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مجلة التربوي

مجلة علمية محكمة تصدر عن كلية التربية الخمس

جامعة المرقب

العدد الثامن والعشرون (28)

يناير 2026م

- المجلة ترحب بما يرد عليها من أبحاث وعلى استعداد لنشرها بعد التحكيم .
- المجلة تحترم كل الاحترام آراء المحكمين وتعمل بمقتضاها .
- كافة الآراء والأفكار المنشورة تعبر عن آراء أصحابها ولا تتحمل المجلة تبعاتها .
- يتحمل الباحث مسؤولية الأمانة العلمية وهو المسؤول عما ينشر له .
- البحوث المقدمة للنشر لا ترد لأصحابها نشرت أو لم تنشر .

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يشترط في البحوث العلمية المقدمة للنشر أن يراعى فيها ما يأتي :

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- يرفق بالبحث تزكية لغوية وفق أنموذج معد .
- تعدل البحوث المقبولة وتصحح وفق ما يراه المحكمون .
- التزام الباحث بالضوابط التي وضعتها المجلة من عدد الصفحات ، ونوع الخط ورقمه ، والفترات الزمنية الممنوحة للتعديل ، وما يستجد من ضوابط تضعها المجلة مستقبلا .

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- للمجلة الحق في تعديل البحث أو طلب تعديله أو رفضه .
- يخضع البحث في النشر لأولويات المجلة وسياستها .
- البحوث المنشورة تعبر عن وجهة نظر أصحابها ، ولا تعبر عن وجهة نظر المجلة .

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Polycystic Ovary Syndrome and its Association with Insulin Resistance and The Extent of Patients` Awareness Of this Association in the region of Al-khums City, Libya

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Abstract

Polycystic Ovary Syndrome (PCOS) is currently recognized as one of the most common endocrine diseases claimed by women of reproductive age, with a worldwide prevalence ranging from 6 to 21%, depending on the diagnostic criteria, which commonly associated with insulin resistance (IR), (PCOS) syndrome increases the risk of developing type 2 diabetes mellitus. The Method used A cross-sectional study design was used to estimate the association between serum hormones and insulin sensitivity in women with PCOS each participant had their blood drawn following the standard blood draw process. A Mindray CL- 900 i analyzer was used to check the samples and measure the levels of hormones luteinizing hormone (LH), follicle stimulating hormone (FSH), prolactin (PRL) and Homeostatic Model Assessment for Insulin Resistance (HOMA-IR). Blood samples were taken from several laboratories in Al-Khums city, Libya, from November 2024 to February 2025. Statistical analysis was performed using IBM SPSS Statistics 23 software to evaluate correlations between hormonal levels and insulin resistance, as well as to compare differences in hormonal profiles across various subgroups.41 women with a diagnosis of Polycystic Ovary Syndrome (PCOS) were included in the study. The mean age of the subjects surveyed was 32.46 years. Spearman correlation coefficients were used to assess the relationship between hormonal levels and insulin resistance. T-tests were employed to compare hormonal levels in patients with high and low insulin

resistance. Additionally, a one-way ANOVA was conducted to evaluate differences in insulin resistance across age groups. the study employed questionnaire to assess the awareness or knowledge of (PCOS) patients regarding the association of insulin resistance with this disease. The Result is This study looked at the association of dysfunctional hormones (LH, FSH, and Prolactin) and insulin resistance, along with the knowledge of associated insulin resistance in PCOS. The results demonstrate that there is a high prevalence of insulin resistance in the study sample; however, there were no statistically significant associations between insulin resistance as measured by HOMA-IR and the selected hormonal levels. This indicates that, at least in this population, insulin resistance may be driven by other factors not considered in this study. Furthermore, the study showed the level of awareness towards the association of PCOS and insulin resistance was low, which points to the necessity for tailored educational programs.

Keywords: PCOS, insulin resistance, Hormones (LH), HOMA-IR, Awareness.

1. Introduction

Polycystic ovary syndrome (PCOS) is the most common type of endocrine disorder that develops in females of reproductive age. [(1)] According to an estimate by the World Health Organization, over 116 million women worldwide are affected by PCOS (3.4%). [(2)]. The diagnosis requires the presence of at least two of the following three criteria: hyperandrogenism, persistent anovulation, and polycystic ovaries. [(3)]. Insulin resistance (IR) and compensatory hyperinsulinemia (HI) are critical factors in the development of PCOS. These conditions not only drive hyperandrogenemia but also significantly impact reproductive function through various mechanisms. Understanding their role is essential for effective management and treatment of this complex disorder [(4)]. The risk rises with insulin resistance (IR) and compensatory hyperinsulinemia (HI) affect 65-95% of females with PCOS [(5).] research indicates that insulin resistance (IR) can worsen hormonal and ovulatory disorders associated with polycystic ovary syndrome (PCOS). Additionally, it may increase the risk of type 2 diabetes, hypertension, metabolic syndrome, and cardiovascular disease. Addressing IR is crucial for managing both PCOS and associated health risks [(6,7,8).] Insulin directly stimulates androgen production in theca cells through the PI-3K and MAPK pathways, as well as the inositol-glycan signal transduction system, It also enhances the amplitude of luteinizing hormone (LH) pulses that are stimulated by

