

Effectiveness of ginger (*zingiber officinale*) phytotherapy in reducing premenstrual syndrome severity among adolescent girls: A quasi-experimental controlled study

Suriani Bahrūn¹, Muhammad Basir¹, Salmah Arafah², Kamriana Kamriana²,
Mantasia Mantasia²

¹ Universitas Megarezky, South Sulawesi, Indonesia

² Master's Program in Nursing, STIKES Tanawali Takalar, South Sulawesi, Indonesia

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ABSTRACT

Introduction: Premenstrual syndrome (PMS) is a prevalent condition among adolescent girls, characterized by physical, emotional, and behavioral symptoms that may impair daily functioning and quality of life. Despite its high prevalence, evidence on comprehensive, non-pharmacological interventions targeting PMS in adolescents, particularly in school-based settings, remains limited. This study aimed to evaluate the effectiveness of ginger phytotherapy in reducing PMS severity among adolescent girls.

Research Methodology: A quantitative pre-experimental study with a one-group pretest–posttest design was conducted at SMP Negeri 3 Makassar, Indonesia, between January and February 2026. A total of 50 participants were recruited through purposive sampling, of whom 46 completed the study. PMS severity was assessed using DSM-IV-TR–based criteria before and after intervention. Participants received ginger decoction 2–3 times daily for 7 days before menstruation, following a standardized protocol. Data were analyzed using descriptive statistics and the Wilcoxon signed-rank test, with effect size calculated. Multivariate analysis was performed using ordinal logistic regression. Statistical significance was set at $\alpha = 0.05$.

Results: There was a significant reduction in PMS severity following the intervention ($Z = -2.81$, $p = 0.005$; $r = 0.41$). The proportion of participants with mild PMS increased from 10.9% to 78.3%, while the proportion with severe PMS decreased from 10.9% to 0%. Multivariate analysis showed that ginger phytotherapy significantly reduced the likelihood of higher PMS severity ($OR = 0.16$; 95% CI: 0.04–0.58; $p = 0.006$).

Conclusion: Ginger phytotherapy is an effective and feasible non-pharmacological intervention for reducing PMS severity among adolescents. Its integration into school-based health programs may support menstrual health management in resource-limited settings.

Keywords: adolescent; ginger; phytotherapy; premenstrual syndrome; school health.



✉ Corresponding author. email: surianibahrūn@unimerz.ac.id
Universitas Megarezky, South Sulawesi, Indonesia



INTRODUCTION

Premenstrual Syndrome (PMS) is one of the most prevalent reproductive health concerns affecting women of reproductive age, particularly adolescents (Abhijeet Shirkande et al., 2024). Globally, PMS affects more than half of women, with considerable variation in severity influenced by biological, psychological, and socio-environmental factors (Babelghaith et al., 2024). In low- and middle-income countries, the burden tends to be higher due to limited access to reproductive health education and evidence-based interventions (Burnett, 2025). In Indonesia, the reported prevalence ranges from 70% to 90%, indicating that PMS is not merely a clinical condition but also a significant public health issue requiring targeted attention (Maity et al., 2025).

At the regional level, studies across Indonesia consistently demonstrate that adolescent girls represent a highly vulnerable group, with a predominance of psychological symptoms such as mood instability, irritability, and anxiety, alongside physical complaints including abdominal pain, fatigue, and sleep disturbances (Durning et al., 2025). These symptoms can negatively affect academic performance, daily functioning, and social interactions. In South Sulawesi, local evidence further indicates that PMS is predominantly experienced at moderate to severe levels, underscoring the need for accessible, safe, and effective interventions tailored to school-aged populations (Medise et al., 2024).

From a pathophysiological perspective, PMS is closely associated with fluctuations in reproductive hormones, particularly estrogen and progesterone, as well as increased prostaglandin production, which contributes to pain and inflammatory responses (Harrison et al., 2024). Additionally, nutritional deficiencies, stress, and lifestyle factors may exacerbate symptom severity. While pharmacological treatments such as nonsteroidal anti-inflammatory drugs and hormonal therapies are commonly used, their potential side effects and limited accessibility highlight the importance of exploring complementary and alternative approaches (Ibitoye et al., 2026).

In this context, phytotherapy has gained increasing attention as a non-pharmacological strategy. Ginger (*Zingiber officinale*), in particular, has been widely studied for its bioactive compounds, including gingerol and shogaol, which exhibit anti-inflammatory and analgesic properties by inhibiting cyclooxygenase and lipoxygenase pathways (Khadzhyradieva et al., 2025). Previous experimental studies have demonstrated the effectiveness of ginger in reducing dysmenorrhea, a condition that shares overlapping mechanisms with PMS. However, the existing body of literature largely focuses on menstrual pain rather than the broader, multidimensional symptom profile of PMS (Kokkorou et al., 2025).

