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TOTAL PROSTATIC SPECIFIC ANTIGEN IN POLYCYSTIC OVARY SYNDROME PATIENTS PRESENTING WITH HIRSUTISM AT TERTIARY CARE HOSPITAL, HYDERABAD

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ABSTRACT

BACKGROUND: *Prostate-specific antigen (PSA), traditionally associated with male physiology, has recently gained attention as a potential biomarker in women with polycystic ovary syndrome (PCOS). Emerging evidence suggests its role in reflecting hyperandrogenic states, making it a candidate marker for diagnosing androgen excess in females with PCOS.*

OBJECTIVE: *To assess the average total PSA levels in women diagnosed with PCOS who present with hirsutism at a tertiary care facility in Hyderabad.*

STUDY DESIGN: *Cross-sectional study.*

SETTING: *Department of Gynaecology and Obstetrics, Bilawal Medical College, CDF Hospital, Hyderabad.*

STUDY DURATION: *Conducted over six months, from February 1, 2024, to July 31, 2024.*

SAMPLING TECHNIQUE: *Non-probability consecutive sampling*

SAMPLE SIZE: *A total of 146 women with a confirmed diagnosis of PCOS and clinical signs of hirsutism were included in the study.*

PATIENTS AND METHODS: *Women aged 20 to 45 years, diagnosed with PCOS and hirsutism, and were enrolled. Blood samples were analyzed to determine total PSA levels. Descriptive statistics, including means and standard deviations for continuous variables and frequencies with percentages for categorical variables, were used to analyze the data.*

RESULTS: *Most participants were between 30–39 years old (45.9%), resided in urban areas (52.1%), were unemployed (67.8%), had a family income of ≤75,000 PKR per month (56.2%), and were single (56.8%). A statistically significant association was observed between PSA levels and variables such as age, marital status, occupation, income, and parity. No significant association was found between PSA levels and place of residence.*

CONCLUSION: *Elevated PSA levels were observed in PCOS patients with hirsutism, supporting its potential as a biochemical indicator of hyperandrogenism in women. This highlights the possible clinical relevance of PSA in the evaluation and monitoring of androgen excess in PCOS.*

INTRODUCTION:

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age. Clinically, it often presents with menstrual disturbances such as infrequent or absent ovulation, along with signs of androgen excess, including hirsutism, acne, and occasionally alopecia (Glintborg D et al, 2010). Many women with PCOS also exhibit features of insulin resistance and may struggle with obesity. It is estimated that around 5% to 10% of women in the reproductive age group are affected by this condition (Ndefo UA et al, 2013). While multiple theories exist, the exact cause of PCOS remains unclear (Wu ZH et al, 2019 & Azziz R et al, 2019). It is believed that an imbalance in androgen production, as well as disturbances in gonadotropin secretion and metabolic function, play key roles in its development (Azziz R, 2003). Given the complex nature of the syndrome, there is currently no single test that can definitively diagnose PCOS (Vural B et al, 2007). Though biochemical markers of hyperandrogenemia are commonly used, their diagnostic accuracy tends to vary significantly (Tokmak A et al, 2018). A large proportion of women with PCOS display clear symptoms of androgen excess. These may include excessive facial or body hair (hirsutism), acne, scalp hair thinning, and problems related to ovulation and fertility. In individuals not seeking immediate fertility, treatment is often focused on managing the hormonal imbalance, particularly by suppressing androgen levels (Rudnicka E et al, 2018). Prostate-specific antigen (PSA), a serine protease primarily associated with the prostate gland in men and widely used as a tumor marker in prostate cancer, has also been detected in various female tissues. These include the breast, ovarian and endometrial tissues, as well as in breast milk and amniotic fluid. In healthy women, PSA is usually present in very small amounts, and its levels can fluctuate during different phases of the menstrual cycle. Previous studies, such as the one by Zarghami and colleagues (Nadir A et al, 2019), have suggested that steroid hormones released from the corpus luteum may stimulate PSA production in certain tissues like the breast, from where a small amount enters the bloodstream and becomes detectable in serum (Zarghami N et al, 1997; Ukinc K et al, 2009 & Bhat K et al, 2019). Notably, a study by Al Bayatti et al. reported a mean total PSA (tPSA) level of 2.67 ± 0.37 ng/mL in women with PCOS who presented with hirsutism, highlighting a possible link between androgen activity and PSA levels in females (Al Bayatti AA et al, 2004). Over the past decade, researchers have increasingly explored PSA levels in women with PCOS, with the aim of understanding whether it could serve as a useful clinical marker of hyperandrogenism. However, findings remain inconsistent. While some studies have noted elevated total or free PSA levels in PCOS patients, others have failed to establish a significant association. Moreover, there is a clear lack of local studies investigating this topic, especially within our population. Although the exact significance of PSA in PCOS remains uncertain, it has the potential to become a valuable marker for assessing androgen status in affected women. Recognizing its possible diagnostic and clinical relevance, this study aims to measure the mean total PSA levels in women with PCOS who present with hirsutism at a tertiary care hospital in Hyderabad. The findings may help broaden our understanding and contribute to better clinical decision-making and individualized treatment strategies.

