Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.985
*Biol. Clin. Sci. Res. J., Volume, **2024**: 985*
Original research article

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

SHAKEEL Q[1], ASHRAF S[1*], NADEEM F[1], SEHAR K[1], BUTT MA[1], ASLAM R[1], RASHEED MS[2]

[1]Department of Zoology University of Sialkot, Pakistan
[2]Department of Zoology University of Narowal, Narowal Pakistan
**Correspondence author email address: saima.ashraf@uskt.edu.pk*

(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.

[Citation: Shakeel, Q., Ashraf, S., Nadeem, F., Sehar, K., Butt, Ma., Aslam, R., Rasheed, M.S., (2024). Association of type 2 diabetes among reproductive-aged women having polycystic ovarian syndrome in sialkot. *Biol. Clin. Sci. Res. J.*, **2024***: 985*. doi: https://doi.org/10.54112/bcsrj.v2024i1.985]

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 1: Demographic and Clinical Characteristics of Participants

Characteristic	PCOS Group (n=50)	Control Group (n=50)
Average Age (years)	28.5	27.8
Average Weight (kg)	70.3	65.2
Family History of Diabetes	60% (30)	40% (20)

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 2: Prevalence of Symptoms in PCOS and Control Groups

Symptom	PCOS Group (n=50)	Control Group (n=50)
Irregular Menstrual Cycles	87% (43)	10% (5)
Hirsutism	67% (34)	10% (5)
Acne	40% (20)	8% (4)

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 3: HbA1c Levels in PCOS and Control Groups

HbA1c Level (%)	PCOS Group (n=50)	Control Group (n=50)
Normal (<5.7)	60% (30)	90% (45)
Elevated (5.7-6.4)	25% (12)	10% (5)
High (>6.4)	15% (8)	0% (0)

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

.

[Citation: Shakeel, Q., Ashraf, S., Nadeem, F., Sehar, K., Butt, Ma., Aslam, R., Rasheed, M.S., (2024). Association of type 2 diabetes among reproductive-aged women having polycystic ovarian syndrome in sialkot. *Biol. Clin. Sci. Res. J.*, **2024***: 985*. doi: https://doi.org/10.54112/bcsrj.v2024i1.985]

Table 4: Statistical Analysis of HbA1c Levels

Group	Mean HbA1c (%)	Standard Error	p-value
PCOS Group	6.2	0.3	<0.05
Control Group	5.5	0.2	

Table 4 presents the statistical analysis results comparing HbA1c levels between the PCOS and control groups. The mean HbA1c level was significantly higher in the PCOS group, suggesting poorer glycemic control.
These results highlight the significant health burden associated with PCOS, including the potential development of T2DM, necessitating targeted interventions and regular monitoring for affected individuals.

Discussion

The results of this study highlight the significant health burden associated with polycystic ovary syndrome (PCOS) and its potential link to type 2 diabetes mellitus (T2DM) in women of reproductive age. The high prevalence of symptoms such as irregular menstrual cycles, hirsutism, and acne among the PCOS group aligns with the established clinical profile of the condition. These findings are consistent with previous research, which has documented similar symptomatology in women with PCOS. (8).
The elevated HbA1c levels observed in the PCOS group, with 15% of participants exceeding 6.4%, underscore a heightened risk for developing T2DM. This is corroborated by recent studies that have found an increased incidence of insulin resistance and glucose intolerance in women with PCOS, suggesting a potential pathway linking the two conditions. (8, 9). The significant difference in mean HbA1c levels between the PCOS and control groups (6.2% vs. 5.5%, $p<0.05$) further supports this association.
Comparatively, the family history of diabetes reported by 60% of women in the PCOS group compared to 40% in the control group suggests a genetic predisposition that may exacerbate the risk of developing T2DM. (10). This finding is in line with studies that have explored the genetic and familial links in PCOS, which indicate that a family history of diabetes is a common feature 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. (12). 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.
Overall, 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 PCOS, involving endocrinologists, gynecologists, and nutritionists to provide comprehensive care for affected women. Further studies with larger sample sizes and longitudinal designs are recommended to deepen the understanding of these associations and to develop more effective prevention and treatment strategies.

