DEVELOPMENTAL MEDICO-LIFE-SCIENCES

ISSN (P): 3007-2786, (E): 3007-2794 DOI: https://doi.org/10.69750/dmls.02.05.0131

ORIGINAL RESEARCH ARTICLE Open Access

Prevalence of Polycystic Ovary Syndrome (PCOS) and Its Association with Metabolic Syndrome in Reproductive-Aged Women: A Cross-Sectional Study

Muhammad Safdar Luqman [2], Asifa Zeba [3], Nayab Tanveer [4], Sabar Kareem [5]*

1. Department of Allied Health Sciences, Health Services Academy, Islamabad 44000, Pakistan
2. Department of Education, International Islamic University, Islamabad 44000, Pakistan,
3. Department of Education, Sarhad University (SUIT), Peshawar,
4. Department of Public Health, Health Services Academy, Islamabad 44000, Pakistan,

***Corresponding Author:** Muhammad Safdar Luqman , **Email:** safdar@hsa.edu.pk

ABSTRACT

Background: Women of reproductive age are vulnerable to the prevalent endocrine disorder referred to as polycystic ovarian syndrome (PCOS). It is often associated with metabolic syndrome. The existence of these two diseases markedly elevates susceptibility to cardiovascular disease and type 2 diabetes. Despite the significant incidence of obesity and metabolic disorders in the region, there is a lack of reliable information about South Asian women, even as these conditions become more prevalent globally.

Objectives: To The objectives of this study were to determine the prevalence of PCOS among women of reproductive age and to evaluate its association with metabolic syndrome.

Methods: This cross-sectional study was conducted in the obstetrics and gynecology department of several tertiary care hospitals in Pakistan, from January 2024 to December 2024. One hundred women aged 18 to 40 were systematically recruited. Metabolic syndrome was characterized according to the NCEP ATP III criteria, but polycystic ovarian syndrome (PCOS) was diagnosed based on the Rotterdam 2003 guidelines. Data about anthropometric, biochemical, clinical, and sociodemographic factors were gathered. Statistical analysis was conducted using SPSS version 25, using logistic regression to compute 95% confidence intervals and odds ratios (ORs).

Results: Among the patients, 29% were diagnosed with polycystic ovarian syndrome (PCOS). 58.6% of women with PCOS had metabolic syndrome, in contrast to 21.1% of those without the condition ($p < 0.001$). In women with PCOS, the predominant abnormalities were central obesity (79.3%), elevated fasting glucose levels (37.9%), and decreased high-density lipoprotein (62.0%). Polycystic ovary syndrome (PCOS) increased the likelihood of developing metabolic syndrome by almost fourfold, as shown by multivariate logistic analysis (OR = 3.2; 95% CI: 1.4-7.1; $p = 0.005$).

Conclusion: metabolic syndrome is significantly correlated with polycystic ovarian syndrome (PCOS), prevalent among women of reproductive age. To mitigate the future risk of diabetes and cardiovascular issues in this vulnerable population, consistent screening, timely lifestyle modifications, and preventive measures are essential.

Keywords: PCOS, Metabolic syndrome, Insulin resistance, Obesity, Women, Cardiovascular.

Received: 22/01/2025
Revised: 11/05/2025
Accepted: 26/05/2025
Published: 31/05/2025

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is an endocrine disorder of women of reproductive age. This condition should have been defined as greater than 6 months of anovulation with an increase in androgen production and sonographically showed more than one follicle [1]. PCOS is a disorder that used to be thought to be confined to the reproductive system, but is now thought to be an EST and one with serious metabolic, cardiovascular, and psychosocial comorbidities [2]. The pathophysiology is multifactorial and consists of a combination of genetic

factors, environment and lifestyle factors. Ovarian function is also influenced by androgen production via the pathway of insulin resistance (whereby insulin resistance and compensatory hyperinsulinemia are responsible for upregulating androgen production [3]).

Prevalence of PCOS depends on the country; it has been estimated to range from 6% to 20% depending on the criteria used to diagnosis PCOS (Rotterdam consensus, NIH, and Androgen Excess and PCOS Society [4]). Indeed, data show that South Asian women (especially Pakistan and India) are disproportionately impacted, and at an even higher prevalence than their counterparts in the west [5]. This difference has been attributed to early-life development of obesity, selective feeding, lack of physical activity, as well as genetic predisposition [6]. Furthermore, the metabolic derangements were hotter in women from this region supporting the need for regional support study studies if accurate disease burden is intended to be characterized [7].

