

Leaflet-Based Education for Dysmenorrhea Management Among Adolescent Girls: A Pretest–Posttest Study of Knowledge and Attitude

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Abstract:

Dysmenorrhea is a prevalent reproductive health concern among adolescent girls and may impair daily functioning, school attendance, and academic participation. Limited knowledge and unfavorable attitudes can prevent adolescents from adopting appropriate self-management practices or seeking timely healthcare. This study evaluated changes in knowledge and attitudes regarding the management of dysmenorrhea following a leaflet-based educational intervention among adolescent girls at State Junior High School 2 in Bengkulu City, Indonesia. A quantitative pre-experimental study with a one-group pretest–posttest design was conducted among 20 eligible students recruited through simple random sampling. Participants received a standardized group educational session accompanied by a leaflet that covered the definition, causes, symptoms, effects, prevention, and pharmacological and non-pharmacological management of dysmenorrhea. Knowledge and attitudes were assessed using structured self-administered questionnaires before and immediately after the intervention. Preintervention and postintervention scores were compared using paired-samples t-tests. The mean knowledge score increased from 13.75 (SD = 1.37) to 17.15 (SD = 1.18), representing a mean improvement of 3.40 points ($p = 0.001$). The mean attitude score increased from 45.65 (SD = 4.98) to 53.95 (SD = 2.80), with a mean improvement of 8.30 points ($p = 0.001$). Leaflet-supported education was associated with significant immediate improvements in participants' knowledge and attitudes toward the management of dysmenorrhea. This low-cost and accessible approach may support school-based menstrual health education. However, controlled studies with larger sample sizes, validated instruments, and longer follow-up periods are required to establish effectiveness and sustainability.

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INTRODUCTION

Dysmenorrhea represents a prevalent reproductive health concern among adolescent girls worldwide and can substantially affect their physical, psychological, and social well-being. The condition is characterized by painful uterine cramps occurring before or during menstruation, frequently accompanied by fatigue, nausea, headache, dizziness, diarrhea, or emotional changes. These symptoms may interfere with sleep, concentration, mobility, social participation, and academic activities (Donayeva et al., 2023). Adolescence is a critical developmental period in which menstrual experiences can shape long-term perceptions and health-related behaviors. Appropriate knowledge of dysmenorrhea management is therefore essential for helping adolescent girls recognize symptoms, select safe self-care strategies, and seek professional assistance when necessary

(Unnisa et al., 2022). Dysmenorrhea-related impairment has been associated with reduced quality of life and limitations in daily functioning among young females (Esan et al., 2024).

Adolescent girls in school settings frequently experience difficulties managing dysmenorrhea because their knowledge and access to reliable reproductive health information remain limited. Menstrual pain is often considered a normal condition that must be tolerated, even when its severity disrupts everyday functioning. Misconceptions may encourage ineffective practices, inappropriate medication use, avoidance of physical activity, or reluctance to consult healthcare professionals (Liu et al., 2025). Feelings of embarrassment and cultural sensitivity surrounding menstruation can further restrict communication with parents, teachers, school health personnel, and peers. Poor management may contribute to school absenteeism, reduced classroom engagement, impaired academic performance, and diminished quality of life (Li et al., 2024). Dysmenorrhea management barriers may also influence adolescents' healthcare-seeking behavior and their ability to access appropriate support (Rodrigues et al., 2024).

The management of dysmenorrhea requires knowledge of both pharmacological and non-pharmacological approaches, as well as awareness of symptoms requiring clinical evaluation. Common self-management strategies include adequate rest, warm compresses, light physical activity, relaxation techniques, balanced nutrition, hydration, and the responsible use of analgesic medication (Rashmi & Ummer, 2025). Adolescent girls also need to distinguish common primary dysmenorrhea from severe, persistent, or progressively worsening pain that may indicate an underlying health condition. Health education delivered in accessible language can correct misconceptions, strengthen confidence, and promote more constructive attitudes toward menstrual health (Lestari & Rokhanawati, 2024). Schools provide a strategic environment for such education because they reach adolescents during a formative stage of health-behavior development (Brooks et al., 2026).

