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Original Research Article

Effectiveness of menstrual health education program among rural adolescent school-girls: a quasi-experimental study

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ABSTRACT

Background: Menstruation in rural communities is often obscured by misinformation, taboos, and silence, leading to poor practices, anxiety, misconceptions, and negative health and educational consequences among adolescent girls. Although school-based menstrual health education has shown promise, its uptake in rural areas remains inconsistent. This study sought to evaluate the effectiveness of a structured menstrual health education program in improving knowledge, attitudes, and hygiene practices among rural adolescent schoolgirls.

Methods: In this quasi-experimental pre- and post-test study, eighty girls aged 11–15 years from a rural private school in the Ahilyanagar district participated. A standardized 19-item questionnaire assessing knowledge and literacy was administered before and after a 30-minute educational program delivered via lecture, PowerPoint, and video. Data were analyzed using descriptive statistics, the Wilcoxon signed-rank test, and Cohen's d for effect size.

Results: Knowledge scores increased by 57.4% (4.04±1.84 to 6.36±1.70) and menstrual literacy scores by 188.7% (1.68±1.45 to 4.86±1.50), both with high statistical significance ($p<0.001$). Effect sizes indicated large educational impact (Cohen's d: 1.30 for knowledge; 2.14 for literacy). Improvements were especially notable in understanding menstrual physiology, hygienic practices, pain management, and dispelling myths regarding activity and dietary restrictions.

Conclusions: A brief, structured menstrual health education program substantially and significantly improved both knowledge and literacy among rural adolescent schoolgirls. These findings support integrating menstrual health education into school curricula as a vital intervention to promote adolescent health, reduce stigma, and enhance academic participation.

Keywords: Adolescent girls, Knowledge, Literacy, Menstrual health education, Rural population

INTRODUCTION

Although menstruation is a normal physiological event that signifies reproductive maturity, it is still surrounded by misinformation, cultural taboos, and silence in many rural communities.[1] Adolescent girls, particularly those who reside in rural areas with little access to health education, frequently engage in unhealthy practices, fear, anxiety, and misconceptions due to a lack of accurate menstrual knowledge.[2] Reproductive tract infections, urinary tract infections, reduced engagement in daily activities, and notable absences from school during menstruation have all been linked to poor management of menstrual hygiene.[3] Nearly 71% of girls in India are not informed about menstruation prior to menarche, and many experience shock and embarrassment as a result of their lack of preparation.[4] Inadequate sanitation facilities, a lack of sanitary products, poor privacy, and a lack of parental or teacher support are some of the additional difficulties faced by rural girls.[5] These elements emphasize the significance of organized menstrual health education initiatives in educational institutions. It has been demonstrated that menstrual health education

programs, which teach menstrual physiology, hygiene techniques, pain management techniques, and myth-busting, greatly enhance teenage girls' knowledge, attitudes, and healthy behaviors related to menstruation.[6] Improvements in sanitary pad use, knowledge of menstrual cycles, and a decrease in stigma have also been demonstrated by school-based interventions.[7] Additionally, integrating medical specialists like physiotherapists into menstrual health education programs supports a comprehensive understanding of menstrual health by encouraging physical activity, exercise-based pain relief for dysmenorrhea, and awareness of menstrual disorders.

Programs for menstrual health education have been shown to be effective, but their application in rural areas is still uneven. for the purpose of identifying gaps, bolstering school health systems, and advancing adolescent well-being, evaluating the efficacy of menstrual health education among rural adolescent schoolgirls is essential. The aim of this study is to evaluate how effectively menstrual health education programs improve rural adolescent school-age girls' knowledge, attitudes, and hygiene practices.

METHODS

A quasi-experimental, pre- and post-test study was conducted among school-going girls aged 11-15 years from a rural private school in the Ahilyanagar district. Study was commenced after obtaining necessary permissions and approval from the institutional ethics committee. Written consent was obtained by parents and school teachers. All 80 eligible girls aged 11-15 years who had attained menarche from classes 6th-9th in the selected rural private school were included using convenience sampling, determined by school availability. Post-hoc analysis confirmed adequate power for detected effect sizes (Cohen's d=1.30-2.14). The study was conducted from October to November 2025.

