



MENSTRUAL HEALTH EMPOWERMENT IN ADOLESCENT GIRLS: ASSESSING THE IMPACT OF SCHOOL-BASED HEALTH EDUCATION ON MENSTRUAL HYGIENE PRACTICE

Public Health

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ABSTRACT

The study aimed to address the prevalent lack of knowledge and negative stereotypes surrounding menstruation in Indian society through a classroom-based health education intervention targeting 8th and 9th-grade adolescents. Employing a quasi-experimental design, baseline data was collected via questionnaires and focus group discussions, followed by the implementation of a menstrual health module. The results indicated statistically significant differences in knowledge and practice scores between the intervention and control groups ($\chi^2=98.034$, $p<0.001$, $df=2$ and $\chi^2=63.151$, $p<0.001$, $df=2$, respectively), emphasizing the positive impact of the intervention on menstrual hygiene. A strong correlation ($r=0.649$, $p<0.001$) was observed between post-intervention knowledge gain and improved menstrual hygiene practices. Participants experiencing menstrual issues, those comfortable discussing the topic with their sisters, and those with adequate toilet facilities exhibited improved practices and attitudes. Conversely, unhygienic practices were associated with health issues. The findings underscore the need to institutionalize menstrual health management knowledge in education and empower teachers for effective teaching, thereby contributing to a positive shift in knowledge and practices related to menstrual hygiene in adolescent girls.

KEYWORDS

Menstruation, Health Education, Adolescent, Menstrual Hygiene, School Health Services

INTRODUCTION

Adolescence is a critical period of development that spans from the ages of 10 to 19. According to the World Health Organization, 1.2 billion adolescents aged 10-19 years constitute 16 percent of the world's population. South Asia is home to the largest population of adolescents, with around 340 million, followed by East Asia and the Pacific, with around 277 million [1]. India alone has 253 million adolescents, constituting 20 percent of the Indian population and 20 percent of the world's adolescents [2].

The onset of menstruation marks a significant milestone in an adolescent girl's life, signaling the beginning of her journey into womanhood. Unfortunately, taboos, false beliefs, and a lack of access to effective menstrual hygiene management (MHM) hinder this transition for many adolescent girls in India. According to the National Family Health Survey (NFHS-5), which was conducted in 2020–2021, 81.5% of women between the ages of 15 and 24 reported using hygienic methods of protection (locally prepared napkins, sanitary napkins, tampons, and menstrual cups) during their menstrual period. This represents a significant increase from the NFHS-4 data (47.4%) [3].

It is crucial for society to break the taboo surrounding menstruation and provide adolescents with the necessary information and resources for MHM. Organizations at the global level are promoting this agenda through four pillars: social support, knowledge and skills, the provision of facilities, and materials.

In India, there is a need for increased awareness about MHM among women and in communities with prevalent myths. The government has implemented initiatives like the Menstrual Hygiene Scheme and the National Menstrual Hygiene Scheme, but challenges persist, including insufficient supplies and inadequate training. The government aims to achieve universal, sustainable, and equitable access to safe drinking water, sanitation, and hygiene by 2030. [4]. In addition to these, the "FREEDAYS" scheme [3] has been implemented, which envisages supplying a pack of six sanitary napkins to below-poverty line (BPL) women and girls. NGOs like UNICEF, WaterAid India, Save the Children, etc. are also working to improve menstrual hygiene through education, awareness campaigns, and access to menstrual hygiene

products and sanitation facilities. In addition to government initiatives, there have been efforts to raise awareness about MHM through campaigns and media, such as the movie "PADMAN". To further improve menstrual hygiene, schools are encouraged to become "menstruation friendly" by providing access to sanitary napkins, hygiene education, and private facilities for girls to manage their menstruation [5]. However, these efforts alone are not enough to create lasting change. It is crucial to develop a strong commitment to MHM and to implement guidelines and policies that address the issue holistically. This includes encouraging the use of sustainable menstrual products, developing suitable infrastructure for disposal, and addressing the social and cultural stigmas surrounding menstruation. Research studies, monitoring, and evaluations of these programs are needed to understand the impact of these programs on the ground and to identify areas where improvement is needed.

