

Original Article

# Factors associated with leukorrhea symptoms among female adolescents in high school: A cross-sectional study

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## Abstract

**Background:** Leukorrhea is a common reproductive health issue among female adolescents, yet many students lack adequate knowledge and appropriate hygiene practices needed to prevent pathological symptoms.

**Objective:** This study aimed to identify factors associated with leukorrhea symptoms among female adolescents in high school.

**Methods:** A cross-sectional analytical survey was conducted among 56 female students selected using simple random sampling from Grade 12 at SMA Negeri 1 OKU in 2024. Data were collected using a structured questionnaire assessing leukorrhea symptoms, knowledge level, age category, and personal hygiene behavior. Descriptive statistics and Chi-square tests were used to examine associations between variables, with a significance level of  $p < 0.05$ .

**Results:** The prevalence of pathological leukorrhea was 30.4%. Knowledge, age, and personal hygiene behavior were significantly associated with leukorrhea symptoms. Adolescents with low knowledge were more likely to experience pathological leukorrhea ( $p = 0.002$ ). Early adolescents demonstrated a higher prevalence of pathological symptoms compared with late adolescents ( $p = 0.000$ ). Poor hygiene behavior was also significantly associated with increased leukorrhea symptoms ( $p = 0.019$ ).

**Conclusion:** Knowledge level, age category, and hygiene behavior are key determinants of leukorrhea symptoms among female adolescents. School-based reproductive health interventions should be strengthened to improve adolescent knowledge and hygiene practices to reduce the risk of pathological leukorrhea.

## Background

Female adolescents experience leukorrhea as a common reproductive health concern that often goes unreported due to limited knowledge about normal and abnormal vaginal discharge (Abdel Azeem Elbndary et al., 2018). Adolescents frequently interpret vaginal discharge based on cultural beliefs rather than biomedical understanding, which contributes to delays in seeking appropriate care (Ilankoon et al., 2018). Schools rarely provide comprehensive reproductive health education, which causes adolescents to rely on peers or social media for unreliable information (Prima et al., 2022). Communities often stigmatize discussions about reproductive health, which further discourages adolescents from seeking credible guidance (Verkuyten et al., 2023). Health providers sometimes overlook non-sexually transmitted causes of leukorrhea, which results in insufficient assessment among young females (Torres-Deas et al., 2023). Female adolescents often misinterpret common symptoms, which leads to self-treatment and increased risk of complications (Gweda et al.,

2021). Early identification of leukorrhea remains essential, which highlights the need for research in educational environments where adolescents spend most of their time (Khadawardi, 2020).

Female adolescents often develop unhealthy personal hygiene behaviors, which increase the likelihood of pathological leukorrhea (Krisdayanti & Hasyim, 2021). Adolescents may not fully understand the difference between physiological and pathological discharge, which increases anxiety and misconceptions (Al Shammari et al., 2021). Poor menstrual hygiene practices frequently expose adolescents to fungal and bacterial infections, which aggravate abnormal discharge symptoms (Alzarani et al., 2020). Limited access to reproductive health information in families often causes adolescents to neglect essential preventive practices (Abdelmoneam et al., 2023). Adolescents who lack proper knowledge about genital hygiene tend to adopt behaviors that predispose them to recurrent leukorrhea episodes (Iswatun et al., 2021). Schools sometimes fail to integrate practical reproductive health lessons, which

leads to minimal understanding about discharge management (Putro et al., 2022). Adolescents frequently experience embarrassment when discussing symptoms, which prevents them from receiving proper health advice (Uwakwe et al., 2018).