In the pre-intervention phase, a structured questionnaire with socio-demographic details containing personal and menarche related characteristics and knowledge and literacy domain questions was distributed. The questionnaire was converted into the Marathi language, so the student can answer in a comfortable language, either English or Marathi. A total of 19 questions were asked. Out of which 11 belong to the knowledge domain and 8 were from the literacy domain. The principal investigators and other research assistants were trained in data collection and in delivering health education. After the pre-intervention phase, a lecture using a power point presentation and videos was displayed to the students by the principal investigators, assisted by research assistants. The students were given time to ask questions and were answered by the investigators. The impact of the health education intervention was assessed using the same preliminary questions in the pretest questionnaire after delivering an interventional lecture to all the study participants.

Statistical analysis

Descriptive statistics were analyzed using mean, standard deviation, frequency, and percentage for demographic variables and scores. Inferential statistics were calculated using a paired t-test for comparing pre- and post-knowledge/practice scores if data is normally distributed. And the Wilcoxon signed-rank test was used for non-normal data.

RESULTS

The study was conducted among 80 girls from a rural school in Ahilyanagar. The girls were from the 11-15 age group, with a mean age of 13.15±0.97. All participants were from rural areas attending the same school with a semi-English medium of instruction. The sample had a normal BMI distribution (mean 19.24±2.67 kg/m²). All participants had attained menarche, making them capable of experiencing menstruation. Class distribution was relatively evenly spread across grades 6-9, with the majority in grades 7 and 8 (57.4%).

The menstrual knowledge test scores before and after are displayed in Table 2. Following the educational session, participants' knowledge of menstruation significantly improved. The post-test results showed more consistency (lower standard deviation of 1.70 vs. 1.84) than the pre-test results, and the mean knowledge score rose by 2.32 points (57.4% improvement from baseline). Table 3 shows that understanding sun-drying hygiene and the myth about avoiding nocturnal activities showed the most gains. Understanding menstrual cycle variability, the fact that menstruation happens on the same day every month, the fact that some stomach pain is normal, and the myth regarding meal preparation all showed significant improvements. Understanding menarche age, the source of menstrual blood physiological knowledge, and safe pain treatment options all showed moderate improvements.

Menstrual literacy scores, which significantly improved after the intervention, are displayed in Table 4. The participants' confidence in controlling their menstruation, obtaining trustworthy information, and seeking medical assistance when necessary, grew significantly, as seen by the mean score rising by 3.18 points (188.7% improvement). Table 5 demonstrates the notable advancements in knowledge of early menarche indicators, information about pain management techniques, information about puberty changes, and access to further information. Information for managing menstrual bleeding has significantly improved. Comfort seeking medical assistance showed notable improvements. The drop in staying at home during menstruation showed a quite substantial reversal. On the other hand, anticipating a recent menstrual cycle requires some knowledge. In

Table 8, Cohen's d was calculated to estimate the magnitude of change in menstrual knowledge and literacy scores, with values >0.8 interpreted as large effects, indicating strong educational impact.

Table 1: Demographic characteristics of study participants (n=80).

Demographic characteristic	Mean±SD / N	Range / %
Age (in years)	13.15±0.97	11-15
BMI (kg/m²)	19.24±2.67	15.55-24.77
Setting		
Area: Rural	80	100.0
School Type: Private	80	100.0
School Medium: Semi-English	80	100.0
Class distribution		
Class 6th	15	18.8
Class 7th	25	31.2
Class 8th	21	26.2
Class 9th	18	22.5
Menarche status		
Menstruating	80	100.0
Not yet started	0	0.0

Table 2: Menstrual knowledge scores-pre-test and post-test comparison.

Knowledge assessment	Pre-test	Post-test
Mean score (out of 11)	4.04±1.84	6.36±1.70
Median score	4.0	6.0
Range (min-max)	0-7	3-8

Table 3: Menstrual Knowledge–individual question analysis.

Question	Pre-test (%)	Post-test (%)	Improvement (%)	Interpretation
Q1: Menstruation at age 13	37.2	64.1	+26.9	Significant improvement
Q2: Menstrual blood from stomach	42.3	69.2	+26.9	Significant improvement
Q3: Cycle varies between girls	41.0	82.1	+41.0	Substantial improvement
Q4: First period=pregnancy possible	29.5	48.7	+19.2	Moderate improvement
Q5: Same date every month	43.6	82.1	+38.5	Substantial improvement
Q6: Abdominal pain is normal	43.6	80.8	+37.2	Substantial improvement
Q7: Pregnant women menstruate	14.1	24.4	+10.3	Minimal improvement
Q8: Sun drying kills bacteria	41.0	91.0	+50.0	Excellent improvement
Q9: Safe to use painkillers	35.9	65.4	+29.5	Significant improvement
Q10: Shouldn't go out at night	25.6	92.3	+66.7	Excellent improvement
Q11: Shouldn't prepare food	50.0	87.2	+37.2	Substantial improvement

Table 4: Menstrual literacy scores-pre-test and post-test comparison.