Current school-based reproductive health interventions employ various educational media, including lectures, booklets, posters, videos, digital platforms, peer education, and leaflets. Leaflets remain particularly relevant because they are inexpensive, portable, easy to distribute, and usable without internet access or electronic devices. Concise written explanations supported by organized headings and visual elements allow students to review information privately and repeatedly at their own pace. Previous educational interventions have generally demonstrated improvements in knowledge of menstrual health following exposure to structured learning materials (Roux et al., 2022; Nastit et al., 2023). Evidence concerning changes in attitudes, practical application, and effectiveness across specific school populations nevertheless remains less consistent (Yogesh et al., 2023).

Existing research leaves important gaps regarding the contribution of leaflet-based education to the management of dysmenorrhea among junior high school students in Bengkulu City. Many studies focus broadly on menstrual hygiene or reproductive health without specifically examining knowledge and attitudes toward the management of menstrual pain. Some investigations assess knowledge alone, despite the importance of attitudes in help-seeking, treatment acceptance, and self-management decisions (Betsu et al., 2023). Variations in adolescent characteristics, school environments, cultural beliefs, and access to healthcare information also limit the direct application of findings from other settings (Ene et al., 2024). Local evidence is required to determine whether leaflet-assisted education is appropriate for students within this particular educational and sociocultural context (Ghimire et al., 2024).

The present study offers contextual novelty by simultaneously evaluating changes in knowledge and attitudes following a structured, leaflet-based educational intervention among adolescent girls at State Junior High School 2 in Bengkulu City. The use of educational materials,

combined with structured delivery methods, is supported by evidence that school-based menstrual health education can improve adolescents' knowledge of menstrual health and related outcomes (Evans et al., 2022). The leaflet integrates information on the definition, causes, symptoms, effects, prevention, and pharmacological and non-pharmacological management of dysmenorrhea. The intervention combines independent reading with group instruction and opportunities for clarification, allowing the printed material to serve as both an immediate learning aid and a resource participants can retain. The assessment of pre-intervention and post-intervention scores provides preliminary evidence regarding changes associated with exposure to this educational approach (Fuadah et al., 2026).

This study aims to determine the effect of leaflet-based education on adolescent girls' knowledge and attitudes toward managing dysmenorrhea at State Junior High School 2, Bengkulu City. The research is urgent because inadequate understanding and unfavorable attitudes may lead students to normalize disabling pain, adopt inappropriate coping practices, or delay necessary healthcare. Evidence from school-based menstrual health interventions indicates that educational programs can improve knowledge, perceptions, and practices regarding menstrual health among adolescent girls (Tembo et al., 2023). Evidence from large-scale school-based menstrual health programs also suggests that improving menstrual knowledge and awareness may contribute to better health-related behaviors and educational participation among girls (Andargie & Tinuola, 2025). Evidence from this study can support school nurses, teachers, community health professionals, and policymakers in developing practical and culturally appropriate menstrual health programs. Effective education may strengthen self-management, encourage timely help-seeking, reduce disruption to school participation, and improve adolescent girls' reproductive health and overall well-being.

METHOD

Study Design

This study employed a quantitative, pre-experimental design using a one-group pretest–posttest approach. The design was used to evaluate changes in adolescent girls' knowledge and attitudes regarding dysmenorrhea management following a leaflet-based educational intervention. Each participant completed the same outcome measurements before and after the intervention, thereby serving as her own comparator. No control group or random allocation was included in the study design.

Setting

The study was conducted at State Junior High School 2, Bengkulu City, Bengkulu, Indonesia. The pretest, educational intervention, and posttest were conducted in a private room to provide a comfortable environment and maintain participant privacy.

Population, Sample, and Sampling

The target population comprised adolescent girls enrolled at State Junior High School 2, Bengkulu City. A total of 20 eligible students participated in the study. Participants were recruited using simple random sampling based on predefined eligibility criteria.

The inclusion criteria were enrolment status, age range, menstruation history, willingness to participate, and ability to read the leaflet. The exclusion criteria were absence from the intervention, incomplete questionnaires, or health conditions that affected participation.

