

Effectiveness of a menstrual health education program on psychological well-being and behavioral change among adolescent girls in rural Uganda

Yi-Ting Yang,¹ Duan-Rung Chen²

¹Master of Public Health, College of Public Health, National Taiwan University, Taipei; ²Institute of Health Behaviors and Community Sciences, College of Public Health, National Taiwan University, Taipei, Taiwan

Correspondence: Duan-Rung Chen, Institute of Health Behaviors and Community Sciences, College of Public Health, National Taiwan University, Taipei, Taiwan, No. 17, Xu-Zhou Road, Taipei, Taiwan.
Tel.: +886-2-3366-8066.
E-mail: duan@ntu.edu.tw

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Informed consent: To participate in the qualitative interviews' girls provided with guardian written consent to participate and be recorded. No guardian and girls declined participation. Girls were informed that they could decline to answer any question.

Availability of data and material: Summary data (full framework matrix) used for this study is available from the corresponding author upon reasonable request. Raw interview transcripts are not available due to privacy restrictions.

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Abstract

Objectives. Menstrual hygiene management is one of the main barriers to girls' education attainment in low-and middle-income countries. Poor access to sanitary products and lack of menstrual knowledge affect students' performance at school compared to the opposite sex. Limited evidence is available to provide solutions for schoolgirls. This study examines the effectiveness of menstrual health education programs on well-being and behavioral change among adolescent girls in rural Uganda.

Methods. A cluster randomized controlled trial was conducted across 3 schools, including 66 girls aged 13-17 years, in a rural village in Mukono District, Uganda. Schools were randomly allocated to 2 groups: i) health education program intervention and ii) control group (no intervention).

Results. After 5 weeks of the Health Education Program, the schoolgirls in experiment groups showed significantly less fear of sharing the menstruation-related concern with parents and pupils [Mean Difference (MD)=0.87, P=0.029] (MD=2.02, P=0.000), and the sense of shameful feelings during menstruation (MD=1.65, P=0.004); conversely, the fear to go to school during menstruation did not differ between experiment and control groups (MD=-0.04, P=0.94). However, the changes in *feeling comfortable having a period at school* were significantly different between the experiment and control groups (P=0.001).

Conclusions. The study demonstrated promising results of a low-cost intervention for enhancing girls' menstrual health education in a low-income context. Puberty education and reusable pad sewing provision were strongly associated with improving schoolgirls' psychosocial wellbeing related to menstrual management.

Introduction

Menstruation is an essential component of women's lives, but this phenomenon is interpreted differently across cultures and societies.¹ Poor menstruation hygiene management (MHM) affects many girls globally, particularly in low- and middle-income countries.² These MHM challenges are crucial because adolescent girls often lack the knowledge, experience, and self-confidence to manage menstrual hygiene.³ Girls often feel stressed when their cycle begins, and it causes more psychological problems such as confusion and embarrassment due to a lack of knowledge.² In addition, higher educational attainment is associated with many advantages in life for women and girls, such as delayed sexual debut, delayed marriage, and increased future incomes.^{4,5} However, menstruation contributes substantially to low school attendance among girls. World Bank (2005) indicated that girls could be absent from school for up to 4 days every month due to menstruation, which means 10-20% of the school time.⁶

Many researchers have replicated the 2012 pilot study on menstruation and school absence in Ghana in similar rural settings.⁷ The study in Ghana included 120 schoolgirls (aged 12-18) across

4 schools. The 5-month non-randomized cluster-control trial was designed to test the effectiveness of disposable sanitary pad provision and puberty education on school attendance for female pupils. The results revealed significant improvement before and after the intervention, with a 9% increase in attendance for those receiving pads and health education.⁷ One study in Kenya,⁸ and 3 studies in Uganda,^{9, 10, 11} that were conducted in different districts (Entebbe, Gulu, and Kamuli) and settings (peri-urban areas, transit towns, and rural villages), have demonstrated that the provision of menstruation product can improve students' attendance.