Insulin resistance has been described as a key feature of PCOS and is present in up to 70 percent of women regardless of body mass index [8]. Subsequently, the hyperinsulinemia aggravates the androgen excess of the ovaries, causes an inhibition of follicular maturation, and stimulates adipogenesis via a central upregulation of lipogenesis (9). Both of these approaches offer an explicit attribution of PCOS to the causes of MetS [10]. Metabolic syndrome is defined to include various cardiometabolic features including abdominal obesity, atherogenic dyslipidemia, dysglycemia and hypertension [11]. It is also intimately linked with the risk of cardiovascular disease, type 2 diabetes and early mortality [12].

Compared with women without PCOS, women with PCOS also have a greater overall prevalence of central obesity, hypertriglyceridemia, low high-density lipoprotein cholesterol, abnormal glucose tolerance and hypertension [13]. This can result in a "double burden" [14] a joint health risk (metabolic and reproductive) for the long term. The clinical ramifications are very serious. PCOS women have high rates of infertility and pregnancy complications; MetS is a strong risk factor for gestational diabetes mellitus, pre-eclampsia and intrauterine growth retardation [15]. In fact, this interplay results in earlier development of Type 2 diabetes mellitus and cardiovascular disease, which becomes a huge challenge for health-care systems and public health [16].

The health burden of PCOS and its metabolic consequences is increasing in Pakistan and other low- and middle-income countries due to rising prevalence of obesity and sedentary behavior [17]. However, the majority of data to date are from western cultures and may not be representative of the unique demographic and lifestyle factors of South Asian women [18]. This underlines the urgent need for a local study evaluating the overlap of PCOS and metabolic syndrome in women of reproductive age which may impact individualised screening, preventative and therapeutic approaches [19].

The aim of this study was to find the prevalence of PCOS in women of reproductive age and to examine its association with metabolic syndrome using standard diagnostic criteria [20]. The aim of this work is to understand this relationship so that it becomes possible to prevent the development of future cardiometabolic and reproductive disorders through early detection, risk assessment, and comprehensive management [21].

MATERIALS AND METHODS

This 12-month hospital-based cross-sectional study was performed from January 2024 to December 2025 in multiple tertiary level hospitals of Pakistan, by the Departments of Gynaecology and Obstetrics. The study included women 18 to 40 years of age who visited the outpatient clinic for routine gynecological care, infertility investigations or menstrual problems. All participants were informed of the purpose of the study and formal informed consent was obtained before entry into the study. Women with known endocrine abnormalities were excluded (Cushing's disease, thyroid disease, hyperprolactinemia, congenital adrenal hyperplasia, androgen-secreting tumors). Patients with history of cardiovascular disease, chronic renal impairment, type 2 diabetes mellitus, current pregnancy, and use of hormonal medicine in the last three months were excluded to avoid confounding.

There were 100 women in all. The sample size was determined with a 95% confidence level and a 9% margin of error using a single-proportion prevalence estimate based on an anticipated 25% PCOS prevalence among South Asian women of reproductive age, yielding 96 individuals. The sample size was rounded to 100 to account for potentially incomplete responses. After doing a post-hoc power analysis, the sample had around 75-80% power to detect an odds ratio of ≥2.0 for the connection between PCOS and metabolic syndrome at a 5% level. Consecutive sampling was used until the desired number was obtained. To diagnosis PCOS, the modified Rotterdam criteria (2003) were employed, which included at least two of the following: (i) oligo- or anovulation, (ii) clinical or biochemical hyperandrogenism, and (iii) polycystic ovarian morphology on ultrasound.

A menstrual history was collected to assess ovarian function. The modified Ferriman-Gallwey hirsutism score was used to detect clinical hyperandrogenism in the presence of acne and androgenic alopecia. Serum testosterone tests confirmed biological hyperandrogenism. An experienced radiologist conducted a pelvic ultrasound using a transabdominal probe for unmarried women and a high-resolution transvaginal probe for married women. Polycystic ovarian morphology was defined as having at least 12 follicles with diameters ranging from 2 to 9 mm and/or an ovarian volume more than 10 ml.