Educational Intervention

Participants received a leaflet-based educational intervention addressing dysmenorrhea and its management. The leaflet presented information concerning the definition, causes, signs and symptoms, effects, prevention, and pharmacological and non-pharmacological management of dysmenorrhea. The educational content was developed based on clinical guidelines, textbooks, and previous studies.

The researcher delivered the intervention through a group education session lasting approximately 60 minutes. Participants were given 15 minutes to read the leaflet and were allowed to ask questions regarding the material. Each participant retained the leaflet after the educational session. Intervention fidelity was maintained through a standardized teaching protocol, identical leaflet materials, and a facilitator checklist.

Instrument and Measurement Properties

Knowledge and attitudes regarding dysmenorrhea management were assessed using a structured, self-administered questionnaire comprising separate knowledge and attitude domains. The knowledge domain evaluated participants' understanding of dysmenorrhea and its management, whereas the attitude domain assessed their beliefs and responses toward appropriate management practices.

Data Collection Procedure

Potential participants and their parents or legal guardians received information about the study objectives, procedures, potential benefits and risks, confidentiality safeguards, and the voluntary nature of participation. Eligible students were enrolled after written parental, or guardian consent and participant assent were obtained. Participants completed the pretest questionnaire before receiving the educational intervention. The leaflet-based education was subsequently delivered in accordance with the standardized intervention protocol. The posttest questionnaire was administered immediately after the intervention. Identical instruments and administration procedures were used during the pretest and posttest assessments. Completed questionnaires were checked for completeness and assigned unique identification codes. Participant names and other directly identifying information were excluded from the analytical dataset. Research personnel followed standardized instructions to minimize differences in data collection procedures.

Data Analysis

Data were analyzed using IBM SPSS Statistics. Participant characteristics were summarized using frequencies and percentages for categorical variables. Knowledge and attitude scores were summarized using means and standard deviations or medians and interquartile ranges, depending on the data distribution. The normality of the paired score differences was evaluated using the Shapiro–Wilk test. Preintervention and postintervention scores were compared using a paired-samples t-test when the assumption of normality was satisfied. Mean differences, 95% confidence intervals, effect sizes, and exact p-values should be reported to describe both the statistical significance and magnitude of the intervention effect. All tests were two-sided, with statistical significance established at $p < 0.05$.

Ethical Declaration

Ethical approval was obtained from the relevant ethics committee at Muhammadiyah University of Bengkulu before participant recruitment and data collection. Written informed consent was obtained from the participants' parents or legal guardians because the participants were minors.

Written assent was also obtained from each participating student. Participation was voluntary, and participants could withdraw from the study at any time without academic or personal consequences. Participant confidentiality was protected through coded questionnaires, restricted data access, and secure data storage. All study procedures were conducted in accordance with applicable institutional ethical requirements and the principles of the Declaration of Helsinki.

RESULT

A total of 20 participants were included in the analysis. The results assessed changes in participants' knowledge and attitudes toward dysmenorrhea management before and after the leaflet-based educational intervention. The pre- and post-intervention scores are presented in Table 1.

Table 1. Knowledge and Attitude Scores Before and After the Educational Intervention (N = 20)

Variable	Measurement time	n	Mean	SD	Mean change	p
Knowledge	Pre-intervention	20	13.75	1.372	3.40	0.001
	Post-intervention	20	17.15	1.182		
Attitude	Pre-intervention	20	45.65	4.977	8.30	0.001
	Post-intervention	20	53.95	2.800		

The results presented in Table 1 demonstrate significant improvements in both knowledge and attitude following the leaflet-based educational intervention. The mean knowledge score increased from 13.75 to 17.15, with a mean change of 3.40 points ($p = .001$). Similarly, the mean attitude score increased from 45.65 to 53.95, representing an 8.30-point improvement ($p = .001$). The lower post-intervention SDs for both knowledge and attitude also indicate reduced variability in participants' scores following the intervention.

DISCUSSION

The present study identified significant improvements in adolescent girls' knowledge and attitudes regarding dysmenorrhea management following a leaflet-based educational intervention. The mean knowledge score increased from 13.75 before the intervention to 17.15 after the intervention, with a mean difference of 3.40 points. The mean attitude score increased from 45.65 to 53.95, producing a mean difference of 8.30 points. Both changes were statistically significant at $p = 0.001$. The standard deviations of the knowledge and attitude scores also decreased after the intervention, suggesting that participants' responses became more homogeneous. These findings indicate that exposure to structured health information via leaflets was associated with improved understanding and more favorable attitudes toward the management of dysmenorrhea among the participating students (Koçoğlu et al., 2025).