The present study aims to address the lack of knowledge and negative stereotypes surrounding menstruation in Indian society by providing health education through a classroom-based intervention, with the goal of improving knowledge and practices related to menstrual hygiene and addressing issues such as menstrual disorders and reproductive tract infections.

MATERIAL AND METHODS

The Quasi-Experimental study was conducted in government girls' high schools in Berhampur Municipality, an urban area in the Ganjam district of Odisha, from December 2020 to November 2022. The study was carried out on adolescent girls in 8th and 9th grades from four out of the 15 clusters of government schools within the municipality (Figure 1).

The study aimed to determine the sample size needed to demonstrate the effectiveness of an intervention with a 5% superiority margin ($\delta=0.05$), assuming that the true mean effectiveness of the intervention and control groups was 60% ($pT = 0.60$) and 50% ($pC = 0.50$), respectively. To achieve 80% power ($1-\beta = 0.81$) at a 5% level of significance ($\alpha = 0.05$) and equal allocation ($k = 1$), the sample sizes for the test and control groups were calculated as 78 each. However, when accounting for the design effect of 2, the minimum number of

participants for the study was determined to be 316 using an online sample size calculator for the superiority trial.[6] With non-randomized purposive sampling, four schools were selected from four out of 15 different school clusters, based on the number of girls studying in 8th and 9th grade and the location of the schools. The schools selected had a minimum enrolment of 80 girls in 8th and 9th grades and were located at a distance of at least 2-3km apart to prevent dilution of educational intervention at the private tuitions outside the school area.



Figure 1: Flow Diagram of the Study

Participants were included in the study if they had attained menarche and agreed to participate, while those who were unwilling were excluded.

The study employed a range of comprehensive study tools [7], [8], [9], including a pre and post-test questionnaire, a focused group discussion (FGD) guide, and a specially crafted study module. The study module was thoughtfully developed, drawing insights from established Information, Education, and Communication (IEC) materials. These included the ANM training manual [10], the ASHA book for adolescent health [11], the WASH manual [12], and the UNICEF training manual [8]. Utilizing these standard IEC materials, the study module incorporated various formats such as flipbooks and PowerPoint presentations. Notably, these materials were created in both English and Odia, the vernacular language, to ensure accessibility and understanding among the study participants.

The quantitative data was collected via a Semi-structured, self-administered, pre-tested (English and Odia) questionnaire. The students were asked to fill up the form by themselves while the investigators verbally recited the questions one by one for easy follow through of the participants and simultaneous doubt clearance for each question. Dropouts in follow up were approached on separate day for completion.

Then the FGDs were conducted with separate group of students at community level to evaluate the students' present knowledge and conduct an extensive gap analysis of their hygiene practices. Two more FGDs were conducted to confirm the saturation of the data. At the conclusion, there had been six focus group discussions with a total of 53 participants, 39 of whom were in the eighth grade and 14 in the ninth.

The educational intervention was provided through classroom teaching with the developed module and demonstrations with sample menstrual hygiene products. The evaluation was done 1-month after the intervention and at a 2-month interval thereafter to check for

retention of the content in the intervention group. For the control group, their standard science textbook covering chapters on adolescence and reproduction serves as the placebo.

The quantitative data was analyzed using SPSS V17, JAMOVI, Excel, and expressed with percentage, chi-square, and correlation analysis. Principal component analysis on the scoring variables was conducted to identify the principal variables responsible for the change in scoring. The qualitative data were analyzed manually and presented alongside the quantitative findings to confirm the data triangulation. Two interim analyses were planned after pre-test and qualitative data collection followed by the final analysis at the end of follow up period.

Ethical clearance for the study was obtained from the Institutional Ethics Committee of MKCG Medical College and Hospital. The study protocol was also registered on CTRI (CTRI/2021/11/037916). Permission was obtained from the District Education Department, school authorities, parents (consent), and participants (assent) prior to the baseline data collection.

RESULTS

The baseline evaluation results are presented in parallel through a mixed-method approach, incorporating both quantitative data from questionnaires and qualitative insights from Focused Group Discussions (FGDs). This approach ensures data triangulation, enhancing the reliability of the findings, and serves to identify any potential discrepancies between the results obtained through these two distinct methods.

