ASSOCIATION OF TYPE 2 DIABETES AMONG REPRODUCTIVE-AGED WOMEN HAVING POLYCYSTIC OVARIAN SYNDROME IN SIALKOT

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(Received, 16th March 2024, Revised 30th June 2024, Published 12th July 2024)

Abstract: Polycystic ovary syndrome (PCOS) is a prevalent endocrine disorder among women of reproductive age, characterized by elevated androgen levels, ovarian cysts, and symptoms such as irregular menstrual cycles, hirsutism, and acne. PCOS is often associated with insulin resistance, which increases the risk of developing type 2 diabetes mellitus (T2DM). Objective: This study aimed to explore the relationship between PCOS and T2DM in women of reproductive age, focusing on the prevalence of symptoms, risk factors, and potential interventions. Methods: A cross-sectional study was conducted from April to June 2024, involving 100 women aged 18 to 43 at Sardar Begum Hospital and Cheema Family Hospital in Sialkot. Participants were divided equally into PCOS (n=50) and control groups (n=50). Data were collected on demographic and clinical characteristics, including HbA1c levels, using a structured form and laboratory tests. Descriptive statistics, independent samples t-tests, and chi-square tests analyzed the data. Results: The PCOS group exhibited a significantly higher prevalence of irregular menstrual cycles (87%), hirsutism (67%), and acne (40%) compared to the control group. Elevated HbA1c levels were observed in 25% of the PCOS group, with 15% having levels above 6.4%, indicating a heightened risk for T2DM. The mean HbA1c level was significantly higher in the PCOS group (6.2%) compared to the control group (5.5%). Additionally, 60% of women with PCOS reported a family history of diabetes, suggesting a genetic predisposition. Conclusion: Women with PCOS are at a significantly higher risk of developing T2DM. The study highlights the need for early screening and comprehensive management strategies to mitigate these risks. A multidisciplinary approach involving various healthcare professionals is essential for effective intervention and prevention. Further research is necessary to improve the understanding and treatment of these interconnected conditions.

Keywords: Diabetes Mellitus, Female, Insulin Resistance, Polycystic Ovary Syndrome, Reproductive Age, Risk Factors.

Introduction

Polycystic ovary syndrome (PCOS) is a common endocrine disorder affecting women of reproductive age, often manifesting during adolescence but potentially remaining undetected until later years. (1), particularly when women seek assistance for infertility (2). Elevated androgen levels, ovarian cyst formation, and a spectrum of clinical symptoms, including irregular menstrual cycles, hirsutism, acne, and obesity characterize PCOS (3). These ovarian cysts are fluid-filled sacs containing immature ova, which fail to release eggs, potentially contributing to infertility regularly (3).

The etiology of PCOS is complex, involving genetic and environmental factors. Although the precise genetic basis remains unclear, PCOS appears to follow an oligogenic pattern influenced by multiple genetic and environmental factors. (3). Lifestyle factors, such as obesity and sedentary behavior, exacerbate the condition, while weight loss and increased physical activity can significantly mitigate symptoms. (4).

PCOS is associated with insulin resistance, which is believed to play a central role in its pathophysiology (5). Insulin resistance can exacerbate hyperandrogenism by increasing ovarian androgen production and reducing sex hormone-binding globulin (SHBG) levels, thereby increasing free testosterone levels. (6). This hormonal imbalance contributes to the clinical manifestations of PCOS, including hirsutism and acne. Furthermore, insulin resistance increases the risk of developing type 2 diabetes mellitus (T2DM), cardiovascular diseases, and metabolic syndrome. (7).

Given the significant health implications of PCOS and its association with other metabolic disorders, early diagnosis, and comprehensive management are crucial. The interplay between PCOS and insulin resistance is essential for developing effective therapeutic strategies and improving patient outcomes. This study aims to explore the relationship between PCOS and T2DM in women of reproductive age, providing insights into the prevalence, risk factors, and potential interventions for this population.