The improvement in knowledge supports the value of structured educational materials for addressing reproductive health information gaps among adolescents. Previous school-based studies have similarly reported higher knowledge scores after educational interventions delivered through leaflets, booklets, posters, or classroom presentations (Evans et al., 2022). Adolescents commonly receive menstrual health information from family members, peers, social media, or other informal sources that may provide incomplete or inaccurate explanations (Jones et al., 2023). A systematically prepared leaflet can present essential information about dysmenorrhea in a concise and accessible format. The observed increase of 3.40 points suggests that participants acquired

information that had not been adequately understood before the intervention. The smaller post-intervention standard deviation also suggests that the educational material may have reduced knowledge disparities among participants with different baseline levels of understanding.

The educational characteristics of leaflets offer a plausible explanation for the improvement in knowledge. Printed materials combine brief written explanations, organized headings, and visual elements to support attention, comprehension, and information retention (Tang et al., 2025). The ability to read the material repeatedly allows students to process unfamiliar terms at their own pace and revisit information that was not immediately understood, provided the language and readability level are appropriate for adolescent readers (Nkrumah et al., 2025). Repeated exposure can strengthen memory encoding and improve the retrieval of information concerning symptoms, causes, preventive measures, and appropriate management strategies. Leaflets may also reduce embarrassment because students can obtain information privately without having to discuss sensitive reproductive health concerns in front of their peers. These characteristics make leaflet-based education particularly suitable for adolescent health topics that may be affected by stigma, discomfort, or limited opportunities for open discussion.

The improvement in attitude scores is consistent with previous research showing that reproductive health education can promote more constructive perceptions of menstrual pain. Educational interventions targeting menstrual health have been shown to improve adolescents' attitudes by increasing awareness, reducing misconceptions, and strengthening confidence in menstrual management practices (Yogesh et al., 2024). Negative attitudes toward dysmenorrhea may include accepting severe pain as an unavoidable condition, avoiding help-seeking, using medication without adequate information, or withdrawing from school activities without attempting appropriate symptom management. Accurate education can challenge these perceptions by presenting dysmenorrhea as a manageable health concern rather than a problem that must be tolerated. The 8.30-point increase in the present study suggests that participants developed more favorable views toward appropriate management practices after receiving the intervention. The reduction in attitude-score variability also suggests that the participants developed more consistent perceptions following exposure to the same educational content. Similar findings have been reported in adolescent menstrual health education programs, where structured education improved knowledge and attitudes related to menstrual management (Nastiti et al., 2023).

The relationship between knowledge acquisition and attitude development provides another explanation for the observed findings. Health behavior models generally describe knowledge as an important cognitive foundation for the formation of beliefs, evaluations, and behavioral intentions. Adolescents who understand the mechanisms, symptoms, and management of dysmenorrhea may feel more confident in evaluating available treatment options and seeking assistance when necessary. Greater understanding may also reduce fear, misconceptions, and feelings of helplessness associated with menstrual pain. The concurrent improvement in knowledge and attitudes observed in this study is compatible with this theoretical sequence. Previous reproductive health interventions among adolescents have demonstrated that increasing health knowledge can improve attitudes and health-related decision-making (Kosasih et al., 2024). The study did not formally test whether knowledge mediated the change in attitudes, so the proposed relationship should be interpreted as a plausible mechanism rather than a demonstrated causal pathway. Evidence from studies examining menstrual health knowledge, attitudes, and practices also indicates that educational exposure can strengthen adolescents' understanding and promote more positive perceptions toward menstrual health management (Ene et al., 2024).

