

Effect of Adolescent Reproductive Health Education on Awareness of Polycystic Ovary Syndrome (PCOS)

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"Cite this Article" Received: 11 February 2026; Accepted: 20 March 2026; Published: 30 March 2026

Author Contributions: Concept: AA, FMQ; Design: AA, FMQ, SKM; Data Collection: AA, AD, AAr, SS; Analysis: AA, FMQ; Drafting: AA, AD, AAr, SS, FMQ, SKM. **Ethical**

Approval: Govt. Graduate College for Women, Attock, Pakistan. **Informed Consent:** Written informed consent was obtained from all participants; **Conflict of Interest:** The authors declare no conflict of interest. **Funding:** No external funding; **Data Availability:** Available from the corresponding author on reasonable request; **Acknowledgments:** NA

ABSTRACT

Background: Polycystic ovary syndrome is associated with menstrual, hyperandrogenic, reproductive, metabolic, and psychological consequences, yet awareness among adolescent girls remains variable. **Objective:** To assess awareness of PCOS manifestations, long-term risks, health-seeking intentions, and educational preferences among adolescent girls immediately after a reproductive-health education session. **Methods:** A school-based post-education cross-sectional study included 300 girls aged 13–19 years from selected educational institutions in Attock, Pakistan. Participants attended a 30–40-minute reproductive-health session and then completed a structured questionnaire. Categorical variables were summarized as frequencies and percentages, and age as mean $\pm$ standard deviation. **Results:** The mean age was 16.1 ± 1.7 years. Irregular menstrual periods were recognized as a possible PCOS manifestation by 252 participants (84.0%), followed by excessive facial or body hair by 188 (62.7%), acne by 175 (58.3%), and weight gain by 165 (55.0%). Fertility-related consequences were recognized by 146 participants (48.7%), and diabetes risk by 124 (41.3%). Overall awareness was poor in 78 (26.0%), moderate in 137 (45.7%), and good in 85 (28.3%). Medical advice for persistent menstrual irregularity was supported by 236 participants (78.7%), while 261 (87.0%) supported inclusion of PCOS in school health education. **Conclusion:** Participants demonstrated predominantly moderate post-session awareness, with substantial gaps concerning reproductive and metabolic risks. The findings support structured school-based education but do not establish educational effectiveness. **Keywords:** PCOS awareness; adolescent girls; reproductive health education; menstrual health; school health; health-seeking behaviour; Attock; Pakistan.

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common endocrine and metabolic disorder affecting females of reproductive age. Its clinical presentation may include menstrual irregularity, hyperandrogenic manifestations such as acne and excessive facial or body hair, weight gain, and reproductive difficulties. Beyond ovarian dysfunction, PCOS is associated with insulin resistance, obesity, type 2 diabetes mellitus, dyslipidaemia, cardiovascular risk, psychological distress, and impaired quality of life (1,3–7). The condition frequently remains undiagnosed because its manifestations vary considerably and may be normalized, overlooked, or managed without appropriate clinical assessment.

Adolescence is a particularly important period for PCOS awareness because several clinical manifestations may first appear around puberty. Menstrual irregularity, acne, weight changes, and

increased body or facial hair may be interpreted as normal pubertal changes, which can delay recognition and medical consultation. At the same time, diagnosing PCOS during adolescence requires caution because physiological pubertal changes may overlap with diagnostic features of the condition. International guidance therefore emphasizes age-appropriate assessment, avoidance of premature labelling, and appropriate follow-up for adolescents with persistent symptoms (1,2). Improving awareness should consequently help adolescent girls recognize potentially important symptoms without encouraging self-diagnosis or unnecessary anxiety.