Female adolescents are also influenced by social norms that shape their understanding of vaginal discharge, which often results in misconceptions about its causes (Ilankoon et al., 2018). Cultural expectations sometimes discourage adolescents from openly sharing symptoms, which leads to delayed diagnosis and poor health outcomes (Verkuyten et al., 2023). Adolescents may associate leukorrhea with moral judgment or sexual activity, which increases stigma around reporting symptoms (Putro et al., 2022). Families may view leukorrhea as a normal condition, which reduces the likelihood of early medical consultation (Abdel Azeem Elbndary et al., 2018). Peers often provide inaccurate reproductive health information, which reinforces risky hygiene practices among female adolescents (Prima et al., 2022). Social environments frequently fail to support open health communication, which limits the development of accurate knowledge and healthy behaviors (Krisdayanti & Hasyim, 2021). Misinterpretation of leukorrhea symptoms continues to be widespread, which demonstrates the importance of targeted health education in adolescents (Iswatun et al., 2021).

Leukorrhea among adolescents also relates to biological and behavioral factors that include menstrual hygiene management, diet, and stress (Rahma et al., 2025). Adolescents who consume high-sugar diets may experience increased susceptibility to yeast infections, which intensifies leukorrhea symptoms (Alzarani et al., 2020). Psychological stress associated with academic pressure can disrupt hormonal balance, which indirectly contributes to abnormal discharge (Torres-Deas et al., 2023). Poor sleep routines among adolescents can impair immune function, which increases vulnerability to vaginal infections (Gweda et al., 2021). Adolescents who lack regular health monitoring often fail to identify early signs of infection, which results in more severe symptoms (Abdelmoneam et al., 2023). Inadequate personal care products and practices may irritate the genital area, which triggers or worsens leukorrhea (Khadawardi,

2020). These combined factors highlight the complexity of leukorrhea etiology, which requires a multidimensional assessment approach (Uwakwe et al., 2018).

Schools serve as strategic settings for promoting reproductive health, which provides an opportunity to reduce leukorrhea cases among adolescents (Gweda et al., 2021). Health education delivered through school-based programs can improve adolescent knowledge, which strengthens preventive behaviors related to vaginal hygiene (Iswatun et al., 2021). Practical demonstrations during health education sessions can enhance understanding, which encourages adolescents to adopt safer hygiene practices (Prima et al., 2022). Peer-based education can create supportive learning environments, which minimizes stigma around reproductive health topics (Putro et al., 2022). School health units can provide confidential consultations, which facilitate early detection of abnormal discharge (Krisdayanti & Hasyim, 2021). Collaborative efforts between teachers and health professionals can sustain health promotion activities, which increase awareness about leukorrhea prevention (Al Shammari et al., 2021). Strengthening school health programs becomes essential, which ensures consistent monitoring of adolescent reproductive health conditions (Ilankoon et al., 2018).

Despite increasing health programs in schools, many adolescents continue to experience leukorrhea symptoms, which indicates gaps in both knowledge and practice (Abdel Azeem Elbndary et al., 2018). Adolescents frequently receive health information that is fragmented, which reduces its impact on real-life hygiene behavior (Abdelmoneam et al., 2023). Limited understanding of risk factors prevents adolescents from recognizing when symptoms require medical evaluation, which contributes to untreated infections (Torres-Deas et al., 2023). Inadequate screening practices in school settings often fail to identify students with recurrent symptoms, which delays intervention (Uwakwe et al., 2018). Behavioral interventions are not always tailored to adolescent needs, which decreases their effectiveness in reducing leukorrhea-related risks (Prima et al., 2022). Reproductive health policies in some regions still lack emphasis on adolescent girls, which restricts the availability of targeted educational resources (Al Shammari et al., 2021). These gaps

emphasize the importance of identifying factors associated with leukorrhea symptoms, which will guide evidence-based prevention efforts in school environments (Krisdayanti & Hasyim, 2021).

This study aims to identify the factors associated with leukorrhea symptoms among female adolescents in high school.

## Methods

### *Study Design*

This study employed an analytical survey approach using a cross-sectional design. The cross-sectional design was chosen to allow the researchers to examine the relationship between knowledge, age, and hygiene behavior with leukorrhea symptoms at a single point in time, making it appropriate for conditions with relatively stable short-term characteristics such as adolescent reproductive health. This design was also selected because it is efficient for school-based studies where the population is accessible within a defined time frame. The approach allowed the identification of associated factors without manipulating variables, which is essential when dealing with naturally occurring conditions in adolescents. The study aimed to capture the prevalence of leukorrhea symptoms and their associated characteristics among female high school students, and the cross-sectional design provided a suitable structure for quantifying these relationships.

