

Urinary Tract Infections among Iraqi women with polycystic ovarian syndrome(Stein-Leventhal syndrome)

By

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Abstract:

Background: Polycystic ovary syndrome (PCOS) is the most common endocrinopathy in women of reproductive age, and urinary tract infections (UTIs) in women are one of the most common infections occurring at various stages of life. , therefore the aim of the current study is to investigate the relationship between polycystic ovary syndrome (PCOS) and urinary tract infections (UTIs) in Iraqi women. **Patients and methods:** about 150 blood and urine samples were collected from PCOS women during the period (April to September) 2022 from Ramadi Teaching Hospital, As well as a group of healthy women (50samples) as a control. PCOS diagnosis based on clinical and biochemical criteria also using an ultrasound device (Ovarian ultrasound showing 8 or more subcapsular cysts that are less than 10 mm in diameter together with thickened ovarian stroma.). As for the investigation of UTIs performed it was as follows: GUE for mid-stream urine and cultured on both agar (MacConkey's and blood media), Gram staining, and other routine tests were used to identify bacteria after it was cultured, as well as used Vitek 2 system. the concentrations of T, FSH, Anti-FSH, LH, Anti- LH and E were measured with ELISA. **Results:** Current study revealed that more PCOS women with UTIs had irregular menstrual cycles (No. = 59, 90.77%) than regular women (No. = 6, 9.23%), married PCOS women (No. = 47, 72.30%) than single women (No. = 18, 27.70%), and gram-negative bacteria (No. = 46, 70.76%) caused UTIs more frequently than gram-positive (No. = 19, 29.24 Since *Staphylococcus aureus* and *E. coli* were the two most prevalent isolates for PCOS in the UTI group (No.=16; 24.62%), so higher concentrations of FSH, Anti-FSH, LH, and testosterone were found among PCOS women with UTIs as compared to the control group (5.301 ± 0.581 ; 0.514 ± 0.279 ; 5.1256 ± 3.905 ; and 1.09 ± 0.10) respectively compared to the control group (significant ($p < 0.05$)), however, there was no statistically significant difference between the groups for Estradio (E2) and Anti LH (140.699 ± 33.011 ; 0.385 ± 0.222) respectively compared to the control. **Conclusion:** The current study concluded correlated between PCOS with UTIs as well as most PCOS women with UTIs were irregular menstruation compared to regular menstruation, also married women more than

single women, UTIs caused by gram-negative bacteria more than gram-positive, and both *E. coli* and *Staphylococcus aureus* were the most common bacterial isolate from PCOS women with UTI, also higher concentrations of FSH, Anti-FSH, LH, and T hormones among PCOS women with UTIs (significant ($p < 0.05$), whilst no significant difference for both E2 and Anti-LH.

Keywords: Urinary Tract Infections (UTIs); polycystic ovarian syndrome (PCOS); Stein-Leventhal syndrome;; FSH; Anti-FSH; LH; T ; E2 and Anti-LH.

Introduction:

Considering that urinary tract infections were the most common disease among women worldwide, as well as polycystic ovarian syndrome (PCOS) patients are among those who most frequently have endocrine disorders⁽¹⁾, Previously known as "polycystic ovary disease" (PCOD), "polycystic ovarian syndrome" (or PCOS), and even before that, "Stein-Leventhal syndrome,"⁽²⁾.

Urinary tract infections are not directly caused by PCOS, however, both conditions share a number of underlying risk factors. The female reproductive system and/or the urinary tract may be impacted by structural problems, and blood sugar instability(dysregulation Blood sugar is an important consideration when it comes to both PCOS and UTIs, so Insulin resistance is may play a significantly important role in both PCOS and UTI⁽³⁾ , or hormonal imbalance(androgens (male sex hormones like testosterone) and female sex hormones (progesterone and estrogen) all of which can affect the female reproductive system and/or the urinary tract, which might result in UTIs.

In 5%–10% of women of reproductive age, polycystic ovarian syndrome (PCOS) is one of the most prevalent endocrine illnesses⁽⁴⁾. Averaging 7% of all women of reproductive age, polycystic ovarian syndrome (PCOS) is one of the most prevalent endocrine illnesses in this population. Menstrual abnormalities, acne, and clinical and biochemical hyperandrogenism are all related to PCOS^(5&6), It is a diverse syndrome marked by anovulation or polycystic ovarian morphology, as well as, hyperandrogenism and insulin resistance, are the main characteristics of PCOS⁽⁷⁾.

The aim of the study: is to investigate the relationship between polycystic ovary syndrome (PCOS) and urinary tract infections (UTIs) in Iraqi women.