The participants in this study were selected from four different schools (Figure 2), each belonging to a distinct school cluster based on the official directory of the Ganjam District. Among these schools, Schools 1 and 4 were assigned to the intervention group (1) while Schools 2 and 3 served as the control groups (0). Most of the students, 66.4% (220), were in the ninth grade, while 33.5% (111) were in the eighth grade.

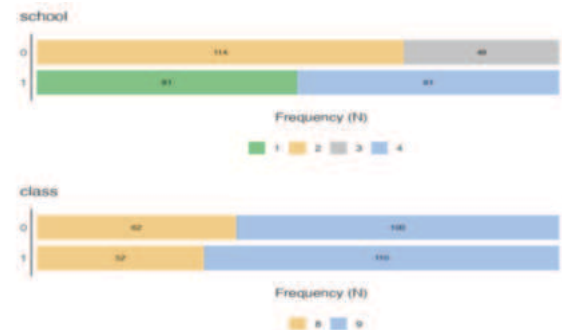


Figure 2: School and Class-wise Distribution of Control and Intervention Group

Table 1: Sociodemographic and Menstrual history of the Participants

		Control		Intervention	
		N1	row%	N2	row%
Age	13 Year Or Less	41	54	35	46
	14-16 Year	121	49	127	51
Religion	Hindu	139	50	137	50
	Christian	3	15	17	85
	Muslim	20	100	0	0
	Other	0	0	8	100
Education Of Mother	No	11	28	28	72
	Primary	44	47	50	53
	Secondary	99	63	59	37
	Graduate	8	24	25	76
Occupation Of Mother	Housewife	128	50	126	50
	Job	26	72	10	28
	Business	0	0	16	100
	Health	8	44	10	56
Occupation Of Father	Job	33	51	32	49
	Business	63	58	45	42
	Health worker	14	88	2	13
	Other	52	39	83	61
Type Of Family	Nuclear	106	50	108	50
	Joint	45	51	44	49
	Extended	11	52	10	48
Residence	Rural	46	61	30	39
	Shm	6	30	14	70
	Urban	110	48	116	52
Have Personal Room At Home?	22	37.3	37	62.7	
Menstruation interval (Days)	<21	20	71	8	29
	21-35	123	48	135	52
	>35	19	50	19	50
Regular	124	49	129	51	
Flow days	<5	99	50	99	50
	>8	56	52	52	48
	5-8	7	39	11	61

The Table 1 presents the demographic and menstrual characteristics of the control and intervention groups. The mean age of the participants was 14 years in both groups. The 84.5% (280) of the participants were Hindu and 88.5% (293) had literate mothers, but 80.3% (266) of the mothers were unemployed. The 64.6% (214) of the participants were from nuclear families. About 43.53% came from rural area for education, while 48.82% were native to the township, indicating migration from rural to urban areas for education opportunities. The average age at menarche was 12.41 ± 0.973 years (8-15 years).

There is higher percentage of participants in the control group with Polymenorrhagia, while the intervention group had more participants with normal menstruation interval. Regularity was similar between the groups, with around half reporting regular cycles. In terms of flow days, approximately half of both groups had less than 5 flow days, while there was an almost equal distribution for those with more than 8 flow days.

As evident from the Figure 3 Menstrual cramp, acne, myalgia, malaise were the major menstrual symptoms among the participants whereas white discharge, dysmenorrhea, foul odor, and itching were the prevalent pathological issues.