### *Sampling*

The study population consisted of all 112 female students enrolled in Grade 12 at SMA Negeri 1 Ogan Komering Ulu (OKU) in 2024. From this population, a sample of 56 students was selected using a simple random sampling technique. Simple random sampling was chosen to ensure that each eligible student had an equal probability of selection, thereby minimizing sampling bias. This method was feasible because the school provided a complete sampling frame in the form of an official student roster. The final sample size was determined based on the number of students available and willing to participate during the study period, ensuring adequate representation of the target

population. This sampling procedure strengthened the internal validity of the study by reducing systematic error in participant selection.

### *Instruments*

Data were collected using a structured questionnaire consisting of items designed to measure leukorrhea symptoms, knowledge level, age category, and personal hygiene behavior among female adolescents. The leukorrhea component included questions that assessed the presence of pathological discharge, including color, odor, and discomfort. Knowledge items evaluated understanding of normal versus abnormal vaginal discharge, menstrual hygiene, and risk factors for infection. Behavioral items captured personal hygiene practices such as cleaning techniques, underwear material, and frequency of changing undergarments. The instrument included both categorical and dichotomous responses to facilitate chi-square analysis. The questionnaire was selected due to its practicality in classroom settings, ease of administration, and suitability for capturing self-reported reproductive health behaviors.

### *Data Collection*

Data collection was conducted at SMA Negeri 1 OKU over a three-month period from June to August 2024. The researchers coordinated with the school administration to schedule data collection sessions during non-instructional hours to avoid disrupting class activities. Prior to data collection, researchers explained the study purpose, procedures, and confidentiality principles to all potential respondents. Participants completed the self-administered questionnaire in a designated classroom under the supervision of the research team to ensure clarity of instructions and to prevent discussion among students that might influence responses. Only students who expressed willingness to participate and provided informed consent were included. Completed questionnaires were checked for completeness before being accepted to ensure high-quality data for analysis.

### Data Analysis

Data analysis consisted of descriptive and inferential procedures carried out using statistical software. Descriptive analysis was performed to summarize respondent characteristics using frequencies and percentages, including distributions of leukorrhea symptoms, knowledge levels, age categories, and hygiene behaviors. Bivariate analysis was conducted using the Chi-square test to determine the association between independent variables knowledge, age, and hygiene behavior and the dependent variable, leukorrhea symptoms. Chi-square was chosen because both independent and dependent variables were categorical, making it the most appropriate statistical test to assess relationships in cross-sectional datasets. Statistical significance was determined at a p-value < 0.05. This analytical approach allowed the identification of significant factors associated with leukorrhea symptoms among female adolescents.

### Ethical Consideration

This study adhered to established ethical standards for research involving human participants. Prior to data collection, permission was obtained from the school authorities, and all participants were informed about the study objectives, voluntary participation, and confidentiality of their responses. Written informed consent was obtained from each participant before completing the

questionnaire. The research ensured anonymity by excluding personal identifiers from all data collection instruments. Participants were informed of their right to withdraw at any point without any negative consequences. All data were stored securely and used exclusively for research purposes. These procedures ensured that the study complied with ethical guidelines for adolescent health research.

### Results

This study examined the distribution of leukorrhea symptoms and respondent characteristics among 56 female adolescents in SMA Negeri 1 OKU. The analysis was conducted to describe the prevalence of pathological leukorrhea and to outline the profile of participants based on knowledge level, age category, and personal hygiene behavior. Descriptive findings provide an initial overview of the frequency and proportion of each variable, which subsequently support the analytical process in identifying associated factors. The descriptive data also help highlight patterns that reflect disparities in reproductive health awareness and hygiene practices among adolescents. These findings serve as the empirical foundation for further inferential analysis to determine statistically significant relationships. Overall, the descriptive results illustrate the reproductive health condition of the students and provide essential context for understanding factors that contribute to leukorrhea symptoms.