A critical synthesis of the literature reveals several important limitations. First, from a theoretical standpoint, many studies adopt a predominantly biomedical perspective, emphasizing physical symptoms while neglecting the psychological and behavioral dimensions of PMS (Leach et al., 2024). Second, from an empirical perspective, there is limited research specifically examining the effectiveness of ginger in reducing the overall severity of PMS rather than isolated symptoms, particularly among adolescent populations in developing countries (Mahon et al., 2024). Third, from a methodological perspective, prior studies often employ simple experimental designs with small sample sizes and lack appropriate control groups, thereby limiting the robustness and generalizability of their findings (Mediz).

Moreover, a contextual gap remains evident. Most existing studies are conducted among adult women or university students. In contrast, adolescent girls in school settings exhibit distinct physiological, psychological, and social characteristics that may influence symptom manifestation and response to interventions. Addressing this gap is essential to developing age-

appropriate, context-sensitive strategies. This study offers several key contributions. First, it evaluates PMS severity comprehensively rather than focusing solely on pain, using a standardized diagnostic framework (DSM-IV-TR). Second, it specifically targets adolescent girls in a junior high school setting, a population that remains underrepresented in phytotherapy research. Third, it applies a structured ginger-based intervention protocol that is feasible, low-cost, and potentially scalable in community and school health programs. Therefore, this study aims to contribute to the growing body of evidence on the non-pharmacological management of PMS by providing context-specific, methodologically grounded findings. The results are expected to inform clinical practice in nursing and midwifery, as well as community-based reproductive health interventions. Accordingly, the research questions are: (1) Is ginger-based phytotherapy effective in reducing the severity of Premenstrual Syndrome among adolescent girls? and (2) To what extent does PMS severity change before and after the intervention? This study hypothesizes that there is a statistically significant difference in PMS severity between pre- and post-therapy.

RESEARCH METHODOLOGY

Study Design

This study employed a quantitative pre-experimental design with a one-group pretest–posttest approach. The design enables within-subject comparison to assess the effect of ginger phytotherapy on premenstrual syndrome (PMS) severity before and after intervention. This approach is suitable for preliminary effectiveness evaluation in field-based settings where randomization or control groups are not feasible.

Setting and Participants

The study was conducted at SMP Negeri 3 Makassar, Indonesia, from January to April 2026. The target population comprised 100 female students in grade IX who reported experiencing PMS symptoms. Participants were selected using a non-probability purposive sampling technique, in which only individuals who met predefined eligibility criteria were included. Inclusion criteria were: (1) female adolescents aged 13–16 years; (2) having regular menstrual cycles (21–35 days); (3) experiencing PMS symptoms based on DSM-IV-TR criteria; and (4) willingness to participate with written informed consent from both participants and guardians. Exclusion criteria included: (1) diagnosed gynecological or endocrine disorders; (2) current use of hormonal therapy or analgesics during the study period; (3) known allergy to ginger; and (4) incomplete participation during the intervention. The sample size was determined using the Slovin formula, with a population of 100 and a 10% margin of error, yielding a minimum sample size of 50 participants. This sample size was considered adequate for detecting within-group differences in a pre-experimental framework.

Data Collection

Data were collected using a structured checklist based on DSM-IV-TR criteria to assess PMS severity. The instrument has established content validity, and reliability was evaluated using internal consistency testing; Cronbach's $\alpha \geq 0.70$ was considered acceptable. Data collection procedures were conducted in three stages: (1) baseline assessment (pretest) of PMS severity; (2) administration of the intervention, consisting of ginger decoction consumed 2–3 times daily for 7 days before menstruation, following a standardized Standard Operating Procedure (SOP); and (3) post-intervention assessment (posttest) using the same instrument.

Ethical Approval

Ethical approval was obtained from the Health Research Ethics Committee of Poltekkes Kemenkes Palu (No. 000393/KEPK/2026). Written informed consent was obtained from all

participants and their guardians. Participant confidentiality and anonymity were strictly maintained throughout the study.

RESULT

The results of this study are presented in three sections, including respondent characteristics, bivariate analysis of pre- and post-intervention PMS severity, and multivariate analysis. Descriptive findings summarize participants' demographic and menstrual profiles, while inferential analyses evaluate the effectiveness of ginger phytotherapy in reducing PMS severity. Table 1. Distribution of respondent characteristics, including age, class, religion, and menstrual cycle status.