Delayed recognition of PCOS may have important reproductive, metabolic, and psychosocial consequences. Adolescents experiencing menstrual irregularity, acne, hirsutism, or weight-related concerns may also experience embarrassment, poor body image, reduced confidence, emotional distress, and reluctance to seek professional care. In later life, PCOS may be associated with infertility, impaired glucose regulation, type 2 diabetes, obesity, and cardiovascular risk (4–7). Although prevalence estimates vary according to the population studied and the diagnostic criteria applied, the available evidence indicates that PCOS represents an important and frequently under-recognized women's health problem (8,9).

Awareness of PCOS among adolescents and young women remains uneven. Studies conducted among students and women in Pakistan and other countries have identified limited understanding of symptoms, risk factors, lifestyle considerations, metabolic complications, and indications for clinical consultation (10,12,13,17–23). Visible manifestations, particularly menstrual irregularity, tend to be recognized more frequently than long-term metabolic and reproductive consequences. Evidence from schoolgirls and their mothers has similarly demonstrated substantial deficiencies in acceptable PCOS knowledge, highlighting the need for age-appropriate education and family engagement (19). Structured educational programmes may improve immediate knowledge among adolescent girls; however, the effectiveness and retention of such education depend on the quality, frequency, cultural appropriateness, and mode of delivery (24).

In Pakistan, menstrual and reproductive health remain sensitive subjects in many families and educational institutions. Adolescent girls may depend on mothers, peers, social media, or informal online sources for information, while teachers and healthcare professionals may be less accessible. Cultural discomfort, limited teacher training, stigma, and fear of embarrassment can restrict discussion of menstrual irregularity, excessive hair growth, acne, and other reproductive-health concerns. Previous Pakistani research has shown that reproductive-health education can be introduced in conservative settings when schools, parents, teachers, healthcare professionals, and community stakeholders are engaged sensitively (15,16). Nevertheless, local evidence concerning PCOS awareness among school- and college-going adolescent girls remains limited, particularly in districts containing mixed urban, semi-urban, and rural populations.

Attock district includes students from diverse educational and socioeconomic backgrounds, many of whom may have limited access to structured reproductive-health information. Although a brief educational session may provide immediate exposure to essential information, the level of awareness demonstrated by adolescents following such a session, including their recognition of PCOS symptoms, understanding of long-term health risks, and intended health-seeking behaviour, requires systematic assessment. Describing this post-session awareness can identify domains that remain poorly understood and inform the content of future school-based reproductive-health programmes.

The present study therefore aimed to assess awareness of PCOS among adolescent girls immediately after a reproductive-health education session in selected educational institutions in Attock, Pakistan. Specifically, it evaluated recognition of common symptoms, awareness of potential reproductive and metabolic consequences, preferred sources of information, intended health-seeking behaviour, and acceptance of including PCOS-related content in school health education.

MATERIALS AND METHODS

A school-based, post-education cross-sectional study was conducted among adolescent girls enrolled in selected schools and colleges in Attock district, Punjab, Pakistan. The study was designed to describe participants' awareness of PCOS immediately after a reproductive-health education session. Because the questionnaire was administered at a single time point after the session, the study evaluated post-session awareness and did not constitute a pretest–posttest assessment of educational effectiveness.

The target population comprised adolescent girls aged 13–19 years who were enrolled in the participating educational institutions. Students were eligible when they were present during the scheduled data-collection visit, attended the educational session, were able to understand the questionnaire, and voluntarily agreed to participate. Students who were absent, declined participation, or were unable to complete the questionnaire independently were excluded. Administrative permission was obtained from the participating institutions before data collection. Students were informed about the purpose of the study, the voluntary nature of participation, the anonymity of their responses, and their right to decline participation or discontinue completion of the questionnaire without penalty.

A total of 300 adolescent girls were recruited through convenience sampling. Selection depended on institutional permission, accessibility of participating classes, and student availability on the day of data collection. Students were approached across different educational levels to include adolescents with varied demographic and academic backgrounds. No participant names or directly identifying information were recorded on the questionnaire.