PATIENTS AND METHODS:

This descriptive cross-sectional study was conducted over a six-month period, from February 1, 2024, to July 31, 2024, at the Department of Obstetrics and Gynaecology, Bilawal Medical College CDF Hospital, Hyderabad. Prior to initiating the study, ethical approval was obtained from the College of Physicians and Surgeons Pakistan, and formal permission was granted by the hospital's Ethical Review Committee.

Women aged 20 to 45 years, diagnosed with polycystic ovary syndrome (PCOS) based on the Rotterdam criteria, were included in the study. According to these criteria, a diagnosis of PCOS requires at least two out of the following three features:

a) Oligo-ovulation or anovulation, clinically seen as irregular or absent menstrual cycles,

b) Signs of hyperandrogenism, specifically hirsutism, and

c) Polycystic ovaries on ultrasound, defined as the presence of 2-8 mm follicles on sonographic imaging. Women with known medical conditions that could influence hormonal levels, such as hypothyroidism, hyperthyroidism, diabetes mellitus, or hypertension, were excluded. Additionally, those with a history of recent hormonal therapy or malignancy were not considered for the study.

Hirsutism was defined as excessive male-pattern hair growth in females, particularly in areas like the face, chest, back, or abdomen. A Ferriman-Gallwey score greater than 8 (Appendix-A) was used as the threshold to confirm clinical hirsutism.

The sample size was calculated using OpenEpi software, based on a previously reported mean total PSA value of 2.67 ± 0.37 ng/mL in hirsute women with PCOS, with a precision level (d) of 0.06 and a 95% confidence interval, resulting in a required sample of 146 participants.

Participants who fulfilled the inclusion criteria were recruited using a non-probability consecutive sampling technique. Informed written consent was obtained from each patient before data collection. Demographic details, including age and place of residence, as well as the duration of PCOS, were recorded. A 5 mL venous blood sample was collected using a sterile disposable syringe and transferred into a labeled tube designed for the measurement of serum total prostate-specific antigen (tPSA).

All relevant data were documented on a structured proforma. Data analysis was performed using SPSS software. Mean and standard deviation were computed for continuous variables such as age, weight, height, PSA levels, and PCOS duration. Frequencies and percentages were calculated for categorical variables including residence (urban/rural), parity, gravidity, occupational status, and family income.

To assess the potential influence of confounding variables, stratification was done based on age, residence, parity, gravidity, occupation, and family income. Following stratification, an independent t-test was applied to determine the statistical significance, with a p-value ≤ 0.05 considered significant.

RESULTS:

A total of 146 individuals were included in the study. The demographic distribution of the study participants is summarized in Table 1. The results of the study revealed statistically significant variations in serum prostate specific antigen (PSA) levels across several demographic and clinical variables, as shown in Table 2.

When analyzed by age groups, the mean PSA levels showed a progressive increase with age. Participants aged 20-29 years had a mean PSA of 1.676 ± 0.73 ng/Ml, which increased to 2.82 ± 1.27 ng/Ml in the 30-39 age groups and further rose to 4.47 ± 2.03 ng/Ml in individuals aged 40-45 years. This difference was statistically significant (p = 0.008), indicating a strong association between age and serum PSA levels.

