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Khetam Salman Alewi
Department of Microbiology, College of Medicine, University of Babylon, Iraq

Zainab Adil Ghani Chabuck
Department of Microbiology, College of Medicine, University of Babylon, Iraq, zainabibz@gmail.com

Suha Jasim Witwit
Department of Gynecology, College of Medicine, University of Babylon, Iraq

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ORIGINAL STUDY

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Evaluation of Vaginal Versus Plasma Pentraxin-3 Level among Females with Polycystic Ovary Syndrome

Khetam Salman Alewi [a], Zainab Adil Ghani Chabuck [a,*], Suha Jasim Witwit [b]

[a] Department of Microbiology, College of Medicine, University of Babylon, Iraq
[b] Department of Gynecology, College of Medicine, University of Babylon, Iraq

Abstract

Background: Polycystic ovary syndrome (PCOS) is a chronic reproductive and metabolic disorder that affects up to 20% of women in their reproductive age, leading to menstrual complications, fertility problems, and other health issues. Vaginitis is a clinical disorder that can result in vaginal symptoms.

Objectives: to compare the vaginal and plasma pentraxin-3 levels among females with polycystic ovary syndrome.

Materials and Methods: Vaginal swabs and venous blood were collected during the present study period, extending from the beginning of August to the end of November 2023, from female patients who were attended to Babylon Maternity and Pediatrics Hospital and Private Clinics, the samples were collected from females with vaginitis and PCOS, and 74 females with vaginitis without PCOS as the control group. High vaginal swabs were collected and processed by culture media followed by identification depending on microscopic, phenotypic, cultivation on Chromagar and application of Human Pentraxin 3 ELISA on both vaginal swabs and blood samples.

Results: A total of (164) females were diagnosed as having polycystic ovary syndrome depending on Rotterdam criteria. The results revealed that 60/164 (36.59%) had positive cultures; these 60 cultures were divided into 22/164 (13.4%) bacterial isolates and the remaining 38/164 (23.2%) had fungal isolates. The results of Pentraxin 3 showed that blood levels were significantly different between patients and controls, also the same for vaginal pentraxin with p value < 0.05. While no correlation between blood and vaginal levels.

Conclusion: Plasma and vaginal Pentraxin 3 levels were significantly elevated and associated with PCOS, giving a hint for further studying the role of pentraxin in the pathophysiology of PCOS.

Keywords: PCOS, Vaginitis, Human Pentraxin 3

1. Introduction

Polycystic ovary syndrome (PCOS) is a hormonal disorder affecting women of reproductive age. Diagnosis by common symptoms includes hormonal imbalances, weight gain, excessive hair growth, acne and abnormal menstruation [1]. An ultrasound or elevated androgens, including testosterone, androstenedione, and dehydroepiandrosterone sulfate [2].

Vaginitis is defined as any condition with symptoms of abnormal vaginal discharge, odor, irritation, itching, or burning. The most common causes of vaginitis are bacterial vaginosis, vulvovaginal candidiasis, and trichomoniasis [3, 4].

The pentraxin family is an ancient group of pattern recognition proteins found in the serum. Pentraxins can be divided into the classical short pentraxins which include C-reactive protein (CRP) and Serum Amyloid P (SAP), and the long pentraxins which

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* Corresponding author.
E-mail address: zainabibz@gmail.com (Z. Adil Ghani Chabuck).

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include PTX3, PTX4 and neuronal pentraxins 1 and 2 (nPTX1 and nPTX2) [5].

All contain the pentraxin domain at the C-terminus, but the long pentraxins have an extended and unrelated N-terminal domain [6].

Pentraxin 3 is physiologically a protective molecule and has a wide range of functions in different contexts. PTX3 plays an important role in innate immunity, inflammation, vascular integrity, fertility, pregnancy, and also in the central nervous system [7].

This study aimed to compare vaginal and plasma pentraxin-3 levels among females with vaginitis and polycystic ovary syndrome in comparison with those without PCOS.

2. Materials and methods

2.1. Sample collection

A total of 164 samples were taken from patients with PCOS (diagnosed based on Rotterdam criteria) who visited Babylon Maternity and Pediatrics Hospital and Private Clinics, and 74 samples from the control group were taken from patients with vaginitis but without PCOS. The age group was 15–60 years. The patient be at dorsal-lithotomy position with adduction of her thighs and knee flexion. A sterile Cusco's speculum applied, and a vaginal swab was taken from the vaginal apex using a swab stick (two swabs were obtained from each female involved). The swabs were then carefully removed and immersed in a plain tube containing one ml of phosphate-buffered saline. The speculum was then withdrawn, and the samples were labeled with the patient's data or number [8]. The specimen was transported to the laboratory, processed using culture media, followed by cultivation and identification based on microscopic, phenotypic, and cultivation on Chromagar. Subsequently, blood samples were collected from all subjects (patients and controls) involved in this study for serum preparation and kept at 4°C in a refrigerator until the ELISA test was conducted [9].