Before completing the questionnaire, participants attended a standardized reproductive-health education session lasting approximately 30–40 minutes. The session was delivered in simple and age-appropriate language through a brief lecture, interactive discussion, and question-and-answer format. Content included basic menstrual health, expected and potentially abnormal menstrual patterns, common manifestations of PCOS, possible lifestyle-related factors, reproductive and metabolic consequences, and indications for seeking professional medical advice. Particular emphasis was placed on persistent menstrual irregularity, acne, excessive facial or body hair, weight gain, and the importance of timely consultation. The session was conducted in a manner intended to minimize embarrassment and stigma. Participants were encouraged to ask general questions but were not required to disclose personal menstrual or reproductive information in front of their peers.

Data were collected immediately after the educational session using a structured, literature-informed questionnaire developed from previous studies concerning PCOS awareness and adolescent reproductive health (10,12,13,17–24). The questionnaire was prepared in simple English and Urdu to improve comprehension among students from different educational levels. It was reviewed by professionals with relevant public-health and reproductive-health expertise, and its wording was refined to remove ambiguity and age-inappropriate terminology. The questionnaire was pretested among adolescent girls who were not included in the final sample, and items identified as difficult or unclear were simplified before formal data collection.

The questionnaire contained four principal domains. The first recorded sociodemographic characteristics, including age, educational level, place of residence, and maternal education. The second assessed recognition of common manifestations of PCOS, including irregular menstruation, acne, excessive facial or body hair, weight gain, and hair loss. The third evaluated awareness of potential long-term consequences, including fertility-related problems, obesity, diabetes, and psychological stress. The fourth assessed intended health-seeking behaviour and educational preferences, including whether persistent menstrual irregularity warranted medical advice, willingness to discuss menstrual concerns with a mother or guardian, preference for consultation with a female physician, usual sources of reproductive-health information, and support for including PCOS in school health education.

Most questionnaire items were closed-ended and used “Yes,” “No,” or “Do not know” response options. Selected items used multiple-choice responses, while a limited number of open-ended questions explored sources of information and perceived barriers to seeking healthcare. Knowledge items were scored by assigning one point to each correct response and zero points to incorrect or “Do not know” responses. The total knowledge score was used to classify participants into poor, moderate, or good awareness categories according to the scoring framework applied during data analysis. Attitudinal responses, consultation preferences, and support for school-based education were analysed separately and were not treated as objectively correct knowledge responses.

Following the educational session, questionnaires were distributed in the classroom and completed independently by participants. A member of the research team remained available to clarify the meaning of questions without suggesting or influencing responses. Completed questionnaires were collected on the same day and reviewed for completeness before data entry. Forms containing insufficient information for calculation of the principal awareness outcome were excluded from the relevant analysis.

The primary outcome was post-session awareness of PCOS, represented by knowledge of common symptoms and potential long-term reproductive and metabolic consequences. Secondary outcomes included intended health-seeking behaviour, preferred consultation arrangements, previous sources of information, and acceptance of PCOS education in schools. Sociodemographic variables included age group, educational level, residence, maternal education, and previous source of PCOS-related information.

Data were analysed using IBM SPSS Statistics version 26.0. Categorical variables were summarized as frequencies and percentages, while age was summarized using the mean and standard deviation. Correct responses to individual knowledge items were reported as n (%). Overall awareness was categorized as poor, moderate, or good using the predefined questionnaire scoring framework. Associations between awareness category and selected sociodemographic characteristics were assessed using the chi-square test where the assumptions of the test were satisfied. All statistical tests were two-sided, and a p-value of less than 0.05 was considered statistically significant. The analysis was interpreted as descriptive and associative because the absence of a baseline assessment and comparison group prevented estimation of change attributable to the educational session.

RESULTS

A total of 300 adolescent girls completed the post-education assessment and were included in the analysis. The mean age of the participants was 16.1 ± 1.7 years. The largest age group comprised participants aged 16–17 years ($n=131$, 43.7%), followed by those aged 13–15 years ($n=92$, 30.7%) and 18–19 years ($n=77$, 25.6%). Most participants were enrolled at the higher-secondary level ($n=137$, 45.7%), and 164 (54.7%) resided in urban areas. Social media or the internet was the most frequently reported previous source of PCOS-related information ($n=113$, 37.7%), whereas only 51 participants (17.0%) identified a teacher or healthcare worker as their previous source of information.

