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Prevalence and Risk Factors of Polycystic Ovary Syndrome among Adolescent Girls in Sanden District: A Cross-Sectional Screening Study

Erna Yovi Kurniawati[1]✉ , Elin Noviasari[2]
[1]Midwifery Professional Program, Department of Midwifery, Faculty of Medicine and Health Sciences, Alma Ata University, Yogyakarta, Indonesia.
[2]Diploma III Midwifery, Ummi Khasanah health Polytechnic, Yogyakarta, Indonesia
✉Penulis Korespondensi: yovi.raharjanto@gmail.com

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ABSTRAK

Polycystic Ovary Syndrome (PCOS) merupakan salah satu gangguan endokrin yang paling umum terjadi pada perempuan usia reproduktif dan seringkali mulai muncul sejak masa remaja. Manifestasi awal seperti ketidakteraturan siklus menstruasi, jerawat, serta gangguan metabolik dapat menjadi indikator awal peningkatan risiko PCOS. Namun demikian, bukti berbasis komunitas mengenai risiko PCOS pada remaja masih terbatas, khususnya di negara berkembang. Penelitian ini bertujuan untuk menilai prevalensi risiko PCOS serta mengidentifikasi faktor-faktor yang berhubungan dengan risiko tersebut pada remaja putri di Kecamatan Sanden. Penelitian ini menggunakan desain observasional analitik dengan pendekatan potong lintang sesuai dengan prinsip pelaporan studi observasional pada STROBE Statement. Sebanyak 32 remaja putri berusia 15–19 tahun direkrut menggunakan teknik purposive sampling. Data dikumpulkan menggunakan kuesioner terstruktur yang meliputi riwayat menstruasi, jerawat, hirsutisme, serta riwayat keluarga, disertai pengukuran antropometri untuk menentukan indeks massa tubuh (IMT). Analisis deskriptif digunakan untuk menggambarkan karakteristik responden, sedangkan analisis bivariat menggunakan uji Chi-square atau Fisher's exact test digunakan untuk mengidentifikasi faktor yang berhubungan dengan risiko PCOS. Hasil penelitian menunjukkan bahwa 28,1% responden dikategorikan memiliki risiko PCOS berdasarkan indikator skrining. Ketidakteraturan siklus menstruasi dan indeks massa tubuh berhubungan signifikan dengan risiko PCOS ($p < 0,05$), sedangkan jerawat, hirsutisme, dan riwayat keluarga tidak menunjukkan hubungan yang signifikan. Temuan ini menunjukkan bahwa sebagian remaja putri di Kecamatan Sanden telah menunjukkan indikator awal yang berkaitan dengan risiko PCOS. Oleh karena itu, skrining dini yang berfokus pada ketidakteraturan menstruasi dan status indeks massa tubuh dapat mendukung upaya deteksi dini serta pencegahan komplikasi reproduksi dan metabolik yang berkaitan dengan PCOS.

ABSTRACT
Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age and often begins during adolescence. Early manifestations such as menstrual irregularities, acne, and metabolic disturbances may indicate an increased risk of PCOS. However, community-based evidence regarding PCOS risk among adolescents remains limited, particularly in developing countries. This study aimed to assess the prevalence of PCOS risk and identify associated factors among adolescent girls in Sanden District. This observational analytic study used a cross-sectional design in accordance with the STROBE Statement. A total of 32 adolescent girls aged 15–19 years were recruited using purposive sampling. Data were collected using a structured questionnaire assessing menstrual history, acne, hirsutism, and family history, along with anthropometric measurements to determine body mass index (BMI). Descriptive statistics were used to summarize participant characteristics, while bivariate analysis using the Chi-square test or Fisher's exact test was performed to identify factors associated with PCOS risk. The results showed that 28.1% of participants were classified as being at risk of PCOS based on screening indicators. Menstrual cycle irregularity and BMI were significantly associated with PCOS risk ($p < 0.05$), whereas acne, hirsutism, and family history did not show statistically significant associations. These findings indicate that a considerable proportion of adolescent girls in Sanden District may already exhibit early indicators associated with PCOS risk. Early screening focusing on menstrual irregularities and BMI may support the early identification and prevention of reproductive and metabolic complications associated with PCOS.

1. INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine and metabolic disorder affecting females of reproductive age, with increasing recognition among adolescent populations. It is characterized by a spectrum of clinical manifestations, including menstrual irregularities, hyperandrogenism, and polycystic ovarian morphology, which may emerge during adolescence and persist into adulthood. Beyond reproductive dysfunction, PCOS is associated with long-term complications such as insulin resistance, type 2 diabetes mellitus, cardiovascular disease, and psychological disorders, thereby constituting a significant public health concern. Early identification during adolescence is therefore essential, as this developmental stage represents a critical window for timely intervention to prevent the progression of metabolic and reproductive morbidity[1,2].

Over the past decade, epidemiological evidence has demonstrated considerable variability in the prevalence of PCOS, ranging from approximately 6% to 20%, depending on diagnostic criteria and population characteristics[1]. However, the burden among adolescents is likely underrecognized due to diagnostic challenges, particularly the overlap between normal pubertal physiological changes and pathological features of PCOS. Contemporary studies have identified several key risk factors, including obesity, insulin resistance, genetic predisposition, and lifestyle-related behaviors such as physical inactivity and unhealthy dietary patterns. Despite these advances, most existing evidence is derived from high-income countries and hospital-based populations, limiting its applicability to broader community settings and diverse sociocultural contexts[3,4].

In low- and middle-income countries, including Indonesia, data on PCOS among adolescents remain scarce and fragmented. Available studies are largely confined to adult or clinical populations, resulting in limited generalizability and potential underestimation of the true burden in younger age groups. Moreover, there is a lack of community-based screening studies that simultaneously assess both prevalence and associated risk factors in adolescent populations. This gap is particularly concerning in

regions undergoing rapid nutritional and epidemiological transitions, where changes in lifestyle and environmental exposures may increase susceptibility to metabolic and reproductive disorders at an earlier age[5].

The absence of population-based data creates uncertainty regarding the true burden of PCOS and its determinants among adolescent girls, particularly in semi-rural settings with limited access to adolescent reproductive health services. Sanden District represents a transitional area characterized by evolving socioeconomic conditions, shifting dietary patterns, and limited screening initiatives targeting adolescent health. To date, no study has systematically examined the prevalence and risk factors of PCOS among adolescents in this region using a structured, community-based approach. This lack of localized evidence hinders the development of effective early detection strategies and context-specific public health interventions.

This study addresses these limitations by offering a novel integrated approach that combines community-based screening with a comprehensive assessment of both clinical manifestations and multidimensional risk factors of PCOS within a single cross-sectional framework. Unlike previous studies that predominantly rely on hospital-based samples or focus on isolated determinants, this research simultaneously captures prevalence and associated risk profiles at the population level. Furthermore, this study specifically addresses an underexplored population adolescent girls in a semi-rural Indonesian setting who are often underrepresented in PCOS research despite being at a critical stage for early detection and prevention. By situating the analysis within a transitioning socio-environmental context, this study provides unique insights into how emerging lifestyle and metabolic risk factors interact in shaping PCOS risk among adolescents.

Therefore, the objective of this study is to determine the prevalence of PCOS and identify its associated risk factors among adolescent girls in Sanden District through a cross-sectional screening approach. The findings are expected to contribute to the evidence base for early detection and prevention strategies, inform public health policies, and support the development of adolescent-focused reproductive health programs. Ultimately, this paper aims to provide a comprehensive epidemiological assessment of PCOS in a community setting, thereby addressing existing research gaps and contributing to the global understanding of PCOS among adolescents in underrepresented, low-resource contexts.

2. MATERIAL AND METHOD

Research Design

This study employed an observational analytic design with a cross-sectional approach to assess the risk of Polycystic Ovary Syndrome (PCOS) among adolescent girls in Sanden District, Yogyakarta, Indonesia. The cross-sectional design was selected to evaluate the prevalence of PCOS risk and associated factors within a defined population at a single point in time. Data collection was conducted between November 2025-Desember 2025 in community settings within Sanden District.