2.2. Ethical approval

The necessary ethical approval was obtained from the ethical committee of the College of Medicine/ University of Babylon and Babylon Maternity and Pediatrics Hospital, as per document number 3–17 (dated 25/6/2023).

3. Results

During the period of this study, a total of (164) females were diagnosed with polycystic ovary syndrome. Their diagnosis was done by different methods based on Rotterdam criteria. After the vaginal swabs on different media for the isolation and identification of different microbial agents, the results revealed that 60/164 (36.59%) had positive cultures. These 60 cultures were divided into 22/164 (13.4%) bacterial isolates and the remaining 38/164 (23.2%) fungal isolates. Furthermore, the 22 bacterial isolates were categorized into 8 Gram-positive and 14 Gram-negative isolates, as shown in Fig. 1.

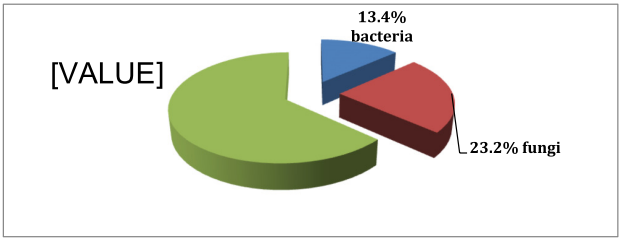

Fig. 1. Frequency distribution of vaginitis cases among female patients with PCOS.

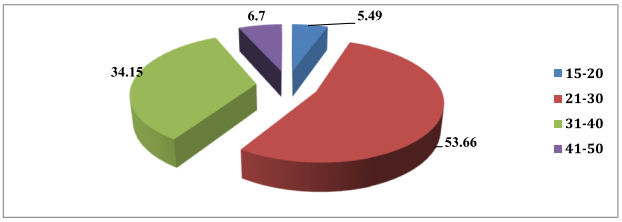

Fig. 2. The frequency distribution of PCOS cases according to age groups.

3.1. Distribution of PCOS cases in association with their age

The distribution of patients' age groups in the present study was shown in (Fig. 2) with a range of (15–50) years. The frequency distribution of patients' groups according to age showed a significant difference ($P < 0.0001$). The highest percentage was among the age group 21–30 years represented as 88/164 (53.66%) followed by group 31–40 as 56/164 (34.15%); while the lowest group was 15–20 year as 9/164 (5.49%).

3.2. Human pentraxin 3

The PTX3 plasma level was significantly higher in PCOS women compared to controls, p value 0.02, as shown in (Table 1) and (Fig. 3).

Regarding Vaginal Pentraxin, it was significantly different between patients and controls, with a p value of 0.038; as shown in (Table 2) and (Fig. 4).

Finally, the correlation between blood and swab pentraxin among patients group showed no significant difference with a p value of 0.176, and no correlation $r = 0.315$; as shown in (Table 3).

Fig. 3. Boxplot show difference in result of blood pentraxin between patient and control.

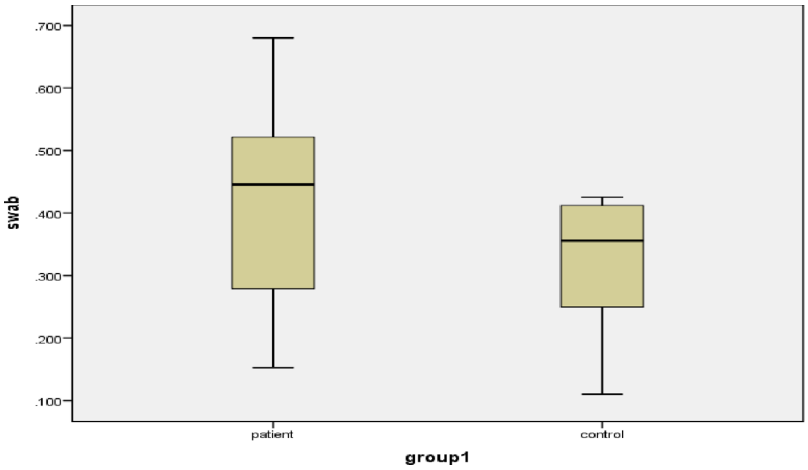

Fig. 4. Boxplot show difference in result of vaginal pentraxin between patient and control.

