Original Article

LINKAGE BETWEEN SERUM TESTOSTERONE AND LIPID PROFILE IN HIRSUTISM DISEASE PATIENTS

Sohail Waheed[1], Mohammad Hanif[1], Anwar Ali[1], Imran Khan[2], Mohammad Israr[3]

[1]Department of Biochemistry, Saidu Medical College, Swat, KP, Pakistan

[2]Department of Physiology, Saidu Medical College, Swat, KP, Pakistan

[3]Department of Biochemistry, Bacha Khan Medical College, Mardan, KP, Pakistan

ABSTRACT

BACKGROUND: *The development of thick, dark, abundant terminal hairs on androgen-dependent body parts, such as the mandibles, chin, and upper lips, is known as hirsutism. Hirsutism may result from ovarian or adrenal tumors, non-classic adrenal hyperplasia, polycystic ovary disease, or other idiopathic causes. The primary factor that causes hirsutism is androgen excess. An aberrant lipoprotein profile, marked by high plasma triglyceride concentrations, mildly elevated LDL cholesterol, and lowered HDL cholesterol, is seen in women with polycystic ovarian syndrome (PCOS). Serum testosterone levels are correlated with lipid problems. There is scant information on alternative hirsutism reasons that may also be related to PCOS, one of the well-established hirsutism causes.*

Objective: *"To establish relationship between lipid profile and serum testosterone in patients with hirsutism" was the study's stated purpose.*

Study Design: *A Descriptive Study*

Duration And Place Of Study: *Department of Combined Military Hospital Peshawar for hair removal treatment between January 2013 and December 2013*

Material and methods: *Patients with established metabolic illnesses such as diabetes mellitus and hypertension were excluded from the research, whereas all female patients in the reproductive age range of 18–45 who presented with hirsutism and provided permission for the study were included. The analysis included one hundred female cases and one hundred female controls. Following clearance from the Advance Study and Research Board (ASRB) ethics committee, blood samples from individuals suffering from hirsutism were obtained in a laboratory at the Combined Military Hospital in Peshawar to investigate their lipid profiles and serum testosterone levels. Using kits from Merck Pakistan, serum lipids were examined using an automated chemical analyzer, the Selectra E. Using the chemical luminescence approach; the Beckman Coulter kit Access Testosterone Assay was used to measure the serum testosterone level. The program SPSS version-23 was used to analyze the data that was collected.*

Results: *The study's findings demonstrated that, except HDL-c, which dramatically dropped, all biochemical markers in hirsutism patients were significantly higher than in the control group. There was a non-significant p (>0.05) and a positive correlation (r=0.052) between testosterone and HDL cholesterol, a significant p (<0.05) and a positive correlation (r=0.239) between testosterone and total cholesterol, and a positive correlation (r=0.314) between testosterone and LDL cholesterol. In contrast, there was a non-significant association (r=0.054) and non-significant p (>0.05) between testosterone and triglycerides.*

Conclusions: *This research found that, compared to controls, serum testosterone, and lipid profiles were considerably aberrant. The lipid profile in hirsutism disorder exhibits a noteworthy correlation with total cholesterol. The association between blood testosterone and LDL cholesterol in hirsutism conditions was then further explored in this research. A notable and positive association was discovered. This research found that variations in blood testosterone levels from a normal point also resulted in variations in total and low-density lipoprotein cholesterol in cases with hirsutism disorder.*

Keywords: *Hirsutism, testosterone, HDL, LDL, triglyceride, polycystic ovary syndrome.*

Correspondence:
Dr. Sohail Waheed
Assistant Professor
Department of Biochemistry Saidu Medical College, Swat
Email: drsohailderm@gmail.com
Cell: 0333-9463868
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INTRODUCTION

The development of thick, dark, abundant terminal hairs on androgen-dependent body parts, such as the mandibles, chin, and upper lips, is known as hirsutism [1].

For women, hirsutism is a very troubling issue

that may cause severe depression in some cases [2,3]. While there is a shortage of information from Pakistan about the occurrence of hirsutism1, the reported prevalence of hirsutism in the United States varies between 5% and 40% according to several studies [4,5].

Several conditions may induce hirsutism, including ovarian or adrenal tumors, non-classic adrenal hyperplasia, and polycystic ovary syndrome [5]. Androgen excess is the primary factor responsible for hirsutism6. The second most prevalent cause of hirsutism, after polycystic ovarian syndrome, is idiopathic hirsutism (IH)[7]. Hirsutism linked to normal ovulatory activity and normal levels of testosterone in the bloodstream is known as idiopathic hirsutism [8]. Mild functional hyperandrogenism may be seen in ovarian and adrenal glands in individuals with idiopathic hirsutism. Little information is available on the pathophysiology of idiopathic hirsutism; nevertheless, elevated peripheral 5-α reductase enzyme activity is significant, and hair follicle sensitivity to circulating androgens may also play a role [9,10]. PCOS affects women in different ways. Among the less common causes are hyperandrogenic insulin-resistant acanthosis nigricans (HAIRAN) and androgenic drugs [12]. PCOS is characterized by elevated concentrations of plasma triglyceride, marginally elevated low-density lipoprotein cholesterol (LDL), and reduced high-density lipoprotein cholesterol (HDL). By stimulating the adrenal gland to produce more dehydroepiandrosterone sulfate (DHEA-S), hyperprolactinemia may lead to hirsutism[13].