A research group conducted a cluster *quasi*-randomized controlled trial on sanitary pads and puberty education provision in Kamuli, Uganda, in 2016. A total of 8 schools with 1124 girls were recruited. Schools were allocated into 4 conditions: the provision of puberty education alone, reusable sanitary pads alone, puberty education and reusable sanitary pads, and control (no intervention). The results supported the positive effect of sanitary pads and puberty education provision on girls' school attendance.¹¹ The study may have been influenced by high social desirability because the survey was distributed to participants verbally. However, this study found no differences in the feelings of shame or insecurity experienced during menstruation across the 4 conditions, which indicated limited realization of full rights to women's health.¹¹ More research addressing psychosocial well-being during menstruation is warranted.^{9, 11} The *MHM in Ten* group, which includes United Nations agencies, nongovernmental organizations (NGOs), academics, and stakeholders, has the universal goal that "girls in 2024 around the world should be knowledgeable about, and comfortable with their menstruation, and able to manage their menses in school in a comfortable, safe and dignified way".¹² To enhance better psychological well-being during menstruation, this study examines the effectiveness of a health educational program intervention in improving girls' psychosocial well-being and menstruation-related behavior in a rural fishing village in Mukono District, Uganda.

Figure 1 presents the research design employed in this study. The health education program's provision was hypothesized to improve girls' psychosocial well-being and behavior regarding menstruation significantly. $O_{1(E)}$ indicates the status of the experimental group before intervention X. The $O_{2(E)}$ shows improvement after the intervention. The hypothesis was: if the difference between $O_{1(E)}$ and $O_{1(C)}$ is nonsignificant, then $O_{1(E)}$ will be significantly higher than both $O_{2(E)}$ and $O_{2(C)}$, whereas $O_{1(C)}$ and $O_{2(C)}$ will remain the same, indicating the randomization is achieved.

Materials and Methods

Ethics

Before the study, the participants' parents and guardians were contacted verbally by an NGO worker and the school's head teacher in cases of illiteracy to fully explain the purpose of this study. A consent form was then sent home with students to be signed by parents. In boarding schools, school representatives signed consent forms as the guardians of students. A Luganda-language version of the consent form and an NGO worker's phone number were available on the forms for emergency purposes.

The research protocol (IRB) was approved by the Research Ethics Committee of National Taiwan University (NTU-REC No. 201907HS002). (Supplementary material 2).

Participants and recruitment

This study was conducted in Mpunge subcounty, a rural area in Mukono District, Uganda. The subcounty was selected because of its poor performance in various key educational, health, and welfare indicators. Although the district is adjacent to the capital of Uganda, the village is located at the far side of the district by the shore of Lake Victoria (Figure 2). The village is characterized by high illiteracy, mortality, fertility rates, early marriage, and poor living conditions. Schools were selected for the intervention in collaboration with our Ugandan-registered NGO partner based on having sufficient understanding of the purpose of the project, a sufficient number of girls who had experienced menarche, and enthusiasm for the project.

Before the research started, a stakeholder meeting was held at the Kyazzi Village Local Council Office to select candidate primary schools and discuss the study purpose, objectives, procedures, and duration. Students predominantly aged 13–15 years in 3 primary schools were recruited. Schools were offered gifts after participation. These gifts were not used as motivation; we did not promise them before the intervention but presented them after the study concluded, as it is culturally typical.

Intervention

A cluster randomized controlled trial design is employed. Figure 3 presents the study flow chart. This study examined the effectiveness of a 5-week health education program to improve psychosocial well-being and menstruation-related behavior among girls aged 13–17 years from March 2020, March 9th till April 12th for 5 weeks. The Health Education Program included two sessions: one was MHM health education, and the other was a reusable sanitary pad sewing session. With the help of a partner NGO and minor adjustments, we integrated our educational materials into the schools' curricula. The NGO also provided an assistant to guide the girls in sewing their reusable sanitary pads. This 5-week educational program included introducing sessions about hygiene and puberty, reproductive anatomy, menstrual cycle, sexual abuse, menopause, sexual assault, self-defense, reusable pad care, and the reusable sanitary pad sewing session.

Before randomly allocating 3 schools into 2 groups, a cardboard box with 3 pieces of paper that had its school title on it was prepared and picked out by a local council officer. Schools were then distributed randomly into the experimental and control groups. The intervention was conducted in the experimental group (1 school). Students in the control group (2 schools) received their schools' original health education, and a booklet on MHM was distributed to each student.