Table 1. Sociodemographic Characteristics of Participants (N=300)

Variable	Category	n	%
Age group	13–15 years	92	30.7
	16–17 years	131	43.7
	18–19 years	77	25.6
Educational level	Secondary	124	41.3
	Higher secondary	137	45.7
	First-year college	39	13.0
Residence	Urban	164	54.7
	Rural or semi-urban	136	45.3
Maternal education	No formal education	81	27.0

Variable	Category	n	%
Previous source of PCOS information	Primary to matriculation	119	39.7
	Intermediate or above	100	33.3
	Family or friends	96	32.0
	Social media or internet	113	37.7
	Teacher or healthcare worker	51	17.0
	No previous information	40	13.3

PCOS: polycystic ovary syndrome. Percentages were calculated using N=300.

Recognition of common PCOS manifestations varied across individual knowledge items. Irregular menstrual periods were the most frequently recognized potential manifestation, identified by 252 participants (84.0%). Excessive facial or body hair was recognized by 188 participants (62.7%), while 175 (58.3%) identified acne as a possible manifestation of hormonal imbalance. Weight gain was identified as being associated with PCOS by 165 participants (55.0%).

Awareness of potential long-term complications was lower than recognition of common clinical manifestations. Fewer than half of the participants recognized that PCOS may affect future fertility (n=146, 48.7%), and 124 (41.3%) identified an increased risk of diabetes.

Table 2. Post-Education Knowledge of PCOS Manifestations and Long-Term Risks (N=300)

Knowledge domain	Item	Correct response, n	%
Clinical manifestations	Irregular menstrual periods may be a manifestation of PCOS	252	84.0
	Excessive facial or body hair may be associated with PCOS	188	62.7
	Acne may be related to hormonal imbalance	175	58.3
	Weight gain may be associated with PCOS	165	55.0
Long-term consequences	PCOS may affect future fertility	146	48.7
	PCOS may increase the risk of diabetes	124	41.3

PCOS: polycystic ovary syndrome. Correct-response percentages were calculated using N=300.

Post-session responses concerning intended health-seeking behaviour were generally favourable. A total of 236 participants (78.7%) agreed that persistent menstrual irregularity warranted medical advice, and 207 (69.0%) indicated willingness to discuss menstrual concerns with their mother or guardian. A female doctor was preferred for consultation by 219 participants (73.0%). Most participants supported incorporating PCOS-related information into school health education (n=261, 87.0%).

Table 3. Intended Health-Seeking Behaviour and Educational Preferences (N=300)

Domain	Response item	Positive response, n	%
Intended health seeking behaviour	Medical advice should be sought for persistent menstrual irregularity	236	78.7
Communication preference	Willing to discuss menstrual concerns with mother or guardian	207	69.0
Consultation preference	Preferred consultation with a female doctor	219	73.0
Educational acceptability	Supported inclusion of PCOS topics in school health education	261	87.0

PCOS: polycystic ovary syndrome. Positive responses represent agreement or stated preference and should not be interpreted as objectively correct knowledge responses.

Based on the reported overall awareness classification, 137 participants (45.7%) demonstrated moderate awareness, 85 (28.3%) demonstrated good awareness, and 78 (26.0%) demonstrated poor awareness. Thus, nearly three-quarters of participants were classified as having either moderate or good post-session awareness, although the individual-item findings demonstrated that recognition of metabolic and fertility-related consequences remained lower than recognition of menstrual irregularity.

Table 4. Overall Post-Education PCOS Awareness Level (N=300)

Awareness category	n	%
Poor awareness	78	26.0
Moderate awareness	137	45.7
Good awareness	85	28.3
Total	300	100.0

PCOS: polycystic ovary syndrome. Counts correspond to the total sample and the reported percentages after rounding to one decimal place.