gonadotropin-releasing hormone (GnRH) and works synergistically with LH to boost androgen synthesis. (9)

2. Methodology

Research Design: A cross-sectional study design was used to estimate the association between serum hormones and insulin sensitivity in women with PCOS. 41 women with a diagnosis of Polycystic Ovary Syndrome (PCOS) were included in the study the age between 15 to 52 females each participant had their blood drawn following the standard blood draw process. A Mindray CL- 900 i analyzer was used to check the samples and measure the levels of hormones: luteinizing hormone (LH), follicle stimulating hormone (FSH), prolactin (PRL) and Homeostatic Model Assessment for Insulin Resistance (HOMA-IR). the Blood samples were taken from several laboratories in Al-Khums city, Libya, from November 2024 to February 2025. Moreover, the study was included questionnaire to assess the awareness or knowledge of polycystic ovary syndrome patients regarding the association of insulin resistance with this disease. Data Analysis: The Statistical analysis was performed using IBM SPSS Statistics 23 software to evaluate correlations between hormonal levels and insulin resistance, as well as to compare differences in hormonal profiles across various subgroups. Spearman correlation coefficients were used to assess the relationship between hormonal levels and insulin resistance. T-tests were employed to compare hormonal levels in patients with high and low insulin resistance. Additionally, a one-way ANOVA was conducted to evaluate differences in insulin resistance across age groups.

3. Results

The Age Distribution Among Patients:

Most of the patients fall within the working-age population as seen in (table 1). Patients aged 19-35 make up 48.8% or 20 patients of the total sample, while, 41.5% is the percentage of patients aged 36-50. Patients aged 51 years and above constitute the least percentage of the population at 2.4% or 1 patient. Finally, the group age less than 18 only has 7.3% or 3 patients that comprise this age range, indicating a low base incidence of younger people in the study population.

Table 1: Age Distribution Among Patients

Age Category	Number of Patients	Percentage %
-18	3	7.3%
19-35	20	48.8%
36-50	17	41.5%
51+	1	2.4%
Totals	41	100%

The Distribution of Insulin Resistance Among Patients:

The categorization of insulin resistance levels for each patient in the sample is depicted in (table 2). The largest group accounting for 36.6 %, falls within the moderate insulin resistance range. Following this group, patients who are considered sensitive account for 31.7%. The proportion of those who are highly resistant is 24.4 %, which illustrates a considerable subset of people with severe metabolic impairment. At last, patients with low insulin resistance have the lesser portion which is 7.3%.

Table2: Distribution of Insulin Resistance Among Patients.

Insulin Resistance Category	Number of Patients	Percentage (%)
Moderate	15	36.6 %
Sensitive	13	31.7 %
Highly Resistant	10	24.4 %
Low	3	7.3 %
Total	41	100 %

Demographics and Hormonal Levels:

The mean age of the patients as shown in (Table 3) is approximately 32.46 years. In terms of hormonal levels, the average luteinizing hormone (LH) concentration is around 12.91, The follicle-stimulating hormone (FSH) levels average about 10.31, while the prolactin (PRL) levels are approximately 22.07, and the ravage of HOMA -IR about 4. 18 These values provide a baseline for understanding the hormonal profiles of the patients in this study.

Table 3: Patient Demographics and Hormonal Levels.

Descriptive Statistics	Minimum	Maximum	Mean	Std. Deviation
Age	15	52	32.46	9.410
Luteinizing hormone	0.59	63.40	12.9068	12.52867
Follicle-stimulating hormone	0.40	57.96	10.3146	10.82694
Prolactin	1.63	61.63	22.0795	13.52512
HOMA-IR	0.39	30.31	4.1842	5.31955

Correlation Between Hormonal Levels and Insulin Resistance (HOMA IR):

Correlation Between LH and HOMA-IR:

The scatter plot (Figure 1) shows the relationship between luteinizing hormone (LH) levels and HOMA IR. The Spearman correlation coefficient was 0.0903, with a p-value of 0.5743, indicating a weak positive relationship that is not statistically significant.