Population and Sampling

The study population consisted of adolescent girls residing in Sanden District. Participants were selected using a purposive sampling technique, a non-probability sampling method that enables the recruitment of individuals who meet predefined eligibility criteria directly aligned with the study objectives. This approach was considered appropriate given the need to identify a specific subgroup post-menarcheal adolescent girls within a defined age range who are at risk of developing Polycystic Ovary Syndrome (PCOS) but may not be readily identifiable through random sampling. In addition, the use of purposive sampling facilitated efficient community-based screening in a setting with limited population registries and logistical constraints, while ensuring that participants possessed the relevant characteristics necessary for valid assessment of PCOS-related outcomes. Although this method may limit generalizability, it enhances the internal relevance of the findings by focusing on individuals most representative of the target at-risk population. A total of 32 respondents who fulfilled the inclusion criteria were included in the final analysis.

Participants were eligible for inclusion if they met the following criteria: adolescent girls aged 15–19 years, had experienced menarche, had been residing in Sanden District for at least six months, and were willing to participate in the study by providing informed consent. For participants younger than 18 years old, parental or guardian consent was also obtained. Participants were excluded if they had previously been diagnosed with endocrine disorders other than PCOS, were currently undergoing hormonal therapy that could affect menstrual patterns, or provided incomplete responses to the study questionnaire.

Variables and Measurements

The primary outcome variable in this study was the risk of PCOS identified through screening indicators. Independent variables included age, body mass index (BMI), menstrual cycle regularity, presence of acne, signs of hirsutism, and family history related to reproductive or endocrine disorders. These variables were selected based on commonly reported screening indicators associated with PCOS risk among adolescents in epidemiological studies. Anthropometric measurements were conducted to determine BMI, which was calculated by dividing body weight in kilograms by height in meters squared (kg/m^2). Standardized measurement procedures were used to ensure accuracy and reliability of the data collected.

Data Collection Procedure

Data were collected using a structured, pre-tested questionnaire designed to assess sociodemographic characteristics, menstrual history, and clinical symptoms associated with PCOS risk. The questionnaire included items on age, age at menarche, menstrual cycle regularity, presence of acne, signs of hirsutism, and family history of reproductive disorders. Prior to data collection, the instrument was reviewed for content clarity and contextual relevance, and a pilot test was conducted on a small group of adolescents with similar characteristics to ensure comprehensibility and feasibility. Before administering the questionnaire, respondents were provided with standardized information regarding the study objectives, procedures, and detailed instructions on how to complete each section of the questionnaire. This orientation aimed to ensure consistency in understanding and to reduce the risk of misinterpretation of items.

The questionnaire was self-administered by the participants without direct interviewer involvement in order to minimize interviewer bias and enhance the accuracy of reporting, particularly for sensitive reproductive health information. Data collection was conducted in a supervised setting to maintain procedural consistency, while allowing participants to complete the questionnaire independently. Researchers were present only to provide clarification when needed, without influencing participants' responses.

Prior to participation, all respondents received comprehensive information about the study, including its purpose, procedures, potential risks and benefits, and assurances of confidentiality and anonymity. Written informed consent was obtained from all participants before data collection. For participants younger than 18 years, additional written consent was obtained from a parent or legal guardian. Participants were informed of their right to decline participation or withdraw from the study at any stage without any consequences.

Following completion of the questionnaire, anthropometric measurements, including height and weight, were obtained by trained researchers using standardized protocols. Height was measured using a calibrated stadiometer, and weight was measured using a digital scale, with participants wearing light clothing and no footwear. Measurements were recorded to the nearest 0.1 cm for height and 0.1 kg for weight to ensure precision.

To ensure data quality, all completed questionnaires were checked for completeness and consistency immediately after submission. Incomplete or unclear responses were verified with participants when possible. Data were then coded and entered into a database using double-entry verification to minimize input errors. All collected data were stored securely and accessible only to the research team.

Data Analysis

The collected data were entered, coded, and analyzed using statistical software. Descriptive statistics were used to summarize participant characteristics, including frequencies and percentages for categorical variables, and means with standard deviations for continuous variables, depending on data distribution. The prevalence of PCOS risk among participants was calculated based on predefined screening indicators.