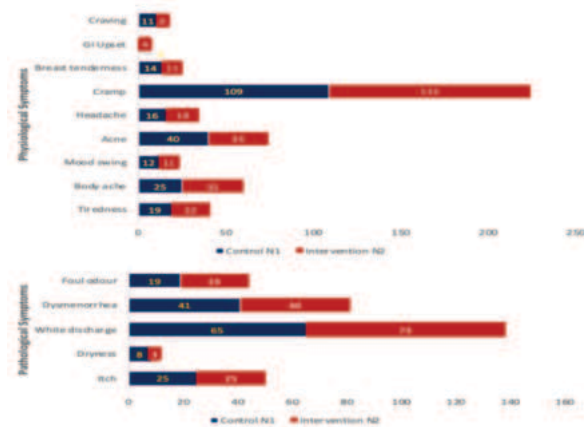


Figure 3: The Range of Physiological and Pathological Symptoms

In Table 2, although 100% of students receive sanitary products from their schools (as part of the KHUSI Program run by the Government of Odisha), only 74.12% (126) in intervention and 68.94% (111) in control use them on a regular basis. About 40% of participants in both groups purchase higher-quality goods on their own or with family members from stores or online retailers, citing the quality issue with the free products. In terms of total monthly menstrual management costs, participants who prefer to use commercial goods, 30.5% (101) spend between 50 and 100 Rupees every month on period management, while 21.5% (71) spend more than 100 Rupees per month. When asked how used napkins were disposed of, the majority replied that they were thrown outside, some in open drains, and only a small minority would wait for the garbage truck to pick them up. Few people had previously utilized the incinerator at the school or the residential complex. Reusable old clothes are mostly thrown away after one use by the participants. P10- "...What was given in school was very thin. it was soaked in just an hour... so I did not use it, gave it to my mother. Then I buy for myself..." -FGD2.

In terms of the reasons for use of old cloth, 83% of respondents (5) cited cost as a motivating factor, while 17% (1) mentioned it for pads. For the concern of a chemical smell, 40% (2) preferred cloth, whereas 60% (3) leaned towards pads. When pads were unavailable, 35% (7) resorted to cloth, while 65% (13) opted for pads. Regarding the drying methods for reusable cloth, 50% (2) chose to dry them under direct sunlight, the same as the other group. Drying inside the room was preferred by 33% (1) but 67% (2) opted for this method. Lastly, 54% (14) used large cloth for drying, compared to 46% (12) who did the same.

Table 2: Absorbent Use Among The Participants

Type Of Absorbent	Control		Intervention	
	N1	row%	N2	row%
Cloth	9	28	7	44

Variables	Control		Intervention	
	N1	row%	N2	row%
Preferred Absorbent				
Insert	4	100	0	0
Comfort	27	30	28	30
Good Absorption	48	37	38	43
Doesn't Stain	93	30	98	30
Easy Access	23	36	18	44
* Absorbent used Per Day				
1	17	46	60	51
2-3	91	28	94	31
>3	14	34	8	38
Purchase				
School	115	32	107	48
Self	85	33	58	47
By Family	88	44	83	38
Online	7	88	1	13
* Expenditure (Monthly)				
Less Than 50	90	27	69	43
50-100	49	48	33	32
More Than 100	23	37	40	83
* Disposal Of Used Absorbent				
Dunkin	105	33	93	48
Open Space	33	32	31	48
Buy	28	48	32	55
Flush In Toilet	12	35	10	43

* Variables for Practice score.

¹⁻⁴Component sequence in the Principal component analysis.

Table 3: Menstrual Hygiene Practice

Practice	Control		Intervention	
	N1	row%	N2	row%
* Daily Bath	100	52	94	48
* Clean External Genitalia	83	52	77	48
* Handwash during changing the absorbent	130	51	127	49
Bath Restriction during menstruation	14	42	19	58
Preferred Place To Change The Absorbent				
Bedroom	21	51	20	49
Bathroom	141	50	142	50
Adequacy of available toilet facility				
None	13	57	10	43
Home	76	47	87	53
School	30	49	31	51
Both	43	56	34	44

* Variables for Practice score

¹⁻⁶Component sequence in the Principal component analysis

The good hygiene practice like daily bath, handwashing, cleaning external genitalia during changing of pads etc. are equally distributed across the groups. Students were dissatisfied with the existing MHM friendly washroom facility in the school were equally distributed among two groups (Table 3 & 4). Insufficient restrooms at the school accounted for 46.2% (153) of school absences, and problems with pad disposal at the school accounted for 6.9% of absences during menstruation. Although there was an incinerator available in the control arm, it was used by only 29.41% (50) in the intervention arm. The findings correlate to the qualitative data. P9- "... there is a box in school. When the pad is full, then you must put it in the box, then close it and switch the green button on. Then it will burn, and smoke will go out... I have never used it. Just have seen it being used... Normally, I come home from school to change... Once I had change at school. There is an open drain behind our school. I threw it there."-FGD6.