Regarding place of residence, individuals from rural areas had slightly higher PSA levels (3.11 ± 1.89 ng/Ml) compared to their urban counterparts (2.74 ± 1.46 ng/Ml), although the difference did not reach statistical significance (p = 0.187).

Occupational status was significantly associated with PSA levels. Unemployed individuals had higher mean PSA values (3.85 ± 1.78 ng/Ml) compared to those who were employed (2.76 ± 1.31 ng/Ml), and this difference was statistically significant (p = 0.034).

Marital status also demonstrated a significant relationship with serum PSA levels. Married individuals exhibited higher PSA levels (3.72 ± 1.84 ng/Ml) than single individuals (2.51 ± 1.08 ng/Ml) with a p-value of 0.019, indicating a statistically significant difference.

In terms of parity, multiparous individuals had a higher mean PSA (3.67 ± 1.78 ng/Ml) than primigravidas (2.44 ± 1.09 ng/Ml), and this difference was statistically significant (p = 0.015).

Lastly, family income showed a clear association with PSA levels. Participants from families earning less than 75,000 PKR had significantly higher PSA levels (3.92 ± 2.04 ng/Ml) compared to those from higher-income families (2.68 ± 1.27 ng/Ml), with the difference being statistically significant (p = 0.027).

Regarding the duration of PCO (years), the mean PSA levels showed a progressive increase with duration of PCO. Participants 1-2 years had a mean PSA of 1.622 ± 0.72 ng/Ml, which increased to 1.982 ± 1.29 ng/Ml in the 3-4 years group and

further rose to 3.56 ± 2.05 ng/Ml in individuals ≥5 years duration. This difference was statistically significant (p = 0.006), indicating a strong association between age and serum PSA levels

These findings highlight that increasing age, unemployment, married status, multiparity, and lower socioeconomic status are significantly associated with elevated serum PSA levels, as summarized in Table 2.

TABLE 1: DEMOGRAPHICAL CHARACTERISTICS OF THE STUDY POPULATION

PARAMETER	FREQUENCY (N=146)	PERCENTAGE (%)
AGE (years)		
20-29	39	26.7
30-39	67	45.9
40-45	40	27.4
RESIDENCE		
Urban	76	52.1
Rural	70	47.9
OCCUPATION		
Employed	47	32.2
Unemployed	99	67.8
FAMILY MONTHLY INCOME		
≤75000	82	56.2
>75000	64	43.8
MARITAL STATUS		
Single	83	56.8
Married	63	43.2
DURATION OF PCO (years)		
1-2	42	28.7
3-4	53	36.3
≥5	51	34.9

TABLE 2: COMPARISON OF MEAN SERUM PROSTATE-SPECIFIC ANTIGEN (PSA) LEVELS WITH AGE, RESIDENCE, OCCUPATION, MARITAL STATUS, PARITY, AND FAMILY INCOME

VARIABLE	Categories	Mean ± SD (PSA ng/Ml)	*p*-value
Age (years)	20-29	1.676 ± 0.73	0.008*
	30-39	2.82 ± 1.27	
	40-45	4.47 ± 2.03	
Residence	Urban	2.74 ± 1.46	0.187
	Rural	3.11 ± 1.89	

VARIABLE	Categories	Mean ± SD (PSA ng/Ml)	*p*-value
Occupation	Employed	2.76 ± 1.31	0.034*
	Unemployed	3.85 ± 1.78	
Marital Status	Single	2.51 ± 1.08	0.019*
	Married	3.72 ± 1.84	
Family monthly income (PKR)	<75,000	3.92 ± 2.04	0.027*
	>75,000	2.68 ± 1.27	
Parity	Primigravida	2.44 ± 1.09	0.015*
	Multipara	3.67 ± 1.78	
Duration of PCO (years)	1-2	1.622 ± 0.72	
	3-4	1.982 ± 1.29	0.006*
	≥5	3.56 ± 2.05	

*Statistically significant

DISCUSSION:

In this study, we explored the relationship between total prostatic specific antigen (PSA) levels and clinical features in women with polycystic ovary syndrome (PCOS) who presented with hirsutism. PSA, traditionally regarded as a male-specific biomarker produced by the prostate gland, has been increasingly recognized to be produced in small amounts by female tissues under the influence of androgens. Notably, sebaceous glands, breast tissue, and periurethral glands in females can also express PSA. Our findings suggest that serum PSA, although primarily used in the context of prostate disorders, may serve as a surrogate marker of androgen activity in females, particularly in hyperandrogenic states like PCOS.