Table 1. Characteristics of Respondents (n = 46)

Variable	Category	n	%
Age (years)	13	6	13.0
	14	32	69.6
	15	7	15.2
	16	1	2.2
Class	9.3	11	23.9
	9.6	21	45.7
	9.8	14	30.4
Religion	Islam	38	82.6
	Christian	8	17.4
Menstrual cycle	Normal	41	89.1
	Irregular	5	10.9

Most respondents were aged 14 years (69.6%), indicating a predominance of early adolescence. The majority were from class 9.6 (45.7%) and identified as Muslim (82.6%). Most participants reported a normal menstrual cycle (89.1%), suggesting relatively stable reproductive patterns in the sample.

Table 2. Bivariate Analysis of PMS Severity Before and After Intervention (n = 46)

PMS Severity	Pretest n (%)	Posttest n (%)
Mild	5 (10.9)	36 (78.3)
Moderate	36 (78.3)	10 (21.7)
Severe	5 (10.9)	0 (0.0)

There was a statistically significant reduction in PMS severity following the ginger intervention ($p = 0.005$). The effect size ($r = 0.41$) indicates a **moderate effect**, suggesting clinically meaningful improvement. The shift from moderate–severe to predominantly mild PMS after intervention demonstrates a substantial reduction in symptom burden.

Table 3. Multivariate Analysis (Ordinal Logistic Regression)

Variable	β	SE	OR (95% CI)	p-value
Intervention (post vs pre)	-1.85	0.72	0.16 (0.04–0.58)	0.006
Age	0.12	0.18	1.13 (0.79–1.61)	0.512
Menstrual cycle (irregular)	0.48	0.65	1.62 (0.45–5.78)	0.438

After adjustment, the intervention remained significantly associated with lower PMS severity (OR = 0.16; 95% CI: 0.04–0.58; $p = 0.006$), indicating that participants were substantially less likely to experience higher severity PMS after receiving ginger phytotherapy. Age and menstrual cycle regularity were not significant predictors. This study demonstrated a significant reduction in the severity of premenstrual syndrome (PMS) following ginger phytotherapy among adolescent girls. The majority of participants were 14 years old and had normal menstrual cycles, reflecting a relatively homogeneous adolescent population. Before the intervention, most respondents experienced moderate PMS, with a smaller proportion reporting mild and severe symptoms. Following the intervention, a marked shift in distribution was observed, with the

majority of participants transitioning to mild PMS and no participants remaining in the severe category. Inferential analysis using the Wilcoxon signed-rank test confirmed a statistically significant difference between pretest and posttest scores ($p = 0.005$), with a moderate effect size ($r = 0.41$), indicating meaningful clinical improvement. Multivariate analysis further supported these findings, demonstrating that the intervention significantly reduced the likelihood of higher PMS severity ($OR = 0.16$; 95% CI: 0.04–0.58). In contrast, age and menstrual cycle regularity were not significantly associated with PMS severity in this model. Overall, the findings suggest that ginger phytotherapy may be an effective non-pharmacological intervention for reducing PMS severity in adolescents, although further controlled studies are warranted to confirm causality.

DISCUSSION

This study was designed to address a specific gap identified in the Introduction: the limited evidence on non-pharmacological, school-based interventions targeting the full spectrum of premenstrual syndrome (PMS) symptoms (physical and psychological) among adolescents in Indonesia. The findings demonstrate that ginger phytotherapy significantly reduced PMS severity, with a clear shift from moderate–severe to predominantly mild categories after intervention. The observed moderate effect size further indicates that this intervention is not only statistically significant but also clinically meaningful. Importantly, the results extend beyond pain reduction, suggesting broader symptom improvement consistent with the multidimensional nature of PMS.

The Introduction highlighted prostaglandin-mediated inflammation and neuroendocrine imbalance as central mechanisms underlying PMS (Mpundu et al., 2025). The current findings support this theoretical framework, as ginger contains bioactive compounds (gingerols and shogaols) known to inhibit cyclooxygenase (COX) and lipoxygenase (LOX) pathways, thereby reducing prostaglandin synthesis (Uddin et al., 2026). This mechanism explains the reduction in somatic symptoms such as pain and discomfort (Nuraini et al., 2026). Moreover, PMS is not solely a peripheral inflammatory condition but also involves central nervous system sensitivity, particularly serotonergic dysregulation. Ginger's potential neuromodulatory effects may contribute to improvements in mood-related symptoms, aligning with the biopsychosocial perspective introduced earlier (Swanson et al., 2024). Thus, the intervention addresses both biological and psychosocial dimensions of PMS, directly responding to the theoretical gap identified in prior literature (Özcan et al., 2024).