Table 4: Effect Of Menstruation on School Life

Days Of School Absence	Control		Intervention	
	N1	row%	N2	row%
Never	100	54	86	46
>2	53	49	56	51
01-Feb	9	31	20	69
Reason For Absent				
Pain	37	42	52	58
Fear Of Staining Cloths	39	49	41	51
School Toilet Unhygienic	11	42	15	58
Disposal Issue At School	11	44	14	56
Social Restriction	1	25	3	78
Change Absorbent At School	43	47	48	53

Table 5: First Menstrual Experiences

		Control		Intervention	
		N1	row%	N2	row%
Caught Unaware		130	48	142	52
Reported first	Mother	125	52	117	48
	Sister	14	38	23	62
	Friend	20	54	17	46
Subsequent Mental State	Confused	32	51	31	49
	Depressed	9	56	7	44
	Felt dirty	20	53	18	47
	Fear	98	52	89	48
	Menstruation Ritual	93	46	108	54

Almost three-fourths of participants (Table 5), had no idea of menstruation before they reached menarche. Only 25% of each group had some awareness. Among those who were aware, their friends accounted for 16% (53) of their direct sources of information, followed by family with 11.5% (38). In the discussion regarding their first period-related experience, it was revealed that, almost everyone was terrified, kept their secrets, and avoided telling anyone. Only when they were unable to handle it on their own did they turn to their parents for help. Many had some short of first period ritual at home. But over the years the restrictions have eased a lot pointing towards socio-cultural shift. P11- "... When my elder sister had her first, there was a grand celebration. Then Papa (father) called everyone... (thinking)... at 4:00 or 5:00 in the morning. I used to take bath in the morning, apply turmeric every night. Then used to feed something ...and mix something in Banana and feed it so that the period did not smell. After feeding her and bringing her to the place to do the ritual, they kept something like coconut-banana or something else in her hand..." -FGD3.

Table 6: Knowledge On Menstruation

		Control		Intervention		
		N1	row%	N2	row%	
Source Of Knowledge	None	115	51	111	49	
	Family	17	43	21	23	
	Friend	39	33	24	43	
	Teacher	1	17	3	33	
	Recent Knowledge					
Basic Knowledge	Age At Menarche	127	51	123	49	
	Reason Of Bleeding	22	39	34	51	
	Organ Involved					
	Uterus	97	52	91	48	
	Vagina	8	62	7	38	
	Uterine Tract	47	43	37	33	
	Stomach	10	23	9	47	
	Cycle Length	143	50	141	50	
	Knowledge On Personal Hygiene	Don't Wash Private Parts	4	57	3	43
		Should Bath Daily	122	51	118	49
Change Stained Undergarment Regularly		70	46	81	54	
Adolescent Change In						
		Breast Enlargement	35	51	34	49
	Growth Spurt	61	54	71	46	
	Personality Evolution	44	33	36	43	

Only 3.9% (13) guessed that the source of bleeding is the uterus, and the other 34.4% (114) thought blood and urine came out through the same tract (Table 6). About 20.55% (68) of participants use hot compresses or drink hot water as home remedies for cramp management. About 21.1% (70) were aware of some symptoms of RTI, but none had any knowledge about the vaccine for cervical (genital) cancer. Initial discussion about the students' knowledge of menstruation focused on what they already knew. Most often, participants didn't respond because they were hesitant. Most of them, however, said that they are unaware after being probed further. Most believed this is the process of removing impurities out of our body. In terms of their understanding of how to handle mild to moderate menstrual symptoms at home, the majority knew to use hot water, but they all believed that a lack of physical activity would lessen symptoms.

P9- "...Menstruation means when the filth in the body comes out..."-FGD1. P10- "... if grandma is at home, then she gives methi (Fenugreek). If there is too much pain then... () ...eat methi and drink some water... () ...the pain doesn't disappear completely, it just subsides to some extent..."-FGD2.