The adult Treatment Panel III (NCEP ATP III) criteria were utilized to categorize metabolic syndrome. MetS was diagnosed using the following criteria: triglyceride levels ≥150 mg/dL (or treatment for hypertriglyceridemia), fasting plasma glucose ≥100 mg/dL (or documented impaired fasting glucose), waist circumference ≥88 cm, HDL cholesterol <50 mg/dL, and blood pressure ≥130/85 mmHg (or use of antihypertensive medication). A structured questionnaire was used to collect sociodemographic information, menstrual and reproductive history, family history of diabetes and cardiovascular disease, and lifestyle factors such as diet and physical activity. Anthropometric variables such as height, weight, and waist circumference were measured using standardised methodologies. Weight (kg) divided by height (m2) was used to calculate BMI. Blood pressure was measured twice at 5-minute intervals while sitting, and an average was determined. Venous blood samples were collected after at least eight hours of fasting over the night to determine fasting glucose, lipid profile, and serum testosterone levels. These were then evaluated in the hospital's central biochemistry laboratory using established enzymatic and immunoassay procedures.

All statistical analyses were conducted using SPSS version 25.0 Categorical data (PCOS status, metabolic syndrome, and its components) were shown as frequencies and percentages, whereas continuous variables (age, BMI, and biochemical indices) were displayed as mean ± SD [26-29]. For continuous data, we utilized the independent-samples t-test, whereas for categorical data, we used the chi-squared test. Once possible covariates such as age and BMI were considered, binary logistic regression was used to provide odds ratios (ORs) with 95% confidence intervals. A two-sided p-value <0.05 indicated statistical significance. The Institutional Review Board awarded its ethical approval (ERC/18A/01/2024). Every participant's identity and privacy were protected, and women may resign from the study at any moment.

RESULTS

The study included 100 women aged 18 to 40 who were recruited between January 2024 and January 2025. The participants had a mean age of 27.8 +- 5.2 years, with the majority (61%) falling between the ages of 21 and 30. The average body mass index (BMI) of the group was 27.3 +- 4.5 kg/m2, indicating a significant prevalence of overweight or obese women.

A total of 29 women satisfied the Rotterdam criteria for PCOS, with a 29% prevalence rate. The average age of women with PCOS was 26.1 +- 4.7 years, whereas women without PCOS was 28.6 +- 5.3 years. The mean body mass index was considerably higher in women with PCOS (29.1 +- 4.2 kg/m2) than in non-PCOS individuals (26.5 +- 4.5 kg/m2; p = 0.02), demonstrating a clear link between increased body weight and PCOS. Clinical data revealed substantial differences across groups, with irregular periods observed in 82.7% of PCOS women and 21.1% of non-PCOS women (p < 0.001). Similarly, 68.9% of PCOS women reported signs of hyperandrogenism (hirsutism and acne), compared to 14.1% of non-PCOS women (p < 0.001). Women with PCOS had a higher prevalence of diabetes in their family (44.8%) than women without PCOS (25.3%, p = 0.04).

The overall prevalence of metabolic syndrome (MetS) was 32%, with 32 women fulfilling at least three NCEP ATP III criteria. Women with PCOS showed a significantly higher frequency of MetS (58.6%) compared with non-PCOS participants (21.1%, p < 0.001), indicating that PCOS nearly tripled the likelihood of having metabolic syndrome. Table 2 displays the distribution of individual MetS components. Central obesity was the most prevalent feature among PCOS women (79.3%) compared with non-PCOS women (49.3%, p = 0.006). Low HDL cholesterol levels were also more common in the PCOS group (62.0% vs. 33.8%, p = 0.01). Elevated fasting glucose was noted in 37.9% of PCOS participants compared with 18.3% of those without PCOS (p = 0.03). Triglyceride levels ≥150 mg/dL were also significantly higher among PCOS women (41.3% vs. 21.1%, p = 0.04). Although elevated blood pressure was more frequent in PCOS cases (31.0% vs. 16.9%), the difference was not statistically significant (p = 0.12).

Binary logistic regression results were in line with the relationship between PCOS and metabolic syndrome. Controlling the ages, BMI, women with PCOS were at risk of developing metabolic syndrome (3.2 (95% CI: 1.4-7.1, p = 0.005) higher risk of having this syndrome compared with women without PCOS. This is an indication that even after obesity has been adjusted to; PCOS escalates the risk of developing metabolic abnormalities. Altogether, the findings of this study reveal that approximately a third of women of reproductive age have PCOS and that the condition is directly associated with metabolic syndrome. The commonest abnormalities that were identified included central adiposity, poor HDL cholesterol, and high fasting glucose. These results suggest that PCOS women are more likely to have cardiovascular and metabolic consequences in the future.