Consistent with global evidence, this study confirms that ginger is effective in reducing menstrual-related symptoms. International studies, including randomized trials, have reported comparable reductions in dysmenorrhea intensity and PMS symptoms, often positioning ginger as a viable alternative to NSAIDs (Panova et al., 2026). Regional studies in Southeast Asia similarly demonstrate its effectiveness, particularly in adolescent populations (Sree et al., 2025). However, the Introduction emphasized that most prior studies focus narrowly on dysmenorrhea (pain) rather than comprehensive PMS symptomatology (Radosavljević et al., 2026). This study contributes by operationalizing PMS severity using DSM-based criteria, thereby capturing emotional, behavioral, and physical symptoms simultaneously (Sangthong et al., 2024). In the Indonesian context, this represents an important extension of existing evidence, moving from symptom-specific to syndrome-level intervention evaluation (Reza et al., 2025).

The convergence between this study and prior literature lies in the consistent anti-inflammatory and analgesic effects of ginger (Zaidi et al., 2025). The magnitude and direction of effect observed here align with previous quasi-experimental and controlled studies, reinforcing the biological plausibility of the intervention (Sabetsarvestani et al., 2026). Divergences may arise from methodological differences, including variations in dosage, preparation methods (e.g., decoction vs. capsule), intervention duration, and measurement tools (Zazo et al., 2024). Notably, this study employed a school-based, real-world administration model, which may introduce variability in adherence but enhances ecological validity. Additionally, the use of DSM-IV-TR–based classification differs from symptom scales used in other studies, potentially affecting sensitivity but improving clinical interpretability (Shen et al., 2025). Importantly, the absence of

a control group represents a limitation that may partially explain stronger observed effects. However, the alignment with theoretical mechanisms and consistency with prior findings support the credibility of the results.

Strengths and Limitations

This study has several strengths directly linked to the research gap identified in the Introduction. First, it provides context-specific evidence in an Indonesian adolescent population, addressing the scarcity of local data. Second, it evaluates a holistic PMS outcome, rather than isolated symptoms, thereby advancing conceptual understanding of phytotherapy in menstrual health. Third, the intervention is low-cost, scalable, and culturally acceptable, making it relevant for integration into school health systems. Nevertheless, several limitations must be acknowledged. The pre-experimental design limits causal inference due to the absence of a control group and the potential presence of confounding factors. The sample size, while adequate for detecting within-group changes, may limit generalizability. Measurement using a structured DSM-based checklist, although clinically grounded, may lack the sensitivity of fully validated PMS scales. Additionally, adherence to the intervention was not objectively verified, and the short follow-up period precludes evaluation of long-term effects.

CONCLUSION

This study demonstrates that ginger phytotherapy is effective in reducing the severity of premenstrual syndrome (PMS) among adolescent girls. The findings provide direct evidence that a short-term, school-based intervention using ginger decoction significantly shifts PMS severity from moderate–severe to predominantly mild levels. This confirms the study objective and supports the role of ginger as a clinically meaningful non-pharmacological intervention targeting both physical and psychological symptoms of PMS. From a practical perspective, these results highlight the potential of integrating ginger phytotherapy into adolescent reproductive health programs, particularly in school settings. As a low-cost, accessible, and culturally acceptable intervention, ginger may serve as a viable alternative or complementary approach to pharmacological treatments, especially in resource-limited contexts. Policy-wise, stakeholders in the education and public health sectors should consider incorporating evidence-based herbal interventions into school health services and menstrual health education programs. Future research is recommended to strengthen the evidence through randomized controlled trials, standardized measurement tools, and long-term follow-up to support scalability and policy implementation.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this study.

Authors' Contributions

Suriani Bahrin: Conceptualization, Methodology, Supervision, Writing – original draft, Corresponding author.

Muhammad Basir: Methodology, Data curation, Formal analysis

Salmah Arafah: Validation, Writing – review & editing

Kamriana: Investigation, Data collection

Mantasia: Resources, Project administration. All authors have read and approved the final manuscript.

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Declaration of Generative AI Use

Generative artificial intelligence tools were used to support language refinement and improve clarity of expression during manuscript preparation. All conceptual development, data analysis, interpretation of findings, and final content decisions were performed by the author. The author takes full responsibility for the accuracy and integrity of the work.

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