Our results demonstrated elevated PSA levels in PCOS patients with moderate to severe hirsutism. This supports the hypothesis that PSA production in females is influenced by circulating androgens, especially testosterone and dihydrotestosterone, which are often elevated in PCOS (Diamandis EP et al, 2017). Several previous studies have echoed similar observations, identifying PSA as a potential marker for biochemical hyperandrogenism in women (Anithasri A et al, 2019; Maleki-Hajiagha A et al, 2019 & Biswas T et al, 2011). The strength of this association reinforces the relevance of PSA as a potential non-invasive indicator to assess androgen excess, which is a hallmark feature of PCOS (Lentscher JA et al, 2018).

Interestingly, the correlation between PSA levels and clinical indicators such as age, marital status, and socioeconomic background was also evaluated. While PSA values tended to be higher in older age groups and in women from lower socioeconomic settings, these trends may reflect differences in healthcare access, nutritional status, and possibly delayed diagnosis or management of PCOS. Additionally, unemployed and married women showed slightly higher PSA levels, possibly linked to variations in lifestyle, stress levels, or metabolic health factors often intertwined with PCOS severity.

Parity also appeared to influence PSA levels, with multiparous women showing relatively higher values. While the biological rationale behind this is not fully established, it may relate to cumulative hormonal exposure over multiple pregnancies, or differences in

metabolic and endocrine profiles post-childbirth. Further research is needed to clarify this aspect.

The association between PSA and hirsutism in our study suggests that PSA could be considered as an adjunct marker in the assessment of hyperandrogenism in PCOS (Bili E et al, 2014 & Mardanian F et al, 2011). However, it is important to note that PSA testing in women is not yet standardized, and variations in assay sensitivity may limit its widespread clinical application. Also, since PSA levels can be influenced by other factors including obesity, insulin resistance, and estrogen levels, a more nuanced approach is required in interpreting these results.

Further large-scale studies with hormonal profiling and longitudinal follow-up are recommended to validate PSA's role and reliability in clinical practice, especially in resource-limited settings where conventional hormone assays may not always be feasible.

CONCLUSION:

The study results shown majority of patients were in 30-39 age group (45.9%), urban population (52.1%), unemployed (67.8%), family monthly income ≤75000 (56.2%) and marital status as single (56.8%).

The p-value for total prostatic specific antigen in relation to age, occupation, marital status, family monthly income and parity is statistically significant while in relation to residence it was found to be non-significant. Thus, total PSA levels were found to be elevated in women with PCOS presenting with hirsutism, suggesting that PSA could serve as a potential biochemical marker of hyperandrogenism in females.

LIMITATION OF THE STUDY:

Despite the promising findings, our study has some limitations. The sample size was relatively small, and it was conducted in a single-center setting, which may limit the generalizability of the results. Moreover, we did not assess serum testosterone or free androgen index levels, which could have strengthened the evaluation of PSA as a surrogate androgen marker. To better understand the link between PSA and PCO with hirsutism future research should involve longer-term, prospective studies with diverse populations across multiple clinical centers. This approach would help strengthen the relevance and generalizability of the results.

AUTHOR'S CONTRIBUTION:

Collection and acquisition of data & grammatical corrections	*Dr. Sidra Memon*
Concept & design of study & proof read	*Dr. Chandra Madhudas*
Drafting the article and finalizing the manuscript	*Dr. Seher*
Revising critically and make it suitable for final format	*Dr. Ghazal*
Acquisition of data and grammatical review	*Dr. Rabiya*
Final Approval of version	*By All Authors*

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