Conclusion

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.

Authors Contribution

QAISRA SHAKEEL
Data Analysis
SAIMA ASHRAF
Final Approval of version
FAIZA NADEEM
Revisiting Critically
KANWAL SEHAR & MAHAK ARSHAD BUTT
Drafting
RASHDA ASLAM & MUHAMMAD SOHAIL RASHEED
Concept & Design of Study

References

1. Manique MES, Ferreira AMAP. Polycystic ovary syndrome in adolescence: challenges in diagnosis and

management. Revista brasileira de ginecologia e obstetricia. 2022;44(04):425-33.
2. Karkera S, Agard E, Sankova L. The clinical manifestations of polycystic ovary syndrome (PCOS) and the treatment options. European Journal of Biology and Medical Science Research. 2023;11(1):57-91.
3. Bjekić-Macut J, Vukašin T, Velija-Ašimi Z, Bureković A, Zdravković M, Andrić Z, et al. Polycystic ovary syndrome: a contemporary clinical approach. Current Pharmaceutical Design. 2021;27(36):3812-20.
4. Louwers YV, Laven JS. Polycystic ovary syndrome (PCOS). Female Reproductive Dysfunction. 2020:1-23.
5. He F-f, Li Y-m. Role of gut microbiota in the development of insulin resistance and the mechanism underlying polycystic ovary syndrome: a review. Journal of ovarian research. 2020;13(1):73.
6. Ding H, Zhang J, Zhang F, Zhang S, Chen X, Liang W, et al. Resistance to the insulin and elevated level of androgen: A major cause of polycystic ovary syndrome. Frontiers in endocrinology. 2021;12:741764.
7. Sun Y, Li S, Liu H, Bai H, Hu K, Zhang R, et al. Oxidative stress promotes hyperandrogenism by reducing sex hormone-binding globulin in polycystic ovary syndrome. Fertility and Sterility. 2021;116(6):1641-50.
8. Teede HJ, Garad RM, Melder A, Norman RJ, Boyle J. Letter to the Editor from Teede:"Clinical Practice Guidelines on the Diagnosis and Management of Polycystic Ovary Syndrome: A Systematic Review and Quality Assessment Study". The Journal of Clinical Endocrinology & Metabolism. 2022;107(3):e1321-e2.
9. Zhu T, Goodarzi MO. Causes and consequences of polycystic ovary syndrome: insights from Mendelian randomization. The Journal of Clinical Endocrinology & Metabolism. 2022;107(3):e899-e911.
10. Livadas S, Anagnostis P, Bosdou JK, Bantouna D, Paparodis R. Polycystic ovary syndrome and type 2 diabetes mellitus: A state-of-the-art review. World journal of diabetes. 2022;13(1):5.
11. Zhao X, Jiang Y, Xi H, Chen L, Feng X. Exploration of the relationship between gut microbiota and polycystic ovary syndrome (PCOS): a review. Geburtshilfe und Frauenheilkunde. 2020;80(02):161-71.
12. Kent J, Dodson WC, Kunselman A, Pauli J, Stone A, Diamond MP, et al. Gestational weight gain in women with polycystic ovary syndrome: a controlled study. The Journal of Clinical Endocrinology & Metabolism. 2018;103(11):4315-23.

[Citation: Shakeel, Q., Ashraf, S., Nadeem, F., Sehar, K., Butt, Ma., Aslam, R., Rasheed, M.S., (2024). Association of type 2 diabetes among reproductive-aged women having polycystic ovarian syndrome in sialkot. *Biol. Clin. Sci. Res. J.*, **2024***: 985*. doi: https://doi.org/10.54112/bcsrj.v2024i1.985]