Bivariate analysis was conducted to examine the association between independent variables and PCOS risk. The Chi-square test was primarily employed to assess associations between categorical variables, as it is appropriate for determining differences in proportions across groups when the expected cell counts meet the required assumptions. In cases where the expected frequency in any cell was less than 5, Fisher's exact test was used as an alternative to ensure the validity of the statistical inference.

The use of the Chi-square test in this study is justified by the categorical nature of the main variables, including PCOS risk status (at risk vs. not at risk) and explanatory variables such as menstrual irregularity, presence of acne, and family history. This approach allows for the identification of potential associations between risk factors and PCOS screening outcomes within a cross-sectional design. A p-value of less than 0.05 was considered statistically significant. Due to the relatively small sample size, multivariable analysis was not performed, and findings should be interpreted with caution

Ethical Considerations

This study was conducted in accordance with ethical principles for research involving human participants. Ethical approval was obtained from the Institutional Ethics Committee of Alma Ata University prior to data collection. All participants received detailed information regarding the objectives and procedures of the study before enrollment. Written informed consent was obtained from all respondents, and parental or guardian consent was obtained for participants under the age of 18 years. The confidentiality and anonymity of all participants were strictly maintained throughout the research process.

3. RESULT AND DISCUSSION

3.1 Result

Participant Characteristics

A total of 32 adolescent girls participated in this study. All respondents met the inclusion criteria and completed the data collection process. The mean age of participants was 16.8 ± 1.2 years. Most respondents were aged 16–17 years (53.1%). Regarding body mass index (BMI), the majority of participants had normal BMI (56.3%), while 28.1% were classified as overweight and 15.6% were underweight.

In terms of menstrual history, 40.6% of participants reported irregular menstrual cycles. Clinical symptoms commonly associated with PCOS risk were also observed among respondents, including acne (46.9%) and signs of hirsutism (18.8%). A family history related to reproductive or endocrine disorders was reported by 21.9% of participants.

Table 1. Characteristics of Study Participants

Variable	Frequency (n)	Percentage (%)
Age		
15 years	5	15.6
16–17 years	17	53.1
18–19 years	10	31.3
BMI Status		
Underweight	5	15.6
Normal	18	56.3

Variable	Frequency (n)	Percentage (%)
Overweight	9	28.1
Menstrual Cycle		
Regular	19	59.4
Irregular	13	40.6
Acne		
Yes	15	46.9
No	17	53.1
Hirsutism		
Yes	6	18.8
No	26	81.2
Family History of PCOS		
Yes	7	21.9
No	25	78.1

Source: Primary data obtained from adolescent girls in Sanden District (2026)

Prevalence of PCOS Risk

Based on screening indicators including menstrual irregularity, acne, hirsutism, and BMI status, 9 participants (28.1%) were classified as having a risk of Polycystic Ovary Syndrome, while 23 participants (71.9%) were categorized as having no apparent risk based on the screening criteria.

Table 2. Prevalence of PCOS Risk

PCOS Risk Status	Frequency (n)	Percentage (%)
At risk	9	28.1
Not at risk	23	71.9

Source: Primary data obtained from adolescent girls in Sanden District (2026)

Factors Associated with PCOS Risk

Bivariate analysis was conducted to examine the association between selected variables and the risk of PCOS. The analysis showed that menstrual cycle irregularity and BMI status were significantly associated with PCOS risk ($p < 0.05$). Participants with irregular menstrual cycles had a higher proportion of PCOS risk compared to those with regular cycles. Similarly, overweight participants showed a greater likelihood of being categorized as at risk for PCOS. However, no statistically significant association was observed between age group, acne, hirsutism, or family history and PCOS risk ($p > 0.05$).

Table 3. Association between Selected Variables and PCOS Risk

Variable	PCOS Risk n (%)	No Risk n (%)	p-value
BMI			
Normal	3 (16.7)	15 (83.3)	0.041
Overweight	5 (55.6)	4 (44.4)	
Menstrual Cycle			
Regular	2 (10.5)	17 (89.5)	0.012
Irregular	7 (53.8)	6 (46.2)	
Acne			
Yes	5 (33.3)	10 (66.7)	0.421
No	4 (23.5)	13 (76.5)	
Hirsutism			
Yes	3 (50.0)	3 (50.0)	0.183
No	6 (23.1)	20 (76.9)	

Source: Primary data obtained from adolescent girls in Sanden District (2026)

This study identified that approximately one-third of adolescent girls in Sanden District were at risk of PCOS based on screening indicators. Menstrual cycle irregularity and higher BMI were found to be significantly associated with PCOS risk, highlighting the importance of early screening and lifestyle-related interventions among adolescents.