Girls who had experienced menarche were considered suitable candidates for participating in the study. In total, 22 girls in primary school 1 were recruited into the experimental group; 24 girls in primary school 2 and 20 girls in primary school 3 were allocated to the control group.

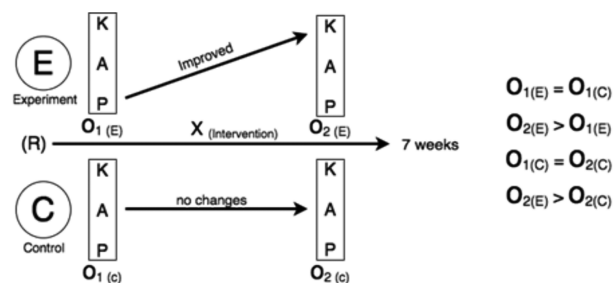


Figure 1. Research design.

MHM health education session

The partner NGO's local trained community health worker administered the MHM health education session. The session was based on the teaching guidelines of the partner NGO with minor adjustments for time. Each session included eight topics, namely introduction to hygiene and puberty (40 minutes), reproductive anatomy (40 minutes), the menstrual cycle (45 minutes), sexual abuse (15 minutes), sexual assault (15 minutes), menopause (15 minutes), self-defense (30 minutes), and care instructions for pads (10 minutes). The total time for the intervention topics was 210 minute long. This MHM Session is designed to execute 8 topics in 4 weeks. All subjects were taught in English and Luganda to ensure that all participants understood all sessions. The health worker answered all reproductive health-related questions at the end of each topic. Twenty-two participants were allocated to this MHM health education session as the experimental group.

Reusable sanitary pad sewing session

Girls eligible to participate in the study required knowledge of sewing a reusable pad from scratch. These reusable sanitary pads were invented to suit the needs of girls in East Africa by partner NGO Love Binti Pads. Their 5 years of experience in the field and their process of making reusable pads were optimal for our target groups. All materials could be acquired at the local market; therefore, the girls could easily make more pads to suit their needs after the study. However, the material for the session was provided by the partner NGO. Compared with previous studies in which girls were provided disposable pads or pads made of imported materials, menstrual products provided in our study were more sustainable. The pads comprised a comfortable top and middle layer made of quick-drying fleece, a water-resistant polyvinyl chloride lining as the bottom layer, and a button on one wing to secure the pad to underwear. These sanitary pads could be reused for up to 24 months. According to individual needs, one menstrual cycle requires 6–10 places. When learning how to sew the reusable sanitary pads, the girls were also taught how to correctly use and clean them by research assistants trained locally by an NGO. Also, the participants were provided two already made reusable pads from the partner NGO for girls to interchange. The sewing procedure is straightforward, which only requires one session of 2 hours.

Outcomes

The intervention was evaluated using a knowledge, attitude, and practice (KAP) questionnaire (Supplementary material 1) before and after the intervention. The questionnaire was based on Miuro's study in Uganda.¹⁰ Still, it was modified into 4 domains with 23 items that included affections, attitudes and behavior, and knowledge toward menstruation. The questionnaire was distributed to all participating students at each school 1 week before the intervention started. After the intervention, the same survey (posttest) was distributed to all 3 schools again. The experimental and control groups received the KAP survey during the same week, even though the control group did not receive the intervention. Sociodemographic data, school hygiene-related facilities, personal menstruation information, feelings, attitudes, and behaviors regarding menstruation, and MHM knowledge were collected. The survey was administered as a self-completed paper form, and the NGO research assistant was present to guide students through the questions one by one. Their guidance did not affect the survey results but fully enabled the participants to understand the questions. The paper forms were double entered into a password-protected Microsoft Access database and Excel (version 16.29) spreadsheet and transferred to IBM SPSS (SPSS 25) for data cleaning and analysis. All surveys, consent forms, and research records were stored in a lockable cabinet. The surveys were analyzed using descriptive statistics to summarize data by school, and between-group comparisons were performed using an