Overall, the findings indicated uneven post-session awareness across the assessed domains. Recognition was highest for menstrual irregularity, whereas awareness of diabetes and fertility-related risks was comparatively limited. The high level of support for school-based PCOS education and the preference for female healthcare professionals indicated that participants considered structured, culturally appropriate reproductive-health information acceptable. Because the assessment was conducted only once after the educational session, these findings describe post-session awareness and do not estimate changes from baseline or the independent effect of the educational intervention.

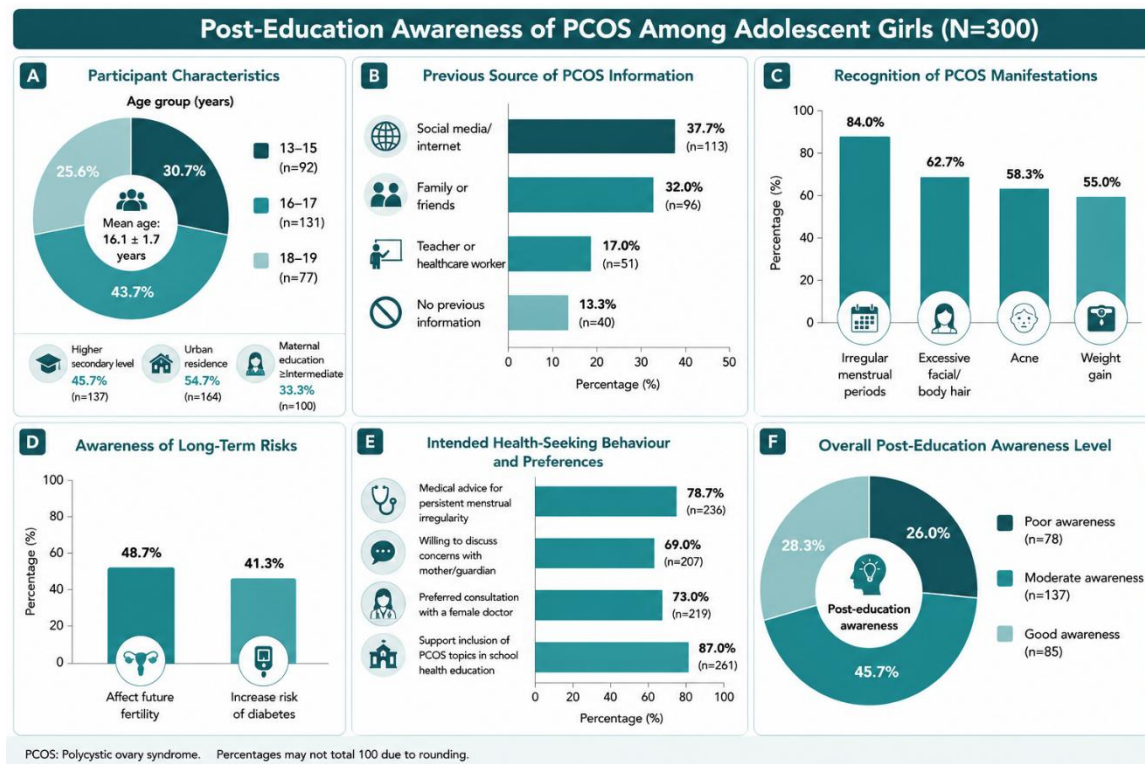


Figure 1: The multipanel figure summarizes post-education PCOS awareness among 300 adolescent girls: most were aged 16–17 years, social media was the leading prior information source, menstrual irregularity was the most recognized manifestation, awareness of fertility and diabetes risks remained comparatively low, health-seeking intentions were generally favourable, and overall awareness was predominantly moderate, with strong support for including PCOS education in schools.