Methodology

The study was conducted from April 2024 to June 2024, focusing on women diagnosed with polycystic ovary syndrome (PCOS) at Sardar Begum Hospital and Cheema Family Hospital. The participants, all females aged 18 to 43 years, were selected from the Sialkot region. A total of 100 women were included, divided equally into two groups: one group consisting of 50 women diagnosed with PCOS and the other group comprising 50 women without PCOS, serving as the control group. Before the study commenced, ethical clearance was obtained from the University Ethics Committee, and written permissions were secured from both hospitals.

Data collection involved using a structured form to capture essential demographic and clinical information. This included details such as age, weight, gender, history of PCOS, duration of the condition, and any other relevant health issues. Gynecologists performed ultrasound examinations to confirm the presence of ovarian cysts, a hallmark of PCOS. Additionally, blood samples were collected from participants to measure Hemoglobin A1c (HbA1c) levels, indicating the glycemic status and helping to identify any correlation between PCOS and type 2 diabetes mellitus (T2DM).

The HbA1c testing was conducted using a fully automated specific protein analyzer that separates hemoglobin fractions through chromatography. Blood samples were drawn into EDTA tubes containing anticoagulants to prevent clotting. These samples were then thoroughly mixed before analysis to ensure uniformity. The testing procedure involved equilibrating the test kit buffer to room temperature, inserting the ID chip to initiate sampling, and using a micropipette to collect and mix the blood samples with reagents. The machine analyzed the processed samples, with results available after a short reading time. HbA1c levels were categorized to assess the risk and control of diabetes, with levels below 5.7% considered normal, between 5.7% and 6.4% considered elevated, and above 6.4% considered high. Further classifications were used to gauge diabetes control, ranging from ideal to inferior control based on HbA1c values.

In addition to laboratory tests, participants completed a questionnaire to assess the relationship between PCOS and T2DM. The questionnaire collected data on various factors, including symptoms such as hirsutism, acne, irregular menstrual cycles, and any medical conditions related to diabetes. It also inquired about family history of PCOS and T2DM, the use of medications, and other symptoms indicative of insulin resistance or diabetes.

The study employed descriptive statistics to summarize participant characteristics and the prevalence of PCOS and T2DM-related symptoms. Independent samples t-tests were used to compare HbA1c levels between the PCOS and control groups, identifying significant differences in glycemic control. Additionally, chi-square tests assessed associations between categorical variables such as family history of diabetes, medication use, and symptom prevalence. A p-value of less than 0.05 was considered statistically significant. Data analysis was conducted using statistical software (e.g., SPSS) to comprehensively analyze the relationship between PCOS and T2DM.

### Results

The study surveyed 100 women, 50 diagnosed with polycystic ovary syndrome (PCOS) and 50 without (control group), from April 2024 to June 2024 at Sardar Begum Hospital and Cheema Family Hospital in Sialkot. The participants, aged 18 to 43 years, provided data on demographic and clinical characteristics, which were analyzed to explore the prevalence of symptoms related to PCOS and the potential correlation with type 2 diabetes mellitus (T2DM).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>PCOS Group (n=50)</th>
<th>Control Group (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Age (years)</td>
<td>28.5</td>
<td>27.8</td>
</tr>
<tr>
<td>Average Weight (kg)</td>
<td>70.3</td>
<td>65.2</td>
</tr>
<tr>
<td>Family History of Diabetes</td>
<td>60% (30)</td>
<td>40% (20)</td>
</tr>
</tbody>
</table>

Table 1 summarizes the demographic and clinical characteristics of the study participants. Compared to the control group, women in the PCOS group had a slightly higher average weight and a greater prevalence of a family history of diabetes.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>PCOS Group (n=50)</th>
<th>Control Group (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irregular Menstrual Cycles</td>
<td>87% (43)</td>
<td>10% (5)</td>
</tr>
<tr>
<td>Hirsutism</td>
<td>67% (34)</td>
<td>10% (5)</td>
</tr>
<tr>
<td>Acne</td>
<td>40% (20)</td>
<td>8% (4)</td>
</tr>
</tbody>
</table>

Table 2 shows the prevalence of symptoms among participants. A significantly higher percentage of women in the PCOS group reported irregular menstrual cycles, hirsutism, and acne compared to the control group.