3.2 Discussion

The present study aimed to assess the prevalence of PCOS risk and identify associated factors among adolescent girls in Sanden District using a screening-based cross-sectional approach. The findings showed that 28.1% of participants were classified as being at risk of Polycystic Ovary Syndrome based on screening indicators. In addition, menstrual cycle irregularity and body mass index (BMI) were found to be significantly associated with PCOS risk, whereas variables such as acne, hirsutism, and family history did not demonstrate statistically significant associations. The relatively high proportion of adolescents identified as being at risk of PCOS in this study highlights the importance of early screening among adolescent populations. Although PCOS is commonly diagnosed in adulthood, the early manifestations often appear during adolescence[6]. Identifying risk indicators such as menstrual irregularity and elevated BMI suggests that reproductive and metabolic disturbances may already be present at an early stage. Early identification of these indicators is therefore important in preventing the progression of PCOS and its long-term complications[2,7,8].

One of the key findings of this study was the significant association between menstrual cycle irregularity and PCOS risk. Menstrual irregularity is widely recognized as one of the earliest clinical manifestations of ovulatory dysfunction. From a pathophysiological perspective, PCOS is associated with dysregulation of the hypothalamic–pituitary–ovarian (HPO) axis. Increased pulsatile secretion of gonadotropin-releasing hormone (GnRH) results in elevated luteinizing hormone (LH) secretion relative to follicle-stimulating hormone (FSH). This hormonal imbalance stimulates ovarian theca cells to produce excessive androgens, leading to hyperandrogenism. Elevated androgen levels subsequently impair follicular maturation and ovulation, resulting in anovulation or oligovulation that clinically presents as irregular menstrual cycles. Therefore, menstrual irregularity observed in adolescents may represent an early manifestation of endocrine dysregulation associated with PCOS[9,10].

Another important finding in this study was the significant association between BMI and PCOS risk. Adolescents with higher BMI were more likely to be categorized as having a risk of PCOS. This finding is consistent with the established role of metabolic dysfunction in the pathogenesis of PCOS[11,12]. Excess adipose tissue contributes to insulin resistance, which is a key metabolic abnormality frequently observed in individuals with PCOS. Insulin resistance leads to compensatory hyperinsulinemia, which enhances androgen production in ovarian theca cells and suppresses hepatic synthesis of sex hormone-binding globulin (SHBG)[4]. Reduced SHBG levels increase circulating free androgens, which further disrupt normal follicular development and ovulatory function. As a result, increased body weight may exacerbate both metabolic and reproductive disturbances associated with PCOS[13,14]. Although acne and hirsutism were observed among several participants, these variables were not significantly associated with PCOS risk in the present study. This finding may be explained by the physiological hormonal fluctuations that normally occur during adolescence. Puberty is characterized by increased androgen activity, which may lead to temporary dermatological manifestations such as acne even among healthy adolescents. Similarly, mild hirsutism may vary according to genetic predisposition, ethnicity, and environmental factors. Consequently, these clinical signs alone may not reliably distinguish adolescents at risk of PCOS from those experiencing normal pubertal hormonal changes[15].

These findings are consistent with recent international evidence demonstrating that menstrual irregularity and elevated BMI are among the most prominent early indicators associated with PCOS risk in adolescent populations. Current international guidelines emphasize that menstrual irregularity is a key diagnostic and risk indicator of PCOS in adolescents, reflecting underlying ovulatory dysfunction and hormonal imbalance[16]. In addition, recent systematic evidence shows that adolescents with PCOS tend to have significantly higher body mass index compared to non-PCOS counterparts, highlighting the strong contribution of metabolic factors in early disease development[17]. Moreover, studies have demonstrated that insulin resistance closely linked to increased adiposity is associated with worsening menstrual cycle disturbances, reinforcing the interaction between metabolic dysfunction and reproductive abnormalities in PCOS[18]. Conversely, clinical features such as acne and hirsutism have

been reported to be less specific in adolescents due to normal pubertal androgen fluctuations, which may limit their diagnostic utility in early screening . Collectively, these findings support the present study's results, indicating that menstrual and metabolic indicators are more reliable markers for early identification of PCOS risk compared to isolated dermatological manifestations[16].