DISCUSSION

The present study described PCOS awareness among adolescent girls immediately after a reproductive-health education session in selected educational institutions in Attock, Pakistan. Most participants demonstrated moderate post-session awareness, while approximately one-quarter were classified as having good awareness. Recognition was highest for menstrual irregularity, whereas awareness of fertility-related consequences and diabetes risk was considerably lower. Participants generally expressed favourable intended health-seeking responses, preferred consultation with a female physician, and strongly supported the inclusion of PCOS-related content in school health education. These findings indicate that awareness was uneven across domains, with visible clinical manifestations being more readily recognized than long-term reproductive and metabolic consequences.

Irregular menstrual periods were the most frequently recognized manifestation of PCOS, identified by 84.0% of participants. This pattern is consistent with previous studies in which menstrual irregularity was more commonly recognized than other features of PCOS among students and young women (17,19,23). Menstrual changes are observable and directly relevant to adolescent girls, which may explain their greater recognition. Nevertheless, menstrual irregularity during adolescence must be interpreted

carefully because physiological cycle variation may occur during the years following menarche, and some pubertal features may overlap with PCOS manifestations (2). Educational programmes should therefore encourage appropriate clinical consultation for persistent menstrual irregularity while avoiding premature self-diagnosis or unnecessary anxiety.

Recognition of excessive facial or body hair, acne, and weight gain was lower than recognition of menstrual irregularity. These manifestations were identified by 62.7%, 58.3%, and 55.0% of participants, respectively. Previous research has similarly demonstrated variable awareness of hyperandrogenic and metabolic manifestations among female students and women in Pakistan and other settings (10,12,18,20). Hirsutism and acne may be perceived as cosmetic or routine adolescent concerns rather than possible manifestations of hormonal disturbance. Social embarrassment may also discourage adolescents from discussing these symptoms with parents, teachers, or healthcare professionals. Because hyperandrogenic manifestations can adversely affect body image, confidence, and quality of life, school-based education should present these features sensitively and explain when professional assessment may be appropriate (3,4,11).

The weakest knowledge domain concerned long-term reproductive and metabolic risks. Fewer than half of the participants recognized that PCOS may affect future fertility, and only 41.3% identified diabetes as a potential long-term risk. Comparable knowledge gaps have been reported among university students and young women in Jordan, Malaysia, the United Arab Emirates, Palestine, and India, where awareness of metabolic and reproductive complications was generally lower than awareness of common symptoms (17,18,20–23). This distinction is clinically important because PCOS is associated not only with menstrual and reproductive manifestations but also with insulin resistance, obesity, dyslipidaemia, type 2 diabetes mellitus, and increased cardiometabolic risk (4–7). Reproductive-health education should therefore extend beyond symptom recognition and explain the importance of long-term monitoring, healthy lifestyle practices, and timely medical assessment.

Approximately 45.7% of participants demonstrated moderate overall awareness, whereas 28.3% had good awareness and 26.0% had poor awareness. These findings should be interpreted as immediate post-session awareness rather than evidence of improvement caused by the educational session. The study did not include a baseline assessment, control group, or follow-up evaluation; therefore, the amount of knowledge attributable to the session and the retention of information over time could not be determined. Participants may already have possessed varying levels of knowledge through family members, peers, formal education, previous healthcare encounters, or digital media. The findings nevertheless identify specific domains that remained insufficiently understood after the session, particularly metabolic and fertility-related risks.

Social media and the internet were the most frequently reported previous sources of PCOS-related information, followed by family and friends. Teachers and healthcare workers were reported less frequently. Similar reliance on informal and digital information sources has been observed in previous PCOS-awareness studies (10,13,18). Online platforms can improve access to reproductive-health information, particularly where cultural barriers limit face-to-face discussion; however, the quality and accuracy of digital information are variable. Adolescents may encounter oversimplified diagnostic claims, unverified treatment advice, or stigmatizing content. Structured school-based education delivered by trained professionals may provide a more reliable framework through which students can interpret online information and identify appropriate sources of care.