The statistical findings require interpretation beyond the reported p-values. A p-value of 0.001 indicates that the observed preintervention–postintervention differences would be unlikely under the

null hypothesis of no mean change, assuming that the statistical assumptions were satisfied. Statistical significance alone does not establish the clinical, educational, or practical importance of the changes (Phillips et al., 2022). Effect sizes and 95% confidence intervals would provide a more informative estimate of the magnitude and precision of the intervention effect (Verhoef et al., 2022). The available mean differences suggest potentially meaningful improvements, especially in attitude scores, but the absence of scale ranges and established thresholds limits interpretation of their practical relevance. Future reporting should include standardized effect sizes, confidence intervals, and the proportion of participants reaching predefined adequate-knowledge or positive-attitude categories.

The findings have practical implications for school-based health promotion programs. School nurses, community nurses, teachers, and primary healthcare professionals can use carefully designed leaflets to support menstrual health education for adolescent girls. Leaflets are relatively inexpensive, portable, easy to distribute, and suitable for settings with limited digital infrastructure. School health programs may integrate leaflet education into reproductive health classes, counseling services, student orientation activities, or routine health promotion sessions (Ghimire et al., 2024). Educational content should explain evidence-informed self-management strategies, including adequate rest, warm compresses, appropriate physical activity, healthy dietary practices, and responsible medication use. Clear guidance should also identify warning signs that require professional assessment, such as severe or progressively worsening pain, abnormal bleeding, fainting, fever, or symptoms that substantially interfere with daily functioning (Yogesh et al., 2024).

Leaflet-based education may produce greater benefits when combined with interactive educational strategies. Printed information alone cannot ensure that students correctly interpret every message or apply the recommended practices in real situations. Facilitated discussion, question-and-answer sessions, demonstrations, peer education, and access to school health personnel can reinforce the leaflet's content (Öztürk et al., 2023). Adolescent-friendly language and culturally appropriate illustrations may improve engagement and reduce misunderstandings. Involvement of parents or guardians may strengthen support for appropriate management of dysmenorrhea at home, if participant privacy and autonomy are respected (Boku et al., 2024). Periodic reinforcement sessions may also help maintain improvements in knowledge and attitudes, as immediate postintervention gains can decline when information is not revisited.

Several design limitations restrict the strength of the causal interpretation. The one-group pretest–posttest design did not include a control group, making it impossible to separate the intervention effect from testing effects, maturation, exposure to external information, or other time-related influences (Pan & Carpenter, 2023). Participants may have remembered questions from the pretest and subsequently provided better responses during the posttest without achieving an equivalent improvement in lasting understanding. The small sample of 20 students reduced statistical precision and increased the possibility that the results were influenced by the characteristics of a limited number of participants (Cao et al., 2024). Recruitment from a single junior high school also limited the generalizability of the findings to adolescents across different schools, age groups, cultural backgrounds, socioeconomic conditions, and healthcare settings.

Measurement and follow-up limitations also require consideration. The use of a self-administered questionnaire created a risk of social desirability bias, particularly for attitude items with responses that participants may have perceived as more acceptable. Insufficient reporting of questionnaire development, scoring procedures, validity, and reliability prevents a full assessment of measurement quality. The timing of the posttest was not clearly described, limiting the ability to determine whether the findings represented immediate recall or sustained educational improvement. The analysis did not report missing-data procedures, assumption testing, confidence intervals, or

effect sizes. Attitudes were measured as self-reported responses rather than observed management behavior, meaning that improved scores should not be interpreted as direct evidence of behavioral change or improved health outcomes. These concerns are consistent with evidence that survey administration methods and self-reported responses can influence reporting patterns and introduce social desirability bias. (Rickwood & Coleman-Rose, 2023)

Future research should use a controlled design with a larger, more diverse sample to provide stronger evidence of the intervention's effectiveness. Cluster-randomized or quasi-experimental studies involving several schools could reduce contamination while improving external validity. Repeated assessments conducted immediately after the intervention and at several follow-up points could determine whether changes in knowledge and attitudes are sustained over time. Validated instruments should be used to measure knowledge, attitudes, self-management practices, pain intensity, school absenteeism, healthcare-seeking behavior, and quality of life. Comparative studies could evaluate leaflets against digital education, video-based instruction, peer-led sessions, or combined educational approaches. Process evaluations should also examine intervention fidelity, participant engagement, leaflet readability, cultural acceptability, and the extent to which students use the information during subsequent episodes of dysmenorrhea. Evidence from school-based menstrual health education research supports the use of controlled designs and follow-up assessments to evaluate changes in adolescent knowledge and attitudes over time. (Wahl et al., 2024).