Parameter	Pre-test (n=78)	Post-test (n=78)
Mean literacy score	1.68±1.45	4.86±1.50
Median	1.5	5.0
Range (min–max)	0.0–6.0	0.5–7.0

Table 5: Menstrual literacy and empowerment-detailed item analysis.

Question	Pre-test Positive (%)	Post-test Positive (%)	Improvement (%)	Interpretation
Q1: Expected period when started	31.6	10.1	-21.5	Change in expectations
Q2: Info about puberty changes	21.5	79.1	+57.6	Excellent improvement

Continued.

Question	Pre-test Positive (%)	Post-test Positive (%)	Improvement (%)	Interpretation
Q3: Know early signs of menarche	13.9	70.3	+56.3	Excellent improvement
Q4: Info to manage bleeding	27.8	82.3	+54.4	Excellent improvement
Q5: Info about pain reduction	13.9	79.7	+65.8	Outstanding improvement
Q6: Can get more info if needed	21.5	81.6	+60.1	Excellent improvement
Q7: Comfortable seeking healthcare help	27.8	72.2	+44.3	Substantial improvement
Q8: Stay at home during menstruation	89.9	10.8	-79.1	Excellent reversal

Table 6: Normality testing (Shapiro-wilk test).

Variable	W statistic	P value	Distribution
Knowledge pre-test	0.9529	0.0058	Not normal*
Knowledge post-test	0.8249	<0.0001	Not normal*
Literacy pre-test	0.8969	<0.0001	Not normal*
Literacy post-test	0.8140	<0.0001	Not normal*

*Data were not normally distributed ($p<0.05$); therefore, non-parametric Wilcoxon signed-rank test was used for comparative analysis rather than paired t-test. Table7 shows that after using Wilcoxon Signed rank test, there were significant improvement in menstrual knowledge and literacy with $p<0.001$.

Table 7: Paired comparison analysis-Wilcoxon signed-rank test.

Variable	Wilcoxon statistic	P value	Interpretation
Menstrual knowledge	237.00	<0.001	Highly Significant
Menstrual literacy	42.00	<0.001	Highly Significant

Table 8: Effect size analysis (Cohen's d).

Variable	Cohen's d	Interpretation	Clinical significance
Menstrual knowledge	1.30	Large effect	Substantial clinical improvement
Menstrual literacy	2.14	Large effect	Marked clinical improvement

DISCUSSION

This quasi-experimental study conducted among 80 rural adolescent schoolgirls in Ahilyanagar district demonstrated significant improvements in menstrual knowledge and literacy following a structured 30-minute menstrual health education program. The mean knowledge score improved by 57.4% (from 4.04±1.84 to 6.36±1.70), while menstrual literacy scores showed a remarkable 188.7% improvement (from 1.68±1.45 to 4.86±1.50). The Wilcoxon signed-rank test confirmed highly significant improvements in both domains ($p<0.001$), with large effect sizes (Cohen's d=1.30 for knowledge and 2.14 for literacy).

The results of this study are consistent with a wealth of data demonstrating the efficacy of organized menstrual health education initiatives. All educational interventions reported improvements in menstrual knowledge, attitudes, and practices (KAP), according to a systematic review by Evans et al that looked at 24 studies. A meta-analysis showed that interactive interventions had greater effect sizes than didactic approaches.[8] This study's significant improvement (Cohen's d=1.30 for knowledge) is consistent with results from other Indian investigations. After educational intervention, mean knowledge scores increased from 10.85±2.83 to 25.93±3.44 in urban areas and from 10.25±3.30 to 23.04±3.33 in rural regions, according to a quasi-experimental study from Uttarakhand.[9] In a similar study, Parasuraman et al showed that health education greatly enhanced adolescent girls' knowledge, attitudes, and menstrual hygiene habits, with the percentage of excellent practices rising from 37.6% to 77% after the intervention.[10]