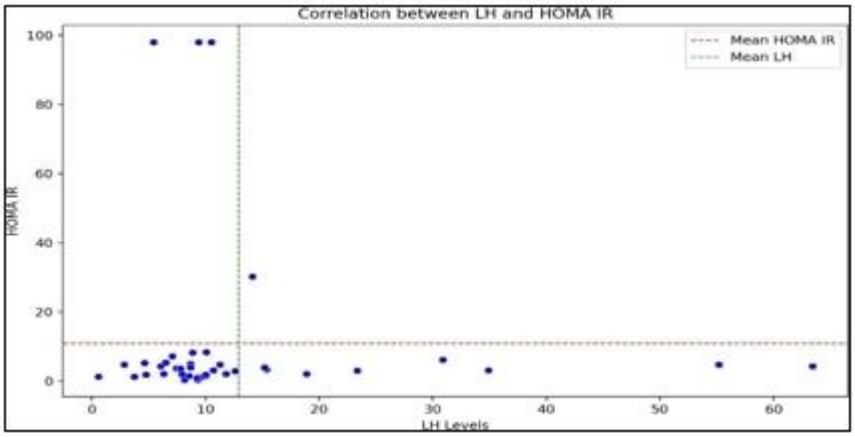

Figure 1: Correlation Between LH and HOMA IR.

Correlation Between FSH and HOMA-IR:

The scatter plot (Figure 2) depicts the relationship between follicle-stimulating hormone (FSH) levels and HOMA IR. The Spearman correlation coefficient was 0.2206, with a p-value of 0.1658, indicating a weak positive relationship that is

not statistically significant. This implies that FSH levels are not significantly correlated with insulin resistance in this dataset.

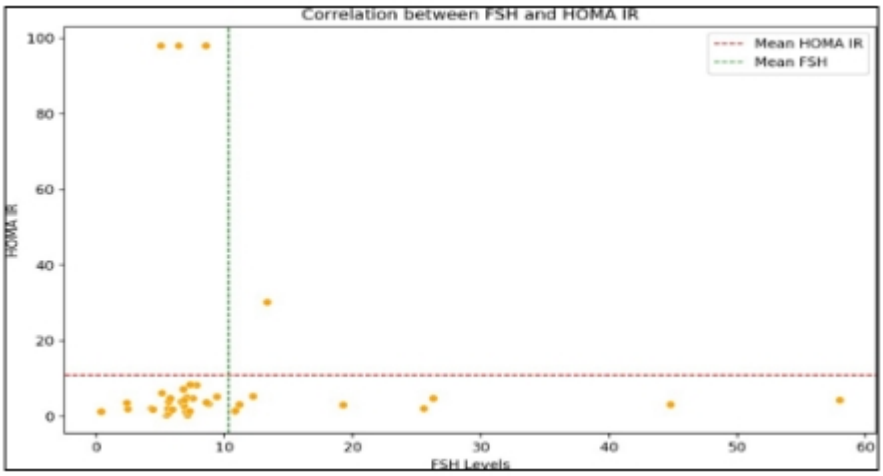

Figure 2: Correlation Between FSH and HOMA IR.

Correlation Between Prolactin and HOMA-IR:

The scatter plot (Figure 3) illustrates the relationship between prolactin (PRL) levels and HOMA IR. The Spearman correlation coefficient was - 0.1899, with a p-value of 0.2345, indicating a weak negative relationship that is not statistically significant. This suggests that PRL levels are not strongly associated with insulin resistance in this dataset.

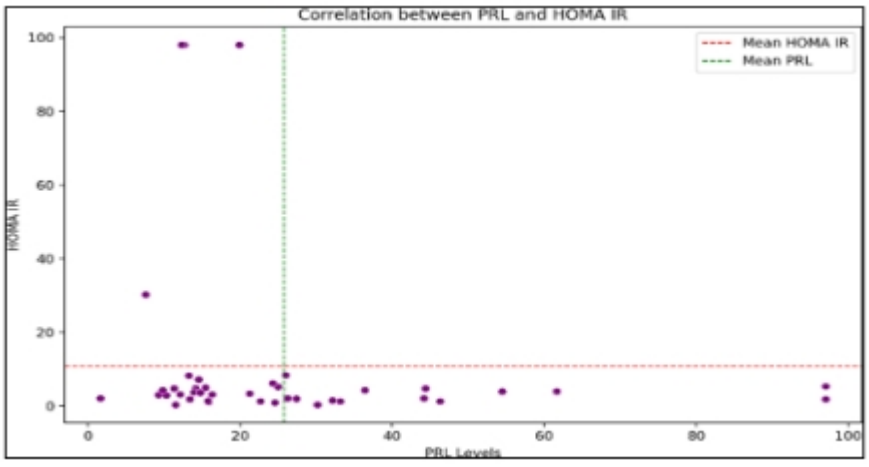

Figure 3: Correlation Between PRL and HOMA IR.