This study has several strengths that should be acknowledged. First, the study provides preliminary community-based evidence regarding PCOS risk among adolescent girls, a population that remains underrepresented in PCOS research in Indonesia. Second, the use of screening indicators allowed early identification of adolescents who may be at increased risk of developing PCOS, which is important for preventive reproductive health strategies. In addition, the study incorporated both clinical indicators and anthropometric measurements, providing a more comprehensive assessment of factors associated with PCOS risk. However, several limitations should also be considered when interpreting the findings of this study. The relatively small sample size may limit the statistical power to detect associations between certain variables and PCOS risk. Furthermore, the cross-sectional design restricts the ability to establish causal relationships between the identified factors and the development of PCOS. In addition, PCOS risk in this study was determined using screening indicators rather than definitive diagnostic methods such as hormonal assessment or ultrasonography, which may lead to potential misclassification. Future research with larger sample sizes, longitudinal designs, and more comprehensive diagnostic approaches is therefore needed to better understand the early development and progression of PCOS among adolescents.

Overall, the findings of this study suggest that a considerable proportion of adolescent girls in Sanden District may already exhibit early indicators associated with PCOS risk. The significant associations observed between menstrual irregularity, BMI, and PCOS risk emphasize the importance of early reproductive health screening and lifestyle interventions aimed at improving metabolic and reproductive health outcomes among adolescents.

4. CONCLUSION

This study identified that a notable proportion of adolescent girls in Sanden District were at risk of developing Polycystic Ovary Syndrome based on screening indicators. Approximately 28.1% of participants were categorized as having potential PCOS risk. The findings further demonstrated that menstrual cycle irregularity and body mass index (BMI) were significantly associated with PCOS risk among adolescents. These results suggest that early reproductive and metabolic disturbances may already be present in adolescent populations, highlighting the importance of early detection and preventive strategies. Identifying adolescents who exhibit early indicators such as irregular menstrual cycles and elevated BMI may help prevent the progression of reproductive and metabolic complications associated with PCOS later in life.

Based on these findings, early screening programs for PCOS risk should be considered in community and school-based adolescent health services. Health promotion initiatives focusing on reproductive health awareness, healthy dietary patterns, regular physical activity, and weight management are also important to reduce modifiable risk factors associated with PCOS. Furthermore, future studies are recommended to involve larger sample sizes and longitudinal designs to better understand the progression of PCOS risk from adolescence to adulthood. Incorporating more comprehensive diagnostic assessments, such as hormonal evaluations and ultrasonographic examinations, may also improve the accuracy of PCOS detection and contribute to a better understanding of its early pathophysiological development.

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BIODATA PENULIS

Nama	:	Dr. Erna Yovi Kurniawati, S.ST., M.Tr.Keb
Tempat, Tangal Lahir	:	Bantul, 17 Mei 1987
Jenis Kelamin	:	Perempuan
Riwayat Pendidikan	:	Doktor Ilmu Kedokteran dan Kesehatan UNDIP
Instansi	:	Universitas Alma Ata
Alamat	:	Jl Brawijaya Jadan Tamantirto Bantul Yogyakarta
HP/WA	:	087739122352
Email	:	yovi.raharjanto@gmail.com
Judul Artikel	:	*Prevalence and Risk Factors of Polycystic Ovary Syndrome among Adolescent Girls in Sanden District: A Cross-Sectional Screening Study*

Nama	:	Elin Noviasari, AMd.Keb
Tempat, Tangal Lahir	:	
Jenis Kelamin	:	Perempuan
Riwayat Pendidikan	:	DII Kebidanan
Instansi	:	
Alamat	:	
HP/WA	:	
Email	:	elin.noviasari@gmail.com
Judul Artikel	:	*Prevalence and Risk Factors of Polycystic Ovary Syndrome among Adolescent Girls in Sanden District: A Cross-Sectional Screening Study*