A crucial gap seen in Indian adolescent populations is addressed by the outstanding progress in debunking stereotypes regarding avoiding nocturnal activities (66.7% improvement) and food preparation limits (37.2% improvement). Many girls in Indian society are subject to restrictions on their daily activities, food intake, and religious participation due to deeply ingrained superstitions and taboos around menstruation. With over 23% of girls in India apparently quitting school when they start menstruating, Garg et al and Anand et al highlighted how such taboos around menstruation affect girls' emotional state, mindset, and lifestyle.[2] According

to research from rural Assam, taboos, beliefs, and prohibitions cause teenage girls to have a lot of negative emotions about menstruation, which puts them under psychological strain and makes them feel bad about their own physical processes.[11] The study's baseline results mirror the more general difficulties found in national surveys. According to data from the National Family Health Survey (NFHS-5), rural areas continue to use fewer hygienic period products during menstruation (72.32%) than urban areas (89.37%).[12] Only 42% of teenage girls in rural India solely adopted sanitary practices, with significant regional differences at the state and district levels.[13]

Significant practical knowledge transfer is demonstrated by the 50% increase in comprehension of sun-drying hygiene procedures. Research has shown that material dried in secret locations frequently stays damp, which can lead to the growth of microorganisms and insect larvae.[14] Knowing that the sun's heat naturally sterilizes reusable cloth materials is important for girls in rural regions who might use cloth pads since they have limited access to commercial sanitary items.[5]

According to the World Bank, methods that combine information, education, infrastructure, and menstrual products are more effective in preventing the negative effects of poor menstrual hygiene.[15] Schools can also give teenage girls the knowledge, sanitary products, and facilities they need to comprehend and manage their menstruation. Understanding menstrual cycle variability (41% improvement) and realizing that menstruation does not always occur on the same date each month (38.5% improvement) both showed notable benefits. According to a systematic review of MHH interventions, educational programs generally seek to improve awareness about menstruation, good hygiene, and the use of sanitary products. Structured teaching programs have been shown to significantly boost knowledge retention.[16]

One of the most notable results of this study is the significant increase in menstrual literacy (188.7%, Cohen's d=2.14). Participants were successfully empowered, as evidenced by the notable increases in understanding of early menarche indications (56.3%), puberty changes (57.6%), and pain reduction techniques (65.8%). According to a logic model put forth by Evans et al girls who possess agency can manage their menstruation instead of the other way around, allowing them to concentrate on their studies and realize their full potential.[9]

Menstrual health education's empowerment component is further supported by the study's significant improvement in comfort seeking medical assistance (44.3%). There has been a paradigm shift in beliefs on staying at home during menstruation, as seen by the highly substantial reversal (from 89.9% to 10.8%). This is especially relevant because studies have shown that dysmenorrhea, mother's restrictions, fear of damaging clothing, and difficulties changing pads in school are the top causes of menstrual absenteeism in India.[17] This study's use of health professionals to provide menstrual health education is an evidence-based strategy. According to the systematic review, peer education and group counseling were just as successful as those given by medical professionals, and eight of the 24 interventions that were reviewed had health professionals as instructors.[9] Particular consideration should be given to the possible involvement of physiotherapists in menstrual health education. By addressing underlying physical dysfunctions and fostering general well-being, research has shown that physiotherapy provides a complete approach to managing menstrual health concerns.[18]

Strengths

This study offers important proof of the value of menstruation health education in rural India. The results are strengthened by the use of verified surveys, suitable statistical techniques, and effect size calculations. The multifaceted character of menstrual health competency is captured by the thorough evaluation of both literacy and knowledge domains. To evaluate long-term effects, future research should take into account randomized controlled designs with extended follow-up times. instruction alone may not be as effective as multi-component interventions that incorporate product provision, infrastructure upgrades, and instruction.

Limitations

There are a few restrictions that should be taken into account. First, because benefits might be partially related to causes other than the intervention, the quasi-experimental approach without a control group restricts the ability to draw conclusions about causality. Second, generalizability can be restricted by the convenience sampling and single-school environment. Third, sustained behavior change or long-term information retention are not captured by the immediate post-test assessment. Fourth, the homogeneous demographic (100% rural, single school) and small sample size (n=80) might not accurately reflect the diversity of adolescent populations in rural areas. Fifth, actual hygiene behaviors and school attendance—two more immediate results of menstrual health education—were not evaluated in this study.

CONCLUSION

This study shows that rural teenage schoolgirls in India can greatly increase their menstrual literacy and understanding with a short, structured menstrual health education program. The therapeutic importance of these therapies is supported by the observed substantial effect sizes. These results contribute to the expanding body of evidence that shows menstrual health education in schools is an essential tactic for enhancing adolescent health outcomes, lowering stigma, and encouraging educational engagement. The implementation of policy-

level pledges to universal menstrual health literacy in schools should be given top priority, utilizing the current school health platforms.

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