Hormonal Levels in Patients with Varying Insulin Resistance:

The differences in insulin resistant patients with high burden (HOMA IR > 2.9) and low burden (HOMA IR < 1.9) in sobered as shown in figure (4) and comparing hormones (LH, FSH, PROL) are analyzed using students' t-test as in (Table 4). Results of the analysis are presented as: LH (Luteinizing Hormone): t=-1.62, p=0.114, FSH (Follicle Stimulating Hormone): t=-1.43, p=0.161 and PRL (Prolactin): t=0.94, p=0.352. These p values suggest that differences in LH, FSH or PRL levels across two groups is not meaningfully different at standard thresholds (α= 0.05). Finding suggests there is no difference of statistical significance between insulin resistance having a burden on the levels of LH, FSH or PRL for the population targeted in the study. Considerable research could be conducted while putting emphasis on different variables that might alter the concentration of these hormones.

Table 4: T-Test Results for Hormonal Levels by Insulin Resistance

Hormone	T-Statistic	P-Value
LH	-1.62	0.114
FSH	-1.43	0.161
PRL	0.94	0.352

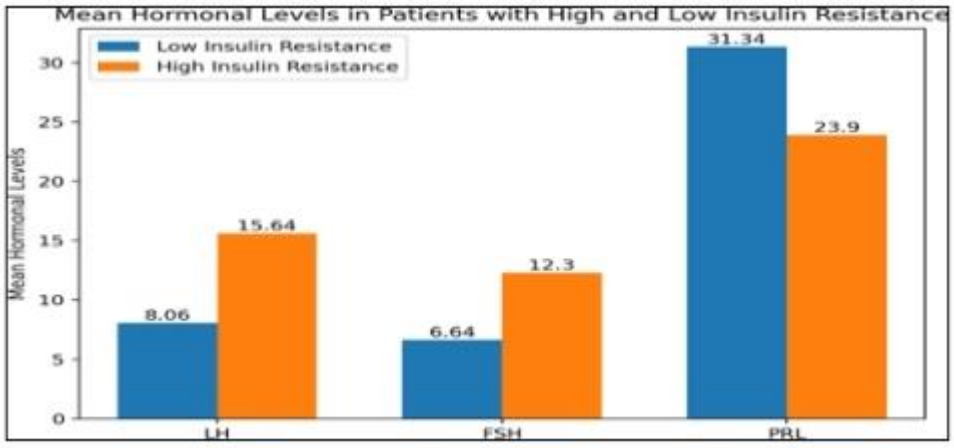

Figure 4: Mean Hormonal Levels in Patients with High and Low Insulin Resistance

One-Way ANOVA Findings:

To determine whether their significant differences in HOMA-IR between age groups, a one-way ANOVA test was used. The results are as follows: F-statistic: 0.50 , p-value: 0.684. The findings suggest there were no differences that are statistically significant in regard to HOMA- IR in the age groups.

- Pearson Correlation Analysis:

The relationship between the age variable considered as a continuous one and HOMA-IR was assessed using Pearson correlation analysis. The results are: Correlation coefficient: -0.258 , p-value: 0.104. Though the negative correlation indicates the trend of HOMA-IR worsening as one ages, this relationship isn't statistically significant.

- Linear Regression Model:

In order to further evaluate the effect of age on the HOMA-IR level, a linear regression model was constructed. The regression equation is: HOMA-IR=33.34−0.69×Age. The value of the age coefficient was 0.104 meaning that the effect of age on HOMA-IR is in significant.