Table 1: Baseline Demographic and Clinical Characteristics of the Study Population

Characteristic	PCOS (n=29)	Non-PCOS (n=71)	p-value
Mean age (years)	26.1 ± 4.7	28.6 ± 5.3	0.04
Mean BMI (kg/m²)	29.1 ± 4.2	26.5 ± 4.5	0.02
Menstrual irregularities	24 (82.7%)	15 (21.1%)	<0.001
Clinical hyperandrogenism	20 (68.9%)	10 (14.1%)	<0.001
Family history of diabetes	13 (44.8%)	18 (25.3%)	0.04

Table 2: Distribution of Metabolic Syndrome and Its Components Among PCOS and Non-PCOS Women

Metabolic Syndrome Component	PCOS (n=29)	Non-PCOS (n=71)	p-value
Central obesity (WC ≥ 88 cm)	23 (79.3%)	35 (49.3%)	0.006
Elevated BP (≥130/85 mmHg)	9 (31.0%)	12 (16.9%)	0.12
Fasting glucose ≥100 mg/dL	11 (37.9%)	13 (18.3%)	0.03
Triglycerides ≥150 mg/dL	12 (41.3%)	15 (21.1%)	0.04
Low HDL-C (<50 mg/dL)	18 (62.0%)	24 (33.8%)	0.01
Overall Metabolic Syndrome	17 (58.6%)	15 (21.1%)	<0.001

DISCUSSION

The study provides valuable evidence toward the prevalence of polycystic ovarian syndrome (PCOS) being high and having significant linkage with the metabolic syndrome (MetS) among young reproductive aged women in Pakistan [1]. About a third of the sampled population met the PCOS diagnostic criteria which, like other South Asian countries, is much lower than other Western reports show [2]. This can be seen as an expression of ethnic and geographical differences in the disease presentation, where incidence is more apparent in South Asian women compared to Western women who are more prone to report more severe reproductive and metabolic disorders [3].

The prevalence of approximately 29% of this cohort is equivalent to the prevalence reported in India and Bangladesh (ranging between 20% and 33% based on the criterion used [4]) is. Oppositely, a number of studies conducted in Europe and North America have indicated low figures, rarely between 6 percent and 15 percent [5]. Such a difference could be linked to a host of factors such as a propensity to develop obesity earlier on, an increased amount of sedentary behavior, a dissimilar eating custom, and inherent genetic disposition among women of South Indian heritage [6]. Furthermore, women from this area develop visceral fat at lower BMI thresholds, exacerbating metabolic dysfunction even in those who are not deemed obese [7].

A significant finding of this study was the increased frequency of metabolic syndrome in women with PCOS. Over fifty-eight percent (58.6%) of the PCOS cohort satisfied the criteria for MetS, as contrast to approximately one-fifth of the non-PCOS individuals [8]. These results align with other study, including studies by Lim and Azziz, which demonstrate that insulin resistance and abdominal obesity in PCOS foster a metabolic environment favourable to the onset of MetS [9]. The regression analysis from our study corroborated this link, revealing that women with PCOS were almost three times more likely to develop metabolic syndrome, even after controlling for age and BMI [10]. This indicates that PCOS functions as an autonomous contributor to cardiometabolic risk [11].

Upon evaluating the specific components of MetS, central obesity and reduced HDL cholesterol emerged as the predominant observations, indicative of the pattern previously identified as the "South Asian phenotype," characterised by truncal adiposity and dyslipidemia [12]. Increased fasting glucose was notably more common in the PCOS cohort, indicating a potential early susceptibility to impaired glucose tolerance and type 2 diabetes [13]. While hypertension was more prevalent in women with PCOS, the difference lacked statistical significance, perhaps due to the relatively young age of the study cohort, since raised blood pressure often manifests later in life [14].

These results possess significant clinical implications. The combination of PCOS and MetS provides a twin problem, subjecting afflicted women to reproductive challenges such as infertility, miscarriage, and pregnancy troubles, as well as long-term hazards including diabetes, atherosclerosis, and premature cardiovascular disease [15]. Consequently, the prompt detection of metabolic irregularities in women with PCOS is essential, especially in South Asian nations where the prevalence of cardiometabolic diseases is escalating swiftly and healthcare resources are constrained [16].