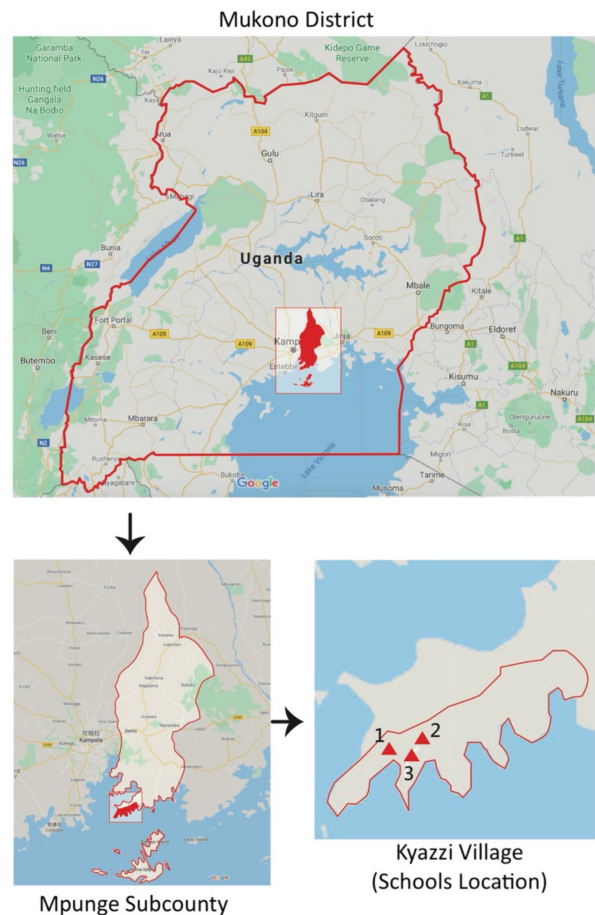


Figure 2. Field map.

Table 1. Study outcome variables.

Domains	Items
The affections	Feel comfortable to talk to my father Feel comfortable to talk to my mother Feel comfortable to talk to my teacher Feel comfortable to talk to my classmate
Attitude	Period is shameful Menstruating at school Menstruating at home Fear to go to school Attendance at school
Behavior	Fetch water Fetch firewood Go to the farm Exercise Go to the school Playtime at school Be around male teacher Be around male classmate Be around father
Knowledge	Next period Handle my period Reduce my menstrual pain Who to consult during period Sew cloth pads

independent t-test. The outcome variables are presented in Table 1.

The KAP survey was designed to monitor 4 domains: affections, attitudes, behavior, and girls' knowledge regarding menstruation. The affections domain was focused on the comfort of interacting with individuals in different roles among the girls while they were menstruating.

Results

Participant characteristics

In total, 66 eligible female students, aged 13–17 (mean=13.83) with varied ages at menarche, were recruited for the pretest on March 9th, 2020. Having experienced menarche was the criterion for including students from the three schools. All 66 students provided informed assent and parental and headteacher consent to participate. At the end of data collection, 4 girls (2 each in the experimental and control groups) were absent on the post-test day. School closures prevented us from retrieving the 4 missing posttests 1 week after the scheduled posttest time. Missing data were removed, yielding 62 valid samples out of 66 recruited for the independent t-test.

The responses of the 62 girls did not differ significantly between the experimental and control groups at baseline. The participants' mean age was 13.95 years in the experimental group and 13.78 years in the control group [mean difference (MD)=0.18, P=0.49]. The mean number of people in the participants' families was 6.55 in the experimental group and 6.92 in the control group (MD=-0.38, P=0.57). Table 2 displays the sample's characteristics

by intervention condition.

Catholicism was predominant in both groups, with 10 (45.5%) students in the experimental group and 20 (50.0%, P=0.673) students in the control group identifying as Catholic. Regarding ethnicity, 20 (90.9%) students reported that they were Ugandan, 2 (9.1%) said being non-Ugandan in the experimental group, 37 (92.5%) reported being Ugandan, and 3 (7.5%) reported being non-Ugandan in the control group. No significant difference was observed between the 2 groups (P=1.000). In the experimental group, 3 girls (12.5%) were partial orphans, and in the control group, 9 (22.5%) girls were partial orphans, and 1 (2.5%) was a total orphan. The family status of the girls did not differ between the experimental and control groups (P=0.861). 19 (86.3%) girls reported living with their mothers in the experiment group, and 3 (13.6%) said living without their mothers. In the control group, 26 (65.0%) lived with their mothers, and 14 (35.0%) lived without their mothers; no significant differences were observed between conditions (P=0.065).