Patients and methods:

Collected about 150 blood and urine samples from PCOS women with UTIs during the period (April to September) 2022 Feb from Ramadi Teaching Hospital - Iraq, As well as a group of healthy women (50 samples) as a control.

Examination and diagnosis:

Investigation of 150 women who have already received a PCOS diagnosis based on clinical and biochemical criteria also using an ultrasound device (Ovarian ultrasound showing 8 or more subcapsular cysts that are less than 10 mm in diameter together with thickened ovarian stroma.). As for the investigation of UTIs performed it was as follows: GUE for mid-stream urine and cultured on both agar (MacConkey's and blood media), Gram staining, and other routine tests were used to identify gram-negative and positive bacteria after it was cultured for 24 hours at 37°C, as well as used Vitek 2 system.

Measurement of Hormones:

Concentrations of Testosterone (T), FSH, Anti-FSH, LH, Anti- LH, and estrogen (E): were measured with an Enzyme-linked Immunosorbent Assay (ELISA, Biomerieux, France).

Statistical analysis: Statistical Analysis System (SAS, 2012), was employed.

Results:

About (No.= 65,43.4%) as PCOS women with UTIs from 150 PCOS women, As well as a group of healthy women (50 samples) as a control (in table-1).

Table (1): Distribution of PCOS women according to UTIs infections.

Study groups	With UTIs	Without UTIs	Total	Control group (Healthy)
	No. (%)			
PCOS women	65(43.4%)	85(56.6%)	150(100%)	50(100%)

Results in table (2) showed that most PCOS women with UTIs were irregular menstruation as (No.=59, 90.77%) compare to Regular (No.=6, 9.23%), also married PCOS women (No.= 47, 72.30%) more than single women (No.= 18, 27.70%)

Table (2): Menstrual cycle and Married state for Iraqi women with the polycystic ovarian syndrome

Menstrual cycle	NO.	%
Regular	6	9.23
Irregular	59	90.77
Married state		
Married	47	72.30
Single	18	27.70
Total	65	100

According to table (3), there was more Gram-negative (Number = 46, 70.76 %). in the current study than Gram-positive (Number =19, 29.24 %).

Table (3): Types of the bacterial isolate from the urine specimens

Types of bacterial isolate	PCOS with UTIs group	
	NO.	%
Gram-positive	19	29.24
Gram-negative	46	70.76
Total	65	100%

The results showed both *E. coli* and *Staphylococcus aureus* were the most common isolate (No.=16; 24.62%) for PCOS with the UTI group, followed by *Pseudomonas aeruginosa* (No.=11; 16.92%), and *Klebsiella pneumoniae* (No.=8; 12.30 %) that showed in the table (4).

Table (4): Frequency of bacteria identified isolated from urine specimens of Iraqi women.

Bacterial isolate	UTI with PCOS	
	No.	%
<i>Staphylococcus aureus</i>	16	24.62
<i>Escherichia.coli</i>	16	24.62
<i>Pseudomonas aeruginosa</i>	11	16.92
<i>Klebsiella pneumoniae</i>	8	12.30
<i>proteus Mirabalis</i>	6	9.23
<i>Acinetobacter baumannii</i>	3	4.63
<i>Enterococcus faecalis</i>	3	4.63
<i>Burkholderia cepacia</i>	2	3.05
Total	65	100

Results in a table (5) showed higher concentrations (Mean \pm Std.) of FSH, Anti Follicle-stimulating hormone (FSH); Luteinizing hormone and testosterone among PCOS women with UTIs as (5.301 ± 0.581 ; 0.514 ± 0.279 ; 5.1256 ± 3.905 ; and 1.09 ± 0.10) respectively compared to the control group (significant ($p < 0.05$)), whilst no

statistically significant difference for both E2 and Anti LH (140.699 ± 33.011 ; 0.385 ± 0.222) respectively compared to the control group.

Table (5): Serum hormonal concentrations in PCOS women with UTIs and control women.

Hormones	PCOS women with UTIs	Control	P-Value
	Mean \pm Std.		
Testosterone (ng/ml)	1.09 ± 0.10	0.29 ± 0.02	Significant (p<0.05)
E2	140.699 ± 33.011	176.502 ± 27.477	Non significant (p<0.05)
FSH	5.301 ± 0.581	4.966 ± 0.591	significant (p<0.05)
Anti FSH	0.514 ± 0.279	0.299 ± 0.030	Significant (p<0.05)
LH	5.1256 ± 3.905	3.050 ± 0.531	significant (p<0.05)
Anti LH	0.385 ± 0.222	0.357 ± 0.106	Non - significant (p<0.05)

Discussion:

Urinary tract infections (UTIs) are more common in females with polycystic ovarian syndrome, a common hyperandrogenic condition, than in their counterparts⁽⁸⁾.