The symptoms of PCOS, or polycystic ovarian syndrome, include obesity, hyperandrogenism, and recurrent anovulation. In a similar vein, the most prevalent and frequent anomaly among women with polycystic ovarian syndrome was a disturbed lipid profile [14].

Finally, it is impossible to overlook the part obesity plays in illuminating the origins of hirsutism. Simple obesity without a clear metabolic problem may cause hyperandrogenism and hirsutism [15]. Seventy-one percent of individuals with adrenal adenoma had abnormalities in their lipid levels [16].

Except in instances of idiopathic hirsutism, elevated levels of testosterone, the sex hormone, are present in all cases of hirsutism. It is also known that people with hirsutism, primarily women with polycystic ovarian syndrome, have changed lipid profiles as a result of this hyperandrogenemia. This fact was confirmed by Senoz et al.'s study, which looked at the relationship between hyperandrogenemia and lipid profiles in hirsute women with polycystic ovarian syndrome. They found that while high-density lipoprotein (HDL) concentrations were low, triglyceride, total, and low-density lipoprotein (LDL) concentrations were high. Similarly, Wild et al. discovered a noteworthy correlation between hyperandrogenemia and HDL and triglyceride levels. Their findings demonstrated that in women with hirsutism, hyperandrogenemia lowers HDL cholesterol levels while raising triglyceride levels[18].

It was shown that androgen excess was connected to lipid abnormality in females with lipid and androgen abnormalities in the United States based on a correlation between free plus albumin-bound testosterone and triglyceride and HDL cholesterol. This research suggests a connection between abnormal blood testosterone levels and lipids [19]. There is scant information on alternative hirsutism reasons that may also be related to PCOS, one of the well-established hirsutism causes. The current research set out to ascertain if the lipid profile and blood testosterone level of hirsutism patients who visited the dermatology department at CMH Peshawar were associated.

MATERIALS AND METHODS

Following clearance from the Advance Study and Research Board (ASRB) ethics committee, blood samples from individuals suffering from hirsutism were obtained in a laboratory at the Combined Military Hospital in Peshawar to investigate their lipid profiles and serum testosterone levels. Using kits from Merck Pakistan, serum lipids were examined using an automated chemical analyzer, the Selectra E. Using a chemical luminescence approach, the serum testosterone level was measured using a kit (Access Testosterone Assay) supplied by Beckman Coulter, USA.

This descriptive research comprised 100 normal people from the general community as a control group and 100 consecutive hirsute patients who sought hair removal therapy from the Dermatology Department of the Combined Military Hospital Peshawar between January 2013 and December 2013. Every patient had a thorough medical history and physical examination documented. The employed proforma included age of hirsutism onset, duration, marital status, parity, irregular menstruation, and body mass index (BMI).

Patients with established metabolic illnesses such as diabetes mellitus and hypertension were eliminated, and the same criteria were applied to the control participants. All female patients in the reproductive age range of 18–45 who presented with hirsutism and were granted permission for this research were enrolled as case subjects. Before lipid profile collection, the individuals were given comfortable seating for around fifteen minutes. Following an overnight fast, venous blood (5cc) was obtained using a meticulous aseptic procedure between 8:00 and 9:00 a.m. For fifteen minutes, serum was separated at a relative centrifugal force of 2500–3500 rpm. The study of lipid profiles includes LDL-C, HDL-C, TG, and TC.

SPSS version 23 was used to analyze all of the collected data for continuous variables such as age, menstrual cycle, parity, duration of hirsutism, family history of hirsutism, history of diabetes, hypertension, BMI, serum lipid profile, serum testosterone, mean ± SD and frequency distribution were computed in univariate analysis. Correlation was employed in a bi-variate study to determine if the independent and dependent variables were related. The Mean ± SEM of hirsutism patients' lipid profile and testosterone were compared with those of control participants using an independent-sample t-test analysis.

RESULTS

The anthropometric measurements of patients with hirsutism are shown in Table 1 as Mean, Standard Deviation, Standard Error of Mean, and Coefficient of Variance. Table -2 shows the comparison of testosterone and lipid profiles among hirsutism patients and control subjects. The mean ± SEM of triglycerides, total cholesterol, HDL, LDL, and testosterone of hirsutism patients were compared with that of control. In hirsutism patients, these parameters were increased with high significance compared to power, while HDL in patients was significantly decreased compared to control.

Table - 3 shows the correlation of serum testosterone with lipid profile in patients of hirsutism. The triglycerides and HDL in patients were non-significantly correlated with testosterone. Total cholesterol vs. testosterone in patients was positively associated with significance ($p<0.05$), and LDL cholesterol vs. testosterone in patients was positively associated with high relevance.