#Variables for Knowledge score

1-15Component sequence in the Principal Component Analysis

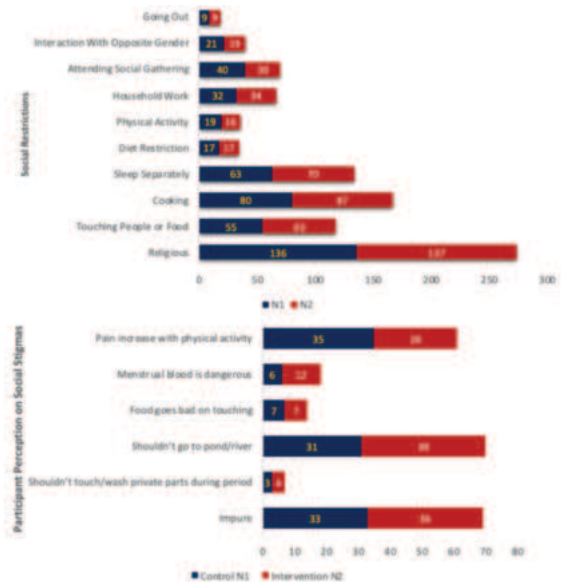


Figure 4: Social Restrictions and Stigmas Related to Menstruation.

Religious activity, cooking and sleeping separately were the major social restrictions followed (Figure 4) whereas the menstrual blood being impure, restriction on physical activity and avoiding communal bath area were the major perception among the participants. P11- "...yes, I don't go to masjid.... when it happened for the first time, mommy said that Chicken should not be eaten, should not eat lentils etc., due to which I am in pain, if it smells, then all those things should not be eaten...on eating those your period will smell bad..."-FGD2.

Participants in both groups were comfortable discussing menstrual problems (Table 7) with their mothers, followed by their sister 19% (33) in the intervention group and friends (14%) in both. About 25.7% of subjects had ever asked about menstruation to anyone, but 12.7% then faced avoidance. This could be the reason 34.4% (114) avoided seeking help regarding the matter. Even so, now 83.4% (276) are willing to learn more about the subject. When it came to discussing menstruation with others during the FGD, everyone admitted that they avoid doing so due to social shame and shyness. They learn about it from personal experience or social media. The question of government initiatives and any material or educational assistance they received at school or elsewhere was finally investigated. Most of them consented to receiving pads, iron-folic acid tablets every week, and albendazole for deworming every year. However, only a small number of them were taking the tablets since they were unaware of implication of the drugs, and only half of them used those pads. P10- "...I asked mum my mum earlier when I was having too much pain...she laughed and said that you are just a child. Don't ask too much..." -FGD2.

Table 7: Interpersonal Communication Regarding The Topic Of Menstruation

	Control		Intervention		
	N1	row%	N2	row%	
Comfortable Talking To	Mother	102	48	112	52
	Teacher	15	71	6	29
	Sister	19	40	28	60
	Friend	24	45	29	55
	Asked Any Family Member	47	57	35	43
Faced Avoidance On Asking					
		19	45	23	55
Wish To Learn More About The Topic	No	52	50	51	50
	By Doctors On School Health Day	68	49	71	51
	By Teachers In Regular Classrooms At The School	29	50	29	50
	From People Of The Same Age	12	55	10	45
	Social Media	1	50	1	50

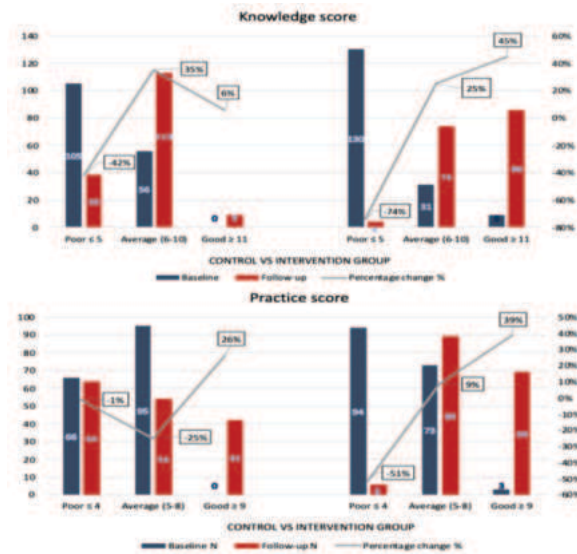


Figure 5: Change In Knowledge And Practice Score Over Study Period.