Table 1. Difference between blood pentraxin levels in patients and controls.

		Blood pentraxin		
Group	No	Mean	±SD	P value
Patient	20	0.239	0.074	0.02
Control	20	0.192	0.045	Sig

Independent sample t test, Sig = significant at $p < 0.05$, SD = standard deviation.

Table 2. Difference of vaginal pentraxin between patient and control.

		Vaginal pentraxin		
Group	No	Mean	±SD	P value
Patient	20	0.412	0.554	0.038
Control	20	0.325	0.569	Sig

Independent sample t test, Sig = significant at $p < 0.05$, SD = standard deviation.

Table 3. Correlation between blood and vaginal pentraxin among patients with PCOS.

	r	*P*
Pearson correlation between blood and swab	0.315	0.176 NS

Pearson correlation test, *r* = Correlation coefficient, NS = non-significant at $P > 0.05$.

4. Discussion

As one of the most prevalent syndromes among reproductive-aged women, polycystic ovary syndrome (PCOS) manifests with endocrine, reproductive, and metabolic disturbances [10].

This condition can cause menstrual disorders, lack of ovulation, obesity, acne, hirsutism, hair loss, and baldness. Long-term complications include endometrial cancer, infertility, insulin resistance, type 2 diabetes, high blood pressure, heart disease, depression, and stress. Short-term consequences and complications may also arise [11]

Polycystic Ovarian Syndrome in adults is diagnosed when two out of three characteristics are present: oligomenorrhea or amenorrhea, hyperandrogenism (biochemical or clinical), and polycystic ovarian morphology (PCOM) [12].

These results suggest that the highest number of PCOS patients were diagnosed by ultrasound, followed by symptomatic diagnosis, and the hormonal assay was the lowest. This can be explained by the fact that ultrasound is more accessible, non-surgical, lower cost, and gives more information than hormonal assays that are costlier and require additional

information to be beneficial. Studies suggest that having PCOM does not imply having PCOS directly; similarly, having ovulatory dysfunction and hyperandrogenism alone may not be sufficient evidence. According to the Rotterdam criteria, a patient must possess two of the three main symptoms to be diagnosed with PCOS [13].

According to Fig. 2 the variation in the distribution of PCOS among different age groups can be attributed to many factors, including the number of patients involved in the study and their ability to attend clinics, genetic factors, lifestyles, hormonal factors, body development, and sexual activity when starting to seek pregnancy. These result suggested girls within the age group (20–30 years) are particularly susceptible to PCOS and the risk factors are more prevalent in the reproductive age group, especially concerning overweight and obesity, which significantly impacts their quality of life at a higher proportion.

The study by Agarwal (2024) showed that PCOS cases increased in the reproductive age group, with a significant number of girls identified as obese, with 57 cases in the 21–30 age group and 16 cases in the 31–40 age group exhibiting hirsutism. This condition is linked to elevated levels of testosterone and the presence of PCOS as observed through ultrasound [14].

These results reflect the enormous variation in the vaginal inhabitants and the disruption of vaginal microbiota among those with and without PCOS. Female bacterial vaginosis (BV) had the highest number in comparison with candida because course of menstrual cycles, sexual activity, or even personal hygiene [15].

The study suggested that bacterial vaginosis (BV) had the highest number in comparison with candida because BV considered one of the most common causes of vaginal dysbiosis in women of reproductive age [15].

Vulvovaginal candidiasis (VVC) is the second most common infection of the genital tract in women, right after the bacterial etiology of this inflammation [16].

There was a positive correlation between PTX3 plasma levels and PCOS diagnosis, overweight, cycle length, serum LH to FSH ratio, estradiol, and total testosterone (TT). Multivariate linear regression analysis indicated that participants' serum PTX3 levels were proportional to the circulating TT level, the existence of PCOS, basal estradiol level, and AFC [17]

Previous study indicated that follicular cells from PCOS women have higher PTX3 expression Also, PCOS women with healthy weight showed higher ovarian PTX3 levels [18]. PTX3 is crucial for the organization of the cumulus oophorus extracellular matrix and fertilization [19].

5. Conclusion

Plasma and vaginal Pentraxin 3 levels were significantly elevated and associated with PCOS, giving a hint for further studying the role of pentraxine in the patho-physiology of PCOS.

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