CONCLUSION

Leaflet-based education was associated with significant improvements in adolescent girls' knowledge and attitudes regarding dysmenorrhea management. The findings support the potential use of concise, accessible, and culturally appropriate printed materials as a practical component of school-based reproductive health education. Integration of leaflet-based education with interactive discussion and professional guidance may strengthen adolescents' understanding, promote appropriate self-management, and encourage timely healthcare-seeking when warning signs occur. Future controlled studies involving larger and more diverse populations, validated measurement instruments, and longer follow-up periods are required to confirm the effectiveness and sustainability of this educational approach.

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CONFLICT OF INTEREST

There is no conflict of interest in this research. The research was carried out in accordance with procedures and with official research permission. Research is not related to the interests of other parties or anything else.

REFERENCES

- Andargie, F. A., & Tinuola, F. R. (2025). Effects of school menstrual hygiene management, water, sanitation, and hygiene interventions on girls' empowerment, health, and educational outcomes: Lasta district, Amhara regional state, Ethiopia. *PLOS ONE*, 20(4), e0321376. <https://doi.org/10.1371/journal.pone.0321376>
- Betsu, B. D., Medhanyie, A. A., Gebrehiwet, T. G., & Wall, L. L. (2023). "Menstruation is a fearful thing": A qualitative exploration of menstrual experiences and sources of information about menstruation among adolescent schoolgirls. *International Journal of Women's Health*, 15, 881–892. <https://doi.org/10.2147/IJWH.S407455>
- Boku, G. G., Garoma Abeya, S., Ayers, N., & Abera Wordofa, M. (2024). The effect of school-linked module-based friendly-health education on adolescents' sexual and reproductive health knowledge, Guji Zone, Ethiopia: Cluster randomized controlled trial. *Adolescent Health, Medicine and Therapeutics*, 15, 5–18. <https://doi.org/10.2147/AHMT.S441957>
- Brooks, A. E., Maybin, J. A., & Harper, J. C. (2026). Menstrual experiences of adolescent girls in schools: Recommendations for menstrual health education in England. *BMC Public Health*, 26, 946. <https://doi.org/10.1186/s12889-025-24681-1>
- Cao, Y., Chen, R. C., & Katz, A. J. (2024). Why is a small sample size not enough? *The Oncologist*, 29(9), 761–763. <https://doi.org/10.1093/oncolo/oyae162>
- Donayeva, A., Amanzholykyz, A., Abdelazim, I., Nurgaliyeva, R., Gubasheva, G., Saparbayev, S., Ayaganov, D., Kaldybayeva, A., & Samaha, I. (2023). The impact of primary dysmenorrhea on adolescents' activities and school attendance. *Journal of Medicine and Life*, 16(10), 1462–1467. <https://doi.org/10.25122/jml-2023-0247>
- Ene, N., Bolarinwa, O. A., Adedigba, C., Oyeleye, J., Boboye, I., Nwosu, U., Olususi, F., Oluwayemi, P., & Okeke, S. R. (2024). "If I use pad, I feel comfortable and safe": A mixed-method analysis of knowledge, attitude, and practice of menstrual hygiene management among in-school adolescent girls in a Nigerian city. *BMC Public Health*, 24, 1721. <https://doi.org/10.1186/s12889-024-19256-5>
- Esan, D. T., Ariyo, S. A., Akinlolu, E. F., Akingbade, O., Olabisi, O. I., Olawade, D. B., Bamigboye, T. O., & Ogunfowokan, A. A. (2024). Prevalence of dysmenorrhea and its effect on the quality of life of female undergraduate students in Nigeria. *Journal of Endometriosis and Uterine Disorders*, 5, 100059. <https://doi.org/10.1016/j.jeud.2024.100059>
- Evans, R. L., Harris, B., Onuegbu, C., & Griffiths, F. (2022). Systematic review of educational interventions to improve the menstrual health of young adolescent girls. *BMJ Open*, 12(6), e057204. <https://doi.org/10.1136/bmjopen-2021-057204>
- Fuadah, F., Yogisutanti, G., & Saragih, B. D. (2026). The effectiveness of digital media in improving menstrual hygiene knowledge among adolescent girls: A study in junior high schools in Bandung regency. *BMC Public Health*, 26, Article 65. <https://doi.org/10.1186/s12889-025-24967-4>
- Ghimire, S., Gahatraj, N. R., Shrestha, N., Manandhar, S., & Dhital, S. R. (2024). Effects of health education intervention on menstrual hygiene knowledge and practices among the adolescent girls of Pokhara Metropolitan, Nepal. *PLOS ONE*, 19(9), e0291884. <https://doi.org/10.1371/journal.pone.0291884>
- Jones, S. C., Boniface, E. R., Boehnlein, C., Jones Packham, A., & Baldwin, M. K. (2023). Menstrual health literacy among adolescents and young adults who menstruate: Impact of Christian family background and United States region. *Journal of Pediatric and Adolescent Gynecology*, 36(6), 518–524. <https://doi.org/10.1016/j.jpog.2023.07.006>
- Koçoğlu, F., Sezer, H. K., & Kocaöz, S. (2025). The effect of education on adolescents' knowledge of menstrual characteristics and treatment-seeking behavior. *Revista da Associação Médica Brasileira*, 71(5), e2025003. <https://doi.org/10.1590/1806-9282.2025003>
- Kosasih, C. E., Solehati, T., & Maryati, I. (2024). Comparing the effect of LINE-based and WhatsApp-based educational interventions on reproductive health knowledge, attitudes, and behaviors among