The health-seeking findings were generally favourable. Most participants agreed that persistent menstrual irregularity warranted medical advice, and more than two-thirds indicated willingness to discuss menstrual concerns with a mother or guardian. These responses suggest that family-based communication may be an important pathway for adolescent reproductive-health support. In culturally conservative settings, however, embarrassment, fear of judgement, and limited parental knowledge may restrict such discussions. Previous work from Pakistan has shown that reproductive-health education is

more acceptable when parents, teachers, healthcare professionals, and community stakeholders are involved and when content is presented in a culturally sensitive manner (15,16). Strengthening parental knowledge may therefore complement school-based interventions and improve adolescents' access to appropriate guidance.

Nearly three-quarters of participants preferred consultation with a female physician. This preference is consistent with the sensitive nature of menstrual and reproductive-health concerns and may reflect perceived privacy, comfort, and cultural acceptability. Adolescent-friendly health services should consider gender preferences, confidential consultation arrangements, respectful communication, and appropriate referral pathways. The availability of trained female healthcare professionals or counsellors may reduce barriers to discussing menstrual irregularity, hirsutism, acne, weight concerns, and reproductive-health anxiety.

A particularly notable finding was that 87.0% of participants supported including PCOS topics in school health education. This high level of acceptability indicates that adolescent girls considered structured reproductive-health information relevant and appropriate. Previous educational research has suggested that organized awareness programmes can improve immediate PCOS knowledge among adolescent girls, although repeated assessment is required to determine retention and behavioural effects (24). School programmes should therefore use age-appropriate language, distinguish normal pubertal variation from warning signs, address stigma, include metabolic and reproductive consequences, and provide clear guidance about when and where to seek medical advice.

The study contributes local evidence from Attock district and includes adolescent girls from different age groups, educational levels, residential backgrounds, and maternal education categories. It also distinguishes knowledge of clinical manifestations and long-term consequences from intended health-seeking behaviour and service preferences. This distinction is important because awareness, intention, preference, and actual healthcare use represent different constructs and should not be interpreted interchangeably.

Several limitations should be considered. The cross-sectional, post-session design did not include baseline measurement, a comparison group, randomization, or follow-up; consequently, the study could not determine educational effectiveness, individual knowledge change, or retention over time. Convenience sampling and selection of accessible institutions may have introduced selection bias and limit generalizability beyond the participating schools and colleges. Responses were self-reported and may have been affected by social-desirability bias, guessing, or immediate recall of information presented during the session. The students were nested within institutions and classrooms, but the reported analysis did not account for potential clustering. The questionnaire's scoring thresholds and psychometric properties also require clear documentation because classification into poor, moderate, and good awareness depends on the validity and reliability of the measurement framework. Finally, intended health-seeking responses do not necessarily predict actual consultation behaviour.

Future research should use a validated PCOS-awareness instrument and a prospective pretest–posttest design with an appropriate comparison group. Follow-up assessments would help determine whether knowledge is retained and whether education influences communication, healthcare use, or lifestyle-related behaviour. Cluster-based sampling and analysis should also be considered when participants are recruited through schools or classrooms. Within the limits of the present design, the findings support the need for repeated, culturally sensitive, professionally delivered reproductive-health education that places greater emphasis on the metabolic and reproductive consequences of PCOS.

CONCLUSION

Adolescent girls assessed immediately after a reproductive-health education session demonstrated predominantly moderate awareness of PCOS, with the greatest recognition observed for menstrual

irregularity and comparatively limited understanding of fertility-related consequences and diabetes risk. Participants generally supported seeking medical advice for persistent menstrual irregularity, preferred consultation with a female physician, and strongly favoured including PCOS-related content in school health education. These findings identify important post-session knowledge gaps and support the development of structured, culturally appropriate school-based reproductive-health programmes, although the absence of baseline, comparison, and follow-up assessments prevents conclusions regarding the effectiveness or durability of the educational session.

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