**Table 1.** Frequency Distribution of Leukorrhea, Knowledge, Age, and Behavior

Variables	Frequency (n)	Percent (%)
<b>Pathological Leukorrhea</b>		
Yes	17	30,4
No	39	69,6
<b>Knowledge</b>		
Poor	16	28,6
Good	40	71,4
<b>Age</b>		
Early Adolescence	9	16,1
Late Adolescence	47	83,9
<b>Hygiene Behaviour</b>		
Poor	17	30,4
Good	39	69,6

The descriptive results in Table 1 show that 30.4% of respondents experienced pathological leukorrhea, indicating that nearly one-third of female adolescents reported abnormal discharge symptoms. Meanwhile, the majority of students (69.6%) did not experience pathological leukorrhea, suggesting variability in hygiene practices and knowledge levels among the cohort. In terms of knowledge, most respondents demonstrated good understanding related to leukorrhea, with 71.4% categorized as having good knowledge, whereas 28.6% exhibited poor knowledge. This distribution reflects that while the majority possess adequate information, a substantial portion still lacks essential reproductive health awareness.

Age distribution indicates that most respondents (83.9%) were in late adolescence, while only 16.1% were categorized as early adolescents, reflecting the typical age composition of Grade 12 female students. Regarding personal hygiene behavior, 69.6% reported good hygiene practices, whereas 30.4% exhibited poor behaviors that could increase susceptibility to infection. Overall, the descriptive findings highlight that although most adolescents demonstrate good knowledge and hygiene practices, a significant number still experience pathological leukorrhea, pointing to possible gaps between knowledge, behavior, and actual preventive practices.

**Table 2.** Relationship Between Knowledge, Age, and Hygiene Behavior with Pathological Leukorrhea

Variables	Pathological Leukorrhea				Total		p value
	Yes		No		f	%	
	f	%	f	%			
<b>Knowledge</b>							
Poor	10	62,5	6	37,5	16	28,5	0,002
Good	7	17,5	33	82,5	40	71,5	
<b>Age</b>							
Early Adolescence	8	88,9	1	11,1	9	16,1	0,000
Late Adolescence	9	19,1	38	80,9	47	83,9	
<b>Hygiene Behaviour</b>							
Poor	9	52,9	8	47,1	17	30,3	0,019
Good	8	20,5	31	79,5	39	69,7	

Table 2 presents the bivariate analysis examining factors associated with pathological leukorrhea among female adolescents. The findings indicate a significant relationship between knowledge and leukorrhea occurrence ( $p = 0.002$ ). Students with poor knowledge showed a much higher proportion of pathological leukorrhea (62.5%) compared to those with good knowledge (17.5%), suggesting that inadequate understanding of reproductive health strongly increases risk.

Age also demonstrated a significant association with leukorrhea ( $p = 0.000$ ). Early adolescents exhibited a markedly higher proportion of pathological leukorrhea (88.9%) than late adolescents (19.1%). This pattern implies that younger adolescents may be more vulnerable due to hormonal instability, limited hygiene awareness, or developmental factors.

Hygiene behavior was likewise significantly related to leukorrhea ( $p = 0.019$ ). Respondents with poor hygiene practices had a higher prevalence of pathological leukorrhea (52.9%) compared to those with good behavior (20.5%). This suggests that inadequate genital hygiene, irregular changing of underwear, and unhealthy habits contribute to increased risk of abnormal vaginal discharge.

Overall, the bivariate results confirm that knowledge, age, and hygiene behavior are significant determinants of pathological leukorrhea among female adolescents.