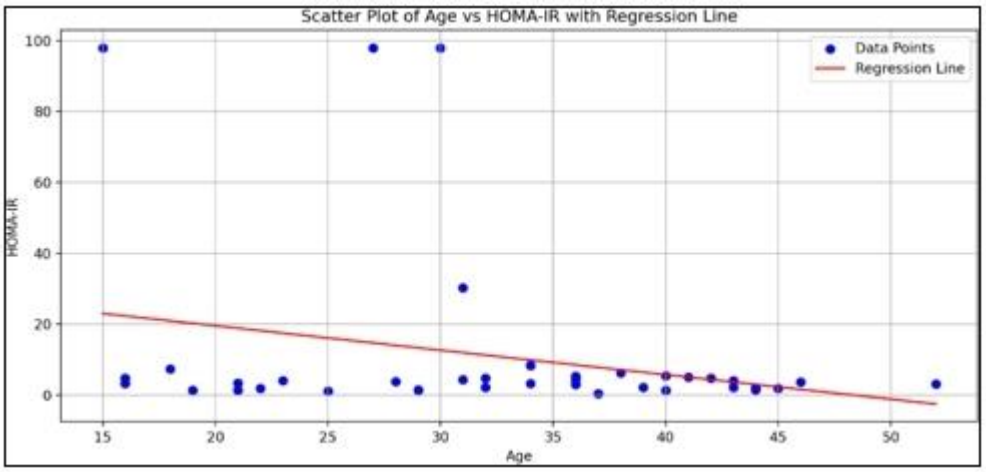

Figure5: Scatter plot showing the relationship between age and HOMA-IR, with a fitted regression line.

Awareness of Insulin Resistance in Relation to PCOS:

Among the total sample of 41 respondents, the majority (63.4% or 26 individuals) indicated that they were unaware of the potential link between Polycystic Ovary

Syndrome (PCOS) and insulin resistance, as shown in Figure (6). Conversely, only 36.6% of respondents (15 individuals) reported being aware of this association. These findings highlight a significant gap in awareness regarding the metabolic complications associated with PCOS, emphasizing the need for targeted educational efforts to improve understanding.

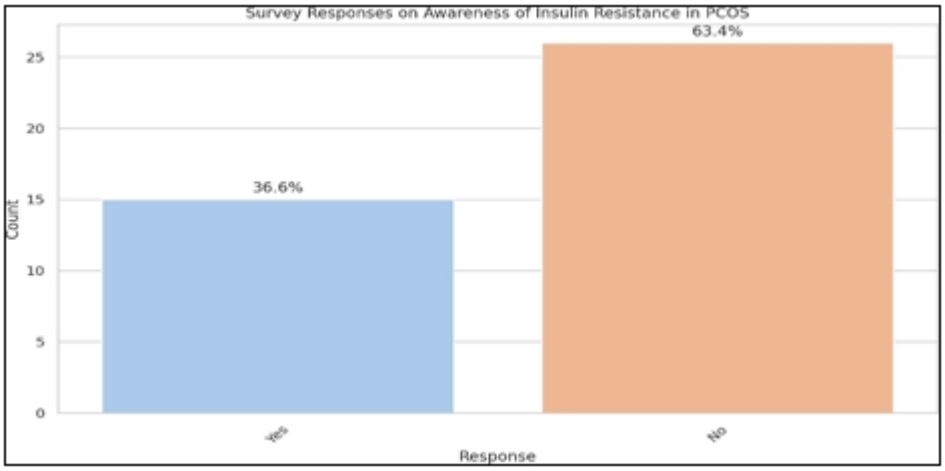

Figure 6: Awareness of Insulin Resistance in PCOS.

4. Discussion:

The relationship between hormonal levels (LH, FSH, Prolactin) and insulin resistance (HOMA- IR) in patients with Polycystic Ovary Syndrome (PCOS) appears to be minimal, as indicated by several studies. While insulin resistance is a common feature in PCOS, the correlation with specific hormonal levels is not significant. Our study reveals a weak positive correlation between FSH and HOMA-IR (Spearman's $\rho = 0.2206$, $p = 0.1658$), which is also not statistically significant. This aligns with ([10], who reported no meaningful association between FSH levels and insulin resistance markers in PCOS patients. The most lack of significance suggests that FSH may not play a direct role in the PCOS.A weak negative correlation was observed between prolactin levels and HOMA-IR in the dataset (Spearman's $\rho = -0.1899$, $p = 0.2345$). This finding aligns with) [11] who similarly found no significant relationship between prolactin levels and insulin resistance markers. Our results in the provided data is indicate a weak positive correlation between LH and HOMA- IR (Spearman's $\rho = 0.0903$, $p = 0.5743$), which is not statistically significant. These findings are consistent with those of ([12] who also reported no significant association between LH:FSH ratios and

insulin resistance after adjusting for BMI (body mass index).

5. Conclusion:

This study looked at the association of dysfunctional hormones (LH, FSH, and Prolactin) and insulin resistance, along with the knowledge of associated insulin resistance in PCOS. The results demonstrate that there is a high prevalence of insulin resistance in the study sample; however, there were no statistically significant associations between insulin resistance as measured by HOMA-IR and the selected hormonal levels. This indicates that, at least in this population, insulin resistance may be driven by other factors not considered in this study. Furthermore, the study showed the level of awareness towards the association of PCOS and insulin resistance was low, which points to the necessity for tailored educational programs.

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