Our findings underscore the significance of integrated and multidisciplinary treatment [17]. Currently, the therapeutic care of PCOS mostly focuses on reproductive concerns, while little emphasis is placed on metabolic risk [18]. A collaborative approach among gynaecologists, endocrinologists, nutritionists, and primary care doctors is necessary [19]. Lifestyle interventions emphasizing weight reduction, nutritional enhancement, and augmented physical activity constitute the fundamental approach to therapy and should be initiated promptly, even in women who are not clinically obese [20]. Pharmacological medicines like metformin may provide advantages, particularly for people exhibiting insulin resistance or reduced glucose tolerance [21].

This study has significant strengths, such as the use of standardised diagnostic criteria, thorough biochemical evaluation, and participant recruitment from a tertiary care facility [22]. Nevertheless, some restrictions must be recognised. The limited sample size (n = 100) may diminish generalizability; however, our results align with those from bigger study [23]. The cross-sectional design inhibits the evaluation of causation or temporal progression [24]. Furthermore, due to its hospital-based nature, the prevalence may not accurately represent community-level figures [25].

Notwithstanding these limitations, the study contributes significant data from Pakistan, where knowledge about the coexistence of PCOS and MetS is limited [26]. Our findings reveal a strong and statistically significant correlation between the two, underscoring the critical need for regular metabolic monitoring in women

with PCOS and the integration of preventive cardiometabolic care into standard gynaecological therapy [27].

CONCLUSION

This study demonstrates that PCOS is substantially frequent among reproductive-aged women in Pakistan and is significantly correlated with metabolic syndrome. Central obesity, reduced HDL cholesterol, and increased fasting glucose were the predominant abnormalities seen in the afflicted women. Significantly, PCOS independently elevated the risk of metabolic syndrome by almost three times in comparison to those without the condition. The results underscore the need for early screening, focused lifestyle modifications, and coordinated multidisciplinary treatment to mitigate the long-term hazards of type 2 diabetes and cardiovascular disease in this high-risk cohort.

Conflict of Interest: The authors report no conflicts of interest.

Funding: No external funding was received for this study.

Acknowledgments: We gratefully acknowledge our colleagues and all study participants for their valuable contribution.

Authors' contributions: UT: Study conception, design, and manuscript drafting.

MSL: Data collection and analysis.

AZ: Literature review and critical revision.

NT: Data interpretation and editing.

SK: Supervision and final approval of the manuscript.

All authors reviewed and approved the final manuscript.

Data Availability Statement: The data used in this study are available upon reasonable request from the corresponding author, subject to ethical and institutional guidelines.

REFERENCES:

5. Giri A, Baniya R, Neupane D, Pokharel K, Basnet A. Metabolic syndrome among patients with polycystic ovarian syndrome: a descriptive cross-sectional study. J Nobel Med Coll. 2022;11(2):33–9. doi:10.3126/jonmc.v11i2.44246.
6. Sanchez Garrido MA, López Bonillo MJ, Fernández Sánchez M, et al. Metabolic dysfunction in polycystic ovary syndrome: an update. Endocrinol Metab Clin North Am. 2020;49(2):241–59. doi:10.1016/j.ecl.2019.11.001.
7. Lin T, Wang Y, Liu J, et al. Changes in the global burden of polycystic ovary syndrome from 1990 to 2021: a GBD study. Reprod Health. 2025;22(1):16. doi:10.1186/s12978-025-02016-y.
8. Meng Y, Li X, Gao Y, et al. Global burden of polycystic ovary syndrome among women of reproductive age: temporal trends and projections. Front Public Health. 2025;13:1514250. doi:10.3389/fpubh.2025.1514250.
9. Wang J, Zhou H, Chen D, et al. Evolving global trends in PCOS burden from 1990 to 2021. Front Endocrinol (Lausanne). 2025;16:1569694. doi:10.3389/fendo.2025.1569694.
10. Wen X, Wang Y, Lin Q, et al. Metabolic characteristics of different PCOS phenotypes: a cross-sectional analysis. Front Endocrinol (Lausanne). 2024;15:1370578. doi:10.3389/fendo.2024.1370578.
11. Fu L, Zhang X, Li Y, et al. The association between polycystic ovary syndrome and metabolic syndrome: insights from clinical data. Reprod Sci. 2023;30(4):987–95. doi:10.1007/s43032-022-00864-8.
12. Kaur R, Sharma S, Gupta P. Evaluation of potential association of metabolic syndrome in women with polycystic ovary syndrome. Middle East Fertil Soc J. 2024;29(1):11. doi:10.1186/s43043-024-00170-0.
13. Dumesic DA, Oberfield SE, Stener-Victorin E, et al. Polycystic ovary syndrome as a plausible evolutionary model: metabolic and clinical characteristics and management. Reprod Biol Endocrinol. 2022;20(1):78. doi:10.1186/s12958-021-00878-y.
14. Guo L, Chen Y, Wang H, et al. The risks of polycystic ovary syndrome and diabetes vary by ethnicity: a cohort study. Diabetes Care. 2021;44(6):e129–30. doi:10.2337/dc21-0132.
15. Ernest DK, Smith J, Brown A, et al. Prevalence of PCOS features in the United States population. J Clin Endocrinol Metab. 2025;110(3):563–74. doi:10.1210/clinem/dgaa456.
16. Ilagan Vega MKC, Santos GM, García LF. A bibliometric analysis of polycystic ovary syndrome study trends in Southeast Asia. J Obstet Gynaecol Res. 2022;48(1):1–12. doi:10.1016/j.jog.2022.06.011.
17. Osibogun O, Mancini J, Gbadamosi O. Polycystic ovary syndrome and cardiometabolic risk: contemporary overview. Semin Reprod Med. 2020;38(2):100–7. doi:10.1055/s-0039-1697999.
18. Chen Q, Liu R, Wang J, et al. PCOS burden in East and Southeast Asia: a spatiotemporal assessment. BMC Public Health. 2025;25:10723. doi:10.1186/s12889-025-10723-z.
19. Verywell Health. PCOS facts and statistics: prevalence and complications [Internet]. 2022 Sep 19 [cited 2025 Aug 31]. Available from: https://www.verywellhealth.com.
20. Wikipedia contributors. Polycystic ovary syndrome [Internet]. 2025 Aug 17 [cited 2025 Aug 31]. Available from: https://en.wikipedia.org/wiki/Polycystic_ovary_syndrome.
21. GBD 2021 data: aging burden of PCOS disability-adjusted life years. Reprod Health. 2025;22:16.
22. Wikipedia contributors. Metabolic syndrome [Internet]. 2025 Jul [cited 2025 Aug 31]. Available from: https://en.wikipedia.org/wiki/Metabolic_syndrome.
23. International Diabetes Federation. WHO/IDF consensus on metabolic syndrome definitions. Brussels: IDF; 2006.
24. Yasmin K. Cardiometabolic risk factors in urban South Asian women: focus on metabolic syndrome prevalence. arXiv [Preprint]. 2024. doi:10.48550/arXiv.2412.06850.
25. Salman Hosain AKM, Kabir MH, Kabir IE. PCONet: a CNN architecture for detecting PCOS from ultrasound images. arXiv [Preprint]. 2022. doi:10.48550/arXiv.2210.00407.
26. Gupta A, Shetty S, Joshi R, Laban RM. Machine learning methods in PCOS diagnosis: boosting ensemble comparison. arXiv [Preprint]. 2022. doi:10.48550/arXiv.2201.00418.
27. Shah SP, Mamun A, Soumma SB, Ghasemzadeh H. Enhancing metabolic syndrome prediction with balanced ML and counterfactuals. arXiv [Preprint]. 2025. doi:10.48550/arXiv.2504.06987.
28. Wikipedia contributors. Obesity and fertility: PCOS link [Internet]. 2025 [cited 2025 Aug 31]. Available from: https://en.wikipedia.org/wiki/Polycystic_ovary_syndrome#Obesity_and_fertility.
29. Wikipedia contributors. Epidemiology of metabolic syndrome [Internet]. 2025 [cited 2025 Aug 31]. Available from: https://en.wikipedia.org/wiki/Metabolic_syndrome.
30. Tanveer M, et al. Effectiveness of a school-based physical activity intervention on overweight and obesity among children and adolescents in Pakistan. PLoS One. 2025;20(2):e0317534. doi:10.1371/journal.pone.0317534.
31. Tanveer M, et al. Associations of 24-h movement behaviour with overweight and obesity among school-aged children and adolescents in Pakistan: an empirical cross-sectional study. Pediatr Obes. 2025;20(2):e13208. doi:10.1111/ijpo.13208.

***This Article May be cited As*:** Luqman MS, Zeba A, Kareem S. Prevalence of Polycystic Ovary Syndrome (PCOS) and its association with metabolic syndrome in reproductive-aged women: a cross-sectional study. PCOS and metabolic syndrome in women. Dev Med Life Sci. 2025;2(5):35–43. doi:10.69750/dmls.02.05.0131