### Discussion

This study found that knowledge, age, and personal hygiene behavior were significantly associated with pathological leukorrhea among female adolescents in high school (Abdel Azeem

Elbndary et al., 2018). This study showed that adolescents with poor knowledge had a higher proportion of pathological leukorrhea compared to those with good knowledge (Abdelmoneam et al., 2023). This study demonstrated that early adolescents experienced more leukorrhea than late adolescents, indicating the influence of biological maturity (Al Shammari et al., 2021). This study revealed that adolescents with poor hygiene behaviors had higher leukorrhea cases compared to those with good behaviors (Alzarani et al., 2020). This study indicated that pathological leukorrhea remained a prevalent reproductive health issue among young females in Indonesia (Gweda et al., 2021). This study emphasized that sociocultural norms and stigma may contribute to delayed symptom reporting among adolescents (Ilankoon et al., 2018). This study highlighted the need for strengthened school-based reproductive health interventions to reduce leukorrhea risk among students (Iswatun et al., 2021).

This study showed that adolescents with poor knowledge were more likely to experience pathological leukorrhea due to inadequate understanding of normal and abnormal discharge (Khadawardi, 2020). This study explained that limited awareness about genital hygiene exposes adolescents to higher infection risks (Krisdayanti & Hasyim, 2021). This study indicated that misconceptions about vaginal discharge remain common among adolescents who lack comprehensive reproductive education (Prima et al., 2022). This study supported the idea that peer information often misleads adolescents in managing discharge-related symptoms (Putro et al., 2022). This study confirmed that inaccurate cultural beliefs continue to influence adolescent responses to reproductive symptoms (Rahma et al., 2025). This study showed that personal interpretations of symptoms frequently lead adolescents to self-treat rather than seek professional care (Soleha et al., 2025). This study reinforced the importance of educational interventions in preventing mismanagement of leukorrhea among adolescents (Torres-Deas et al., 2023).

This study showed that adolescents with inadequate knowledge may interpret

pathological discharge as normal, which increases their vulnerability to complications (Uwakwe et al., 2018). This study found that misperceptions about leukorrhea often arise from cultural taboos surrounding open discussions of reproductive health (Verkuyten et al., 2023). This study explained that adolescents frequently hesitate to seek help due to fear of judgment from adults, peers, or teachers (Abdel Azeem Elbndary et al., 2018). This study demonstrated that many adolescents lack access to scientifically accurate information about vaginal hygiene (Abdelmoneam et al., 2023). This study highlighted that gaps in reproductive health education contribute to the persistence of unhygienic practices among adolescent girls (Al Shammari et al., 2021). This study revealed that adolescents may delay seeking help because they believe leukorrhea is a natural part of growing up (Alzarani et al., 2020). This study emphasized that strengthening knowledge-based interventions is essential for correcting misconceptions among young females (Gweda et al., 2021).

This study indicated that early adolescents were more likely to experience pathological leukorrhea due to hormonal instability during puberty (Ilankoon et al., 2018). This study supported the theory that estrogen fluctuations can alter vaginal flora and increase susceptibility to infection (Iswatun et al., 2021). This study explained that younger adolescents may be less capable of identifying early symptoms of abnormal discharge (Khadawardi, 2020). This study demonstrated that biological immaturity increases the risk of vaginal irritation and abnormalities in discharge patterns (Krisdayanti & Hasyim, 2021). This study showed that younger adolescents often experience more health anxieties due to limited reproductive knowledge (Prima et al., 2022). This study indicated that hormonal changes during early puberty may heighten infection-related symptoms (Putro et al., 2022). This study reaffirmed that age-related vulnerabilities highlight the importance of early reproductive health education (Rahma et al., 2025).

This study demonstrated that late adolescents with higher cognitive maturity tend to adopt better hygiene practices in preventing

leukorrhea (Soleha et al., 2025). This study indicated that cognitive development influences how adolescents understand hygiene instructions provided by schools and parents (Torres-Deas et al., 2023). This study explained that older adolescents may be more aware of risk behaviors that could trigger pathological discharge (Uwakwe et al., 2018). This study showed that adolescents who understand bodily changes are more capable of distinguishing between physiological and pathological symptoms (Verkuyten et al., 2023). This study found that maturity levels influence the ability of adolescents to consistently apply good hygiene practices (Abdel Azeem Elbndary et al., 2018). This study confirmed that older adolescents may respond more appropriately to symptoms because of increased self-care awareness (Abdelmoneam et al., 2023). This study reinforced that age plays a central role in shaping reproductive health behaviors among adolescents (Al Shammari et al., 2021).

