear that hyper androgensim is associated with some cases of acne vulgaris. So anti-androgen is may be used as options in some resistant cases. New studies are required to determine the role of anti-androgen in treatment of severe acne. Further study required to determine the relation between severity of acne and testosterone. It might be better to involve larger number of cases and control group while in this study only 30 patients included in each group.

Conclusions

Significant difference in hormonal level of Testosterone (free and total) and estradiol between acne group and control group

No conflicts of interest

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Ethical clearance: was taken from the scientific committee of the Iraqi Ministry of health

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