The effects of hormonal imbalance are probably the factor that most directly connects PCOS and recurrent UTI. However, mast cells, a dysregulated inflammatory response, as well as metabolic problems, may be considered underlying features of both diseases, as well as there, are a number of underlying risk factors for both PCOS and UTI that can be addressed to enhance general health, infections are not directly caused by PCOS. Most PCOS women with UTIs were irregular menstruation more than Regular, also married PCOS women more than single women, these results are completely consistent with the results of Ibraheem *etal.*,2022 'study⁽¹⁾', where he

clarified that irregular menstruation among the study PCOS & UTI group (94.1%). is pointedly higher than in the regular menstrual, Additionally, married PCOS women had a considerably greater rate of UTI (76.6%) than unmarried women.

With a prevalence of up to 17.8%, polycystic ovarian syndrome (PCOS) is the most prevalent endocrine and metabolic condition in women⁽⁹⁾. It is characterized by hyperandrogenism, irregular periods, and polycystic ovaries^(10 & 11), Because of the continuous hormonal imbalances, an irregular menstrual cycle is more indicative of PCOS than one that is regular⁽¹²⁾. So, It might be challenging to diagnose PCOS throughout the perimenopause and post menopause periods because, by definition, menstrual cycles are becoming shorter, less frequent, or stopping entirely. Some women may experience an increase in menstrual cyclicity, a decrease in ovarian volume and follicle count, and a maintenance of blood testosterone levels during this time, all of which can hide the clinical manifestation of PCOS. Although there is a general trend toward greater levels of androgen in women with PCOS, there is little information available about the normative ranges of androgens during the perimenopause phase⁽¹³⁾.

According to Ibraheem *et al.*, 2022⁽¹⁾, the number of PCOS women with UTI is significantly greater than control women, who showed an early symptoms of PCOS, acne, and hirsutism for the hyperandrogenic illness was an irregular menstrual cycle, and married women had higher incidence of PCOS than unmarried women. In both groups (PCOS with UTIs and UTIs without PCOS), gram-negative bacteria outnumbered gram-positive bacteria, and *E. coli* was the most prevalent bacterial isolate, also Nabag *et al.*, 2014 clarified in their study that married women with PCOS more than single women⁽¹⁴⁾.

Also, the current study showed the Gram-negative bacteria isolated from PCOS women with UTIs more than Gram-positive bacteria, as well as both *E. coli* and *Staphylococcus aureus*, were the most common isolate (No.=16; 24.62%) for PCOS with UTI group, followed by *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*.

According to Ibraheem *et al.*, 2022⁽¹⁾, the number of women with PCOS and UTI is significantly greater than that of control women and *E. coli* was found to be the most prevalent isolate, accounting for 42.8% of the PCOS with UTI group. It was then followed by *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*, as well as higher concentrations of FSH, Anti - FSH; LH, and testosterone among PCOS women with UTIs compared to the control group, whilst no statistically significant difference for both E2 and Anti-LH compared to the control group.

The results of previous studies^(15; 16) showed that the elevations in testosterone and LH levels, accompanied by a decreased FSH level and a higher LH: FSH ratio, were the main endocrine changes observed in women with PCOS were consistent with the results of the current study. In contrast, to control patients, PCOS women also had higher LH responses to FSH⁽¹⁷⁾.

According to Lewandowski *et al.*, 2011⁽¹⁸⁾, PCOS women have faster hypothalamic GnRH pulses, which increases the LH/FSH ratio, according to Cascella *et al.*, a Study showed a significantly higher level of LH in PCOS women than the control group⁽¹⁹⁾, so the results of ⁽²⁰⁾ showed higher levels of FSH and LH, Therefore, Ibrahim and Abdelsalam stated in their study that a substantial increase was identified in LH, testosterone, and LH/FSH ratio, whereas FSH level was insignificantly raised non PCOS women ⁽²¹⁾.

Conclusion:

- 1- The current study concluded a correlation between PCOS with UTIs, as well as most PCOS women with UTIs were irregular menstruation compared to regular menstruation, also married PCOS women than single women.
- 2- UTIs caused by Gram-negative bacteria more than Gram-positive, and both *E. coli* and *Staphylococcus aureus* were the most common bacterial isolate from PCOS women with UTI.
- 3- Current study conclude higher concentrations of FSH, Anti- FSH, LH, and T among

PCOS women with UTIs (significant ($p < 0.05$), whilst no statistically significant difference for both E2 and Anti-LH.

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