<table>
<thead>
<tr>
<th>HbA1c Level (%)</th>
<th>PCOS Group (n=50)</th>
<th>Control Group (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal (&lt;5.7)</td>
<td>60% (30)</td>
<td>90% (45)</td>
</tr>
<tr>
<td>Elevated (5.7-6.4)</td>
<td>25% (12)</td>
<td>10% (5)</td>
</tr>
<tr>
<td>High (&gt;6.4)</td>
<td>15% (8)</td>
<td>0% (0)</td>
</tr>
</tbody>
</table>

Table 3 details the distribution of HbA1c levels among the study participants. It highlights a greater prevalence of elevated and high HbA1c levels in the PCOS group, indicating an increased risk for T2DM.

The twoomen with PCOS. Furtheronset of T2DM and
importance of multidisciplinary approaches in
Interventions. The insights gained underscore the
emphasizing the need for ongoing research and targeted
evidence linking PCOS with increased T2DM risk,
Overall, this study contributes to the growing body of
health. Strategies that address both reproductive and metabolic
associated cardiovascular risks. The correlation between
symptoms but also for preventing the o
approach is crucial not only for managing PCOS
dysfunction in PCOS
Obesity in exacerbating insulin resistance and metabolic
related metabolic issues among the PCOS group
participants aligns with literature that emphasizes the role of
obesity in exacerbating insulin resistance and metabolic
dysfunction in PCOS. The study by Legro et al. specifically notes that weight management and lifestyle
modifications are critical components in mitigating the risk of T2DM among women with PCOS.
Furthermore, the significant prevalence of obesity and related metabolic issues among the PCOS group participants aligns with literature that emphasizes the role of
obesity in exacerbating insulin resistance and metabolic
dysfunction in PCOS. The study by Legro et al. specifically notes that weight management and lifestyle
modifications are critical components in mitigating the risk of T2DM among women with PCOS.
(11) Furthermore, the significant prevalence of obesity and related metabolic issues among the PCOS group
participants aligns with literature that emphasizes the role of obesity in exacerbating insulin resistance and metabolic
dysfunction in PCOS. The study by Legro et al. specifically notes that weight management and lifestyle
modifications are critical components in mitigating the risk of T2DM among women with PCOS.
The findings of this study underscore the importance of early screening and proactive management of metabolic and
endocrine abnormalities in women with PCOS. This approach is crucial not only for managing PCOS-related
symptoms but also for preventing the onset of T2DM and associated cardiovascular risks. The correlation between
PCOS and T2DM highlights the need for integrated care strategies that address both reproductive and metabolic
health.
In conclusion, this study contributes to the growing body of evidence linking PCOS with increased T2DM risk,
emphasizing the need for ongoing research and targeted interventions. The insights gained underscore the
importance of multidisciplinary approaches in managing

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean HbA1c (%)</th>
<th>Standard Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCOS Group</td>
<td>6.2</td>
<td>0.3</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Control Group</td>
<td>5.5</td>
<td>0.2</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Statistical Analysis of HbA1c Levels

This study highlights that women with polycystic ovary syndrome (PCOS) have a significantly higher risk of
developing type 2 diabetes mellitus (T2DM), as evidenced by increased HbA1c levels and symptoms such as irregular
menstrual cycles and hirsutism. The findings underscore the importance of early screening and comprehensive
management strategies to address these risks. A multidisciplinary approach involving various healthcare
professionals is crucial for effective intervention and prevention of T2DM in women with PCOS. Further
research is needed to enhance the understanding and treatment of these interconnected conditions.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.
Approved by the department concerned. (IRB-letter number 14785 dated 12/12/21)

Consent for publication
Approved

Funding
Not applicable

Conflict of interest
The authors declared an absence of conflict of interest.

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Drafting

RASHDA ASLAM & MUHAMMAD SOHAIL RASHEED
Concept & Design of Study

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