- Triad adolescents: A quasi-experimental study. *Belitung Nursing Journal*, 10(1), 87–95. <https://doi.org/10.33546/bnj.3033>
- Lestari, A., & Rokhanawati, D. (2024). Health education affects knowledge in the management of dysmenorrhea in adolescent girls. *International Journal of Health Science and Technology*, 6(1), 17–25. <https://doi.org/10.31101/ijhst.v6i1.3437>
- Li, X., Hao, X., Liu, J.-H., & Huang, J.-P. (2024). Efficacy of non-pharmacological interventions for primary dysmenorrhoea: A systematic review and Bayesian network meta-analysis. *BMJ Evidence-Based Medicine*, 29(3), 162–170. <https://doi.org/10.1136/bmjebm-2023-112434>
- Liu, T., Qi, D., Zhang, L., Hou, J., Zhao, J., Zhou, Y., Sun, B., Wang, F., Tan, H., & Wang, R. (2025). Academic stress and irregular menstruation influence the dysmenorrhea, school absenteeism and healthcare seeking among adolescent girls in junior high school in Shanghai: A cross-sectional study. *Frontiers in Reproductive Health*, 7, 1574195. <https://doi.org/10.3389/frph.2025.1574195>
- Nastit, A. A., Triharini, M., Pratiwi, A. H., & Kamel Gouda, A. D. (2023). Educational intervention to improve menstrual hygiene management in adolescent girls in Kalimantan, Indonesia. *Journal of the Pakistan Medical Association*, 73(2), S13–S17. <https://doi.org/10.47391/JPMA.Ind-S2-3>
- Nkrumah, J., Abuosi, A. A., Yarney, L., & Baku, A. A. A. (2025). Linguistic difficulties of health educational materials: A sub-national-level assessment and implications for adolescent health literacy in Ghana. *Health Education*, 125(2), 155–169. <https://doi.org/10.1108/HE-11-2023-0111>
- Öztürk, F. Ö., Doğan, E., Gedikaslan, E., & Yılmaz, H. Y. (2023). The effect of structured health promotion education given to adolescents on health literacy and health-promoting behaviors. *Journal of Pediatric Nursing*, 73, e579–e585. <https://doi.org/10.1016/j.pedn.2023.10.036>
- Pan, S. C., & Carpenter, S. K. (2023). Prequestioning and pretesting effects: A review of empirical research, theoretical perspectives, and implications for educational practice. *Educational Psychology Review*, 35, Article 97. <https://doi.org/10.1007/s10648-023-09814-5>
- Phillips, M. R., Wykoff, C. C., Thabane, L., Bhandari, M., Chaudhary, V., & Retina Evidence Trials International Alliance Study Group. (2022). The clinician's guide to p values, confidence intervals, and magnitude of effects. *Eye*, 36, 341–342. <https://doi.org/10.1038/s41433-021-01863-w>
- Rashmi, A., & Ummer, F. B. (2025). Development & validation of a health education module on menstrual health for adolescent girls: A pilot study. *Indian Journal of Medical Research*, 161(5), 473–481. https://doi.org/10.25259/IJMR_1408_2024
- Rickwood, D. J., & Coleman-Rose, C. (2023). The effect of survey administration mode on youth mental health measures: Social desirability bias and sensitive questions. *Heliyon*, 9(9), e20131. <https://doi.org/10.1016/j.heliyon.2023.e20131>
- Rodrigues, J. C., Arruda, G. T., Moraes, P. C., Firão, C. B., Avila, M. A., & Driusso, P. (2024). Self-management of primary dysmenorrhea-related pain: Cross-sectional study on non-pharmacological interventions. *Pain Management*, 14(5–6), 265–272. <https://doi.org/10.1080/17581869.2024.2376519>
- Roux, F., Burns, S., Chih, H., & Hendriks, J. (2022). The use of a two-phase online Delphi panel methodology to inform the concurrent development of a school-based ovulatory menstrual health literacy intervention and questionnaire. *Frontiers in Global Women's Health*, 3, 826805. <https://doi.org/10.3389/fgwh.2022.826805>
- Tang, Y.-H., Lin, C. T., & Wu, L.-C. (2025). Understanding health literacy through patients' interpretation of health education leaflets: A thematic narrative review. *Health Expectations*, 28(6), e70479. <https://doi.org/10.1111/hex.70479>
- Tembo, M., Weiss, H. A., Larsson, L. S., Bandason, T., Redzo, N., Dauya, E., Nzanza, T., Ishumael, P., Gweshe, N., Ndlovu, P., Chikwari, C. D., Mavodza, C. V., Renju, J., Francis, S. C., Ferrand, R., & Mackworth-Young, C. R. S. (2023). A mixed-methods study measuring the effectiveness of a menstrual health intervention on menstrual health knowledge, perceptions and practices among