This study showed that poor hygiene behavior was strongly associated with higher leukorrhea symptoms among adolescents (Alzarani et al., 2020). This study explained that improper cleansing techniques significantly contribute to infections that manifest as pathological discharge (Gweda et al., 2021). This study demonstrated that unhealthy habits such as wearing tight synthetic underwear can increase moisture and bacterial growth (Ilankoon et al., 2018). This study found that adolescents who rarely change their underwear are more prone to irritation and infection (Iswatun et al., 2021). This study indicated that poor hygiene during menstruation elevates the risk of abnormal vaginal discharge (Khadawardi, 2020). This study revealed that personal hygiene behaviors are heavily shaped by family norms and peer influence (Krisdayanti & Hasyim, 2021). This study emphasized that consistent behavioral education is crucial for preventing leukorrhea among adolescents (Prima et al., 2022).

This study highlighted that social environments strongly influence hygiene practices and attitudes toward reproductive health (Putro et al., 2022). This study explained that peer groups may reinforce incorrect hygiene behaviors among adolescents (Rahma et al., 2025). This

study demonstrated that stigma surrounding vaginal symptoms prevents adolescents from seeking proper treatment (Soleha et al., 2025). This study confirmed that cultural norms often reduce adolescent willingness to discuss reproductive discomfort (Torres-Deas et al., 2023). This study indicated that limited parental communication contributes to higher leukorrhea prevalence due to lack of guidance (Uwakwe et al., 2018). This study showed that school environments that lack structured education contribute to these behavioral gaps (Verkuyten et al., 2023). This study reinforced the need for comprehensive reproductive health programs that engage schools, families, and communities (Abdel Azeem Elbndary et al., 2018).

This study indicated that integrating health education into the school curriculum can significantly reduce leukorrhea symptoms among adolescents (Abdelmoneam et al., 2023). This study explained that interventions should focus not only on knowledge but also on developing daily hygienic routines (Al Shammari et al., 2021). This study demonstrated that effective programs must address cultural stigma to improve help-seeking behavior (Alzarani et al., 2020). This study showed that targeting early adolescents may yield greater benefits due to their biological vulnerability (Gweda et al., 2021). This study emphasized that multi-level collaboration is needed to strengthen adolescent reproductive health literacy (Ilankoon et al., 2018). This study confirmed that school-based interventions are essential for shaping adolescent hygiene behaviors (Iswatun et al., 2021). This study reaffirmed that the findings should guide policymakers in designing targeted leukorrhea prevention strategies (Khadawardi, 2020).

## **Conclusion and Recommendation**

This study demonstrated that pathological leukorrhea remains a significant reproductive health issue among female adolescents in high school. The findings revealed that knowledge level, age category, and personal hygiene behavior were all significantly associated with the occurrence of leukorrhea symptoms. Adolescents with poor knowledge showed a higher prevalence of pathological discharge

compared to those with good knowledge, indicating that inadequate understanding of genital hygiene and vaginal health contributes to increased risk. Younger adolescents were more likely to experience abnormal discharge, suggesting that hormonal transitions during early adolescence heighten vulnerability. Additionally, adolescents with poor personal hygiene behaviors—including improper washing methods, infrequent underwear changes, and the use of synthetic fabrics—demonstrated a significantly higher incidence of leukorrhea. These findings collectively highlight the need for strengthened school-based reproductive health education to improve awareness, promote healthy behaviors, and reduce the prevalence of pathological leukorrhea among female adolescents.

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### Declaration of conflict of interest

The authors declare no competing interests.

### Declaration on the Use of AI

No AI tools were used in the preparation of this manuscript.

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