Table 1: Anthropometric Measurements of Hirsutism Patients

Variables	Mean	Standard deviation (SD)	Standard error of mean (SEM)	Coefficient of variance (CV)%
Age of onset (years)	29.56	6.92	0.70	23.37
Duration of disease (years)	3.59	3.46	0.35	96.6
BMI	26.78	4.81	0.48	17.98

Table 2: Comparison of Lipid Profile and Testosterone between Hirsutism Patients and Control

Parameters	Patients (Mean ±SEM)	Control (Mean ±SEM)	P value
Triglycerides (mg/dl)	182.65 ± 3.21	157.64 ± 3.28	0.001
Total cholesterol (mg/dl)	198.51 ± 2.40	173.71 ± 2.32	0.001
High density lipoprotein (mg/dl)	38.32 ± .48	40.52 ± .52	0.002
Low density lipoprotein (mg/dl)	121.04 ± 2.14	97.33 ± 1.58	0.001
Testosterone (ng/ml)	0.83 ± 0.02	0.46 ± 0.02	0.001

Significant = $p < 0.05$

Table 3: Correlation between Testosterone with Lipid Profile

Correlation	Correlation Coefficient (r)	P value
Testosterone vs Triglyceride	-.054	.59
Testosterone vs total cholesterol	.239	.017
Testosterone vs HDL	.052	.606
Testosterone vs LDL	.314	.001

Significant = $p < 0.05$

DISCUSSION

The anthropometric measures of all 100 hirsutism patients are shown in Table -1, with the mean ± SE age being 29.56, ± 0.70, and the CV% being 23.37. According to the family size statistics, the average number of children was 1.47 ± 0.16, and the CV% was 109.6%. The average ± standard error of the hirsutism duration was 3.59 years ± 0.35, with a CV% of 96.6. The average BMI is 26.78 ± 0.48, and the CV% is 17.98.

Table 2 displays the testosterone and lipid profile comparison between the patients and control group. Based on an independent sample t-test analysis, individuals with hirsutism showed considerably higher blood testosterone and lipid profiles ($p<0.05$) compared to the control group. In contrast, patients' HDL levels dramatically dropped ($p<0.05$) in the same comparison. Senoz et al. [17] also showed the same outcomes.

A bivariate analysis examined the relationship between the independent variable (serum testosterone) and the dependent variable (lipid profile, including TG, TC, HDL, and LDL). The results indicated a non-significant ($p > 0.05$) connection between serum testosterone and triglycerides, as seen in Table 3. However, the literature analysis in research by Senoz et al. [17] found that in patients who had previously been diagnosed with polycystic ovarian syndrome and had presented with hirsutism, there was a positive link between hyperandrogenemia and lipid profile triglyceride levels. In contrast to our work, Wild [18] also discovered a strong correlation between hyperandrogenism and elevated triglyceride levels.

Table 3 displays the association between serum testosterone and total cholesterol. A significant ($p < 0.05$) and positive ($r = 0.239$) relationship was discovered. Senoz et al. [17] have also provided evidence in favor of the association between hyperandrogenemia and lipid profile in hirsute women with polycystic ovarian syndrome. He concluded that patients with known PCOS had elevated blood testosterone and total cholesterol concentrations.

Table 3 presents our data, which indicate a slight positive correlation ($r = 0.052$) and a non-significant ($p > 0.05$) relationship between blood testosterone and HDL cholesterol. In contrast, Senoz et al. (2017) found that patients with known PCOS and hirsutism had lower concentrations of high-density lipoprotein (HDL) after examining the relationship between hyperandrogenemia and lipid profile in hirsute women with polycystic ovarian disorders.

The current investigation revealed a significant ($p < 0.05$) and positive connection ($r = 0.314$) between blood testosterone and LDL cholesterol in individuals with hirsutism (table 3). This is comparable to Senoz et al.'s study from 2017, when they looked at the relationship between hyperandrogenemia and hirsute women's lipid profiles, namely LDL cholesterol, and found that furry patients with documented PCOS had higher LDL cholesterol.

CONCLUSION

We found that among hirsute individuals, blood testosterone, total cholesterol, and LDL-c rose considerably, whereas HDL-c dramatically dropped. As a result, hirsutism sufferers have aberrant lipid profiles and elevated blood testosterone levels when compared to controls.

The goal of the current investigation was also to ascertain if the lipid profile in hirsutism and serum testosterone were related. Through analysis using serum testosterone as an independent variable, this research found a significant association between serum testosterone and lipid profile in hirsutism. Serum testosterone has a positive connection, meaning that when the amount of this hormone deviates from the normal range, so does the level of total cholesterol.

The association between blood testosterone and LDL cholesterol in hirsutism conditions was then further explored in this research. It was discovered that there was a strong positive link between changes in the lipid profile's LDL cholesterol level and deviations in the blood testosterone level in hirsutism illness from the normal range.

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