young women in Zimbabwe. *BMJ Open*, 13(3), e067897. <https://doi.org/10.1136/bmjopen-2022-067897>

Unnisa, H., Annam, P., Gubba, N. C., Begum, A., & Thatikonda, K. (2022). Assessment of quality of life and effect of non-pharmacological management in dysmenorrhea. *Annals of Medicine and Surgery*, 81, 104407. <https://doi.org/10.1016/j.amsu.2022.104407>

Verhoef, H., Feskens, E., van 't Veer, P., & Prentice, A. M. (2022). ASN guidelines on p values. *The American Journal of Clinical Nutrition*, 115(2), 597–598. <https://doi.org/10.1093/ajcn/nqab370>

Wahl, K., Albert, A., Larente, M., Lopez de Arbina, E., Kennedy, L., Sutherland, J. L., Imtiaz, S., Orr, N. L., Allaire, C., & Yong, P. J. (2024). Does menstrual health and endometriosis education affect knowledge among middle and secondary school students? A cluster-randomised controlled trial. *Journal of Obstetrics and Gynaecology Canada*, 46(8), 102583. <https://doi.org/10.1016/j.jogc.2024.102583>

Yogesh, M., Trivedi, N., Shah, V., & Lakhtaria, M. (2024). Comparing skills-based and lecture-based education on female adolescents' knowledge, attitudes, and practices regarding menstrual health in puberty: A quasi-experimental study. *Journal of Education and Health Promotion*, 13, 386. https://doi.org/10.4103/jehp.jehp_1875_23

Yogesh, M., Trivedi, N. S., Damor, R., Patel, M., Ladani, H., Ramachandran, A., Vamja, R., & Surati, B. (2023). Assessment of knowledge, attitudes, and practices regarding menstrual hygiene management among adolescent schoolgirls (10–19 years) in the Saurashtra region, Gujarat. *Cureus*, 15(12), e50950. <https://doi.org/10.7759/cureus.50950>