In the Post-Intervention/Endline Evaluation, the Knowledge score total was 15, with 1 point for each right answer, and it is demarcated into Poor: 0–5, Average: 6–10, and Good: 11–15. The score (Figure 5) among the two study groups at the end of the study was found to be statistically significant with ($\chi^2=25.78, p<0.001, df=2$). The Practice score total was 12, and it is divided into Poor: 0–4, Average: 5–8 and Good:9-12. The practice score among the two study groups at the end of the study was found to be statistically significant ($\chi^2=48.25, p<0.001, df=2$). Also compared to the control group, 39% more in the intervention group scored good practice at the end. The improvement in the practice at the endline was positively correlated to the improved endline knowledge score (spearman's $\rho=0.169, p=0.001$).

Principal Component Analysis was employed to pinpoint the primary factors influencing changes in scores. In terms of knowledge, the first component (Loading 4.09, variance 27.2%, Eigenvalue 4.19) primarily pertained to topics such as the physiology of menstruation, home management of pain, symptoms of reproductive tract infections and vaccines related to genital cancer. These knowledge variables were most impacted by the intervention. On the other hand, with regards to change in practice aspect, factors like proper disposal methods, the appropriate number of pad changes per day, and maintaining hygiene by cleaning the external genitalia during pad changes played a significant role (loading at 1.3, variance 27.2%, Eigenvalues >1). These factors significantly contributed to the improvement in practice scores as also evident from the Scree plots (Figure 6).

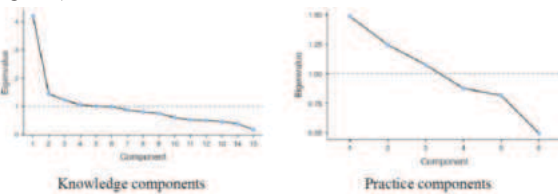


Figure 6: Scree Plot Of Principal Components In Knowledge And Practice Score

In the study, several positive correlations emerged between specific factors and improved practice and attitude. Participants experiencing menstrual health issues such as itching ($\rho=0.101, p=0.03$), foul smell ($\rho=0.115, p=0.02$), and those unable to attend school due to menstrual pain ($\rho=0.093, p=0.04$), as well as those comfortable discussing the topic with their sisters ($\rho=0.114, p=0.02$), exhibited improved practice and attitude by the study's conclusion. Furthermore, participants benefited from a supportive family in procuring adequate sanitary absorbents ($\rho=0.021, p=0.02$), schools with proper disposal facilities ($\rho=0.109, p=0.03$), improved communication with sisters ($\rho=0.161, p=0.002$), and friends ($\rho=0.137, p=0.007$), all of which were positively correlated with enhanced knowledge scores by the endline. The Table 8 reveals that participants who exhibited unhygienic practices were

positively associated with health issues such as itching, white discharge, and dysmenorrhea. Conversely, the presence of adequate toilet facilities was linked to hygienic behaviors, including proper handwashing, changing absorbents in sanitary conditions, and maintaining cleanliness when replacing absorbents.

Table 8: Correlation Matrix Of Hygiene Practice And Menstrual Health Issues

	Itch	Dryness	White discharge	Dysmenorrhea	Foul smell	Toilet Adequate	Daily bath	Clean Genitalia	Handwash	Bath Restriction
Dryness	0.08 p 1	—								
White discharge	0.21 p 2	-0.127 p 2	—							
Dysmenorrhea	0.04 p 9	0.049 p 6	-0.15 p 6	—						
Foul smell	0.08 p 13	0.023 p 13	-0.65 p 66	0.021 p 37	—					
Toilet Adequate	0.11 p 3	0.054 p 3	0.182 p 3	0.003 p 1	-0.15 p 4	—				
Daily bath	0.14 p 1	0.014 p 1	0.247 p 1	-0.124 p 1	0.03 p 5	0.099 p 5	—			
Clean Genitalia	0.12 p 3	0.136 p 3	-0.027 p 3	-0.128 p 3	0.06 p 3	0.148 p 3	0.06 p 3	—		
Handwash	0.11 p 3	-0.073 p 3	0.209 p 3	0.013 p 3	0.15 p 3	-0.021 p 3	0.28 p 7	0.093 p 3	—	

ρ =spearman's rho, $\rho+$ positive correlation, $\rho-$ negative correlation
p value <0.05 significant, <0.001 highly significant

DISCUSSION

The study, conducted in an urban area, captured the demographic dimension and migration patterns of participants in relation to educational opportunities. The age at menarche, a widely used indicator of sexual development, is influenced by factors such as genetics, environment, family size, body mass index, socioeconomic status, and education level [13]. In this study, the mean age at menarche was approximately 12 years, which contrasts with other studies conducted in India where the average age was around 14 years [13], [14]. Dysfunctional uterine bleeding associated with anovulation, a common cause of heavy menstrual bleeding in adolescents, was expected to be higher in this study. Excessive or insufficient bleeding during menstruation could potentially indicate problems such as excessive blood loss or existing nutritional deficits. The study revealed that participants expressed a willingness to purchase better hygiene products if they were available, whereas another study found that despite the awareness, only a few used them[15]. Regarding menstrual waste disposal, most participants reported disposing of it in dustbins, followed by open drains. According to WaterAid India and the Menstrual Hygiene Alliance of India (2018), only 36% of women in the reproductive age group in India, approximately 121 million women, use sanitary pads. This equates to a significant quantity of pads that require proper and safe disposal, with an estimated 1 billion pads per month and 12 billion per year. Basic hand hygiene practices and regular bathing during menstruation were found to be inadequate. Despite efforts such as the "Vision 5T"(Teamwork, Transparency, Technology, Time, and Transformation) and "Mo School" (My School) state programs implemented by the Government of Odisha to improve school facilities [16], poor maintenance and unhygienic conditions of restrooms remained a concern, contributing to school absenteeism. Other reasons for school absenteeism cited in previous studies include physical pain, fear of staining clothes, and restrictions imposed by relatives or teachers [17] but these were not found in this study. Less than a quarter of the participants demonstrated awareness of the normal physiology of menstruation, despite a dedicated subject on reproduction and adolescence in the science textbook used in government high schools. According to the global baseline report for 2018, approximately 64% of schools in India provide menstrual hygiene education to female students. As compared to the last systematic review by Anna Maria van Eijk [7], the findings of this study indicate a lower level of knowledge among the study population regarding menstruation prior to menarche. This may be because participants' direct sources of information were primarily friends and

family members, with little involvement from teachers or healthcare professionals. This indicates a hesitance among teachers to discuss the topic and sub-standard academic effort in the schools. This study also indicates that there are still barriers to open communication about menstrual hygiene, especially when seeking help and discussing the topic with others. This is consistent with findings from similar studies conducted in Egypt and India, where menstruating girls are often considered impure [18], [19]. The focus group discussions complemented the questionnaire data, providing deeper insights into the evolving experiences of menstruating urban Indian adolescents. The study also found a strong positive correlation between the post-intervention knowledge gain and the intervention group's improvement in menstrual hygiene practice as opposed to the study by Subathra et al., which reported no significant positive correlation [20].

The results of the study could not be generalized to the entire population of school-going adolescents as it was a small-scale study in four government schools due to COVID restrictions. A larger, properly randomized study would yield more conclusive findings. An increase in online classes and increased use of gadgets with accessibility and awareness of social media may have contributed to the post-test scores in both groups.

This study demonstrated how difficult it is to expect uptake and sustained behavior change because the MHM policy at the school level is only product-oriented in India. Reviewing outcome indicators like social support, community perceptions, the involvement of men and boys, knowledge, and menstruating adolescent girls' self-efficacy, etc. has to receive a lot of attention because there is no concept of routinely monitoring the data pertaining to MHM practices in schools. Other creative initiatives that can be used to enhance MHM in schools include school clubs, puberty books, online apps and games to promote knowledge and hygiene practices related to MHM, sewing sanitary pads as an activity for both boys and girls in school, especially in the Socially useful productive work (SUPW) classes, etc.

CONCLUSION

The study found that the intervention group had a significant improvement in their knowledge and practice scores compared to the control group. The intervention group also had a stronger correlation between knowledge gain and practice improvement. The study highlighted the need to move beyond product oriented MHM policies in schools and emphasized the importance of institutionalizing MHM knowledge within the educational system and empowering teachers to address this subject effectively.

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