None of the baseline characteristics differed significantly between sites. Therefore, both the experimental and control groups were equal at the start of the intervention. The sociodemographic characteristics of the girls are listed in Table 3.

Intervention effectiveness

Intervention effectiveness was examined by comparing these 2 groups. Findings are presented using the KAP framework domains in Table 1. Efficacy was evaluated in 4 domains: changes in affection, attitude, behavior, and knowledge regarding menstruation after the health education program.

Table 2. Baseline characteristics between experimental and control groups.

Characteristics	Experiment group (n=22), mean (SD)	Control group (n=40), mean (SD)	Statistical test Mean difference	P-value
Age mean	13.95 (0.79)	13.78(1.07)	0.18	0.49
No. people in the family	6.55 (2.42)	6.92 (2.53)	-0.38	0.57

Independent t-test, Fisher's exact (gamma coefficient); SD, standard deviation.

Table 3. Baseline characteristics between experiment and control group.

Characteristic	Experiment group (n=22)	Control group (n=40)	P-value
Religion (%)			0.673
Anglican	2 (9.1)	6 (15.0)	
Born-again	4 (18.2)	8 (20.0)	
Catholic	10 (45.5)	20 (50.0)	
Muslin	6 (27.3)	5 (12.5)	
Other	0 (0.0)	1 (2.5)	
Ethnicity (%)			1.000
Baganda	9 (40.9)	17 (42.5)	
Non-Baganda	11 (50.0)	20 (50.0)	
Non-Ugandan	2 (9.1)	3 (7.5)	
Orphan status (%)			0.861
Not an orphan	19 (86.4)	30 (75.0)	
Paternal	2 (8.3)	6 (15.0)	
Maternal	1 (4.2)	3 (7.5)	
Dual orphan	0 (0.0)	1 (2.5)	
Living Status (%)			0.065
With both parents	12 (54.5)	9 (22.5)	
With father	3 (13.6)	6 (15.0)	
With mother	7 (31.8)	17 (42.5)	
With grandparents	0 (0.0)	5 (12.5)	
Other	0 (0.0)	3 (7.5)	

Affection

Girls were asked with whom they feel comfortable discussing menstruation-related topics. After the intervention, girls in the experimental groups exhibited higher scores in feeling comfortable talking with their fathers as compared to that in control groups (MD=0.87, P=0.029) and classmates (MD=2.02, P=0.000). These results are presented in Table 4.

Attitude

Attitudes toward menstruation were evaluated by asking the girls the extent to which they feel shame or fear regarding attending school during menstruation. Girls in the experimental group exhibited less shame than girls in the control group (MD=1.65, P=0.004). They also felt more comfortable menstruating at school after the intervention (MD=1.49, P=0.001) compared with the girls in the control group. By contrast, comfort with menstruating at home was low at baseline; it did not differ significantly after intervention (MD=0.59, P=0.172). Moreover, *fear of attending school during menstruation* (MD = -0.04, $p = 0.94$) and *menstruation affects school attendance* (MD = 0.57, $p = 0.328$) did not differ between girls in the experimental and control groups. This result is

presented in Table 4.

Behavior

The following remaining items were low at baseline and were nonsignificant after intervention: avoiding fetching water (MD=0.86, P=0.104), avoiding farms (MD=1.36, P=0.485), avoiding exercise (MD=-0.49, P=0.31), avoiding school (MD=0.75, P=0.115), avoiding playtime at school (MD=0.02, P=0.972), avoiding male teachers (MD=-1.09, P=0.066), avoiding classmates (MD=0.17, P=0.791), and avoiding fathers (MD=0.71, P=0.228). Only one item, namely avoiding fetching firewood, reached significance (MD=1.36, P=0.01), shown in Table 4.

Knowledge

The items demonstrated the difference in knowledge acquisition between the 2 conditions (Table 4). After completing the health education program, the girls' self-reported knowledge of when their next menstruation would occur significantly improved (MD=1.65, P=0.003) compared with the control group. Girls in the experimental group also reported knowing how to manage their periods better than girls in the control group (MD=-1.6, P=0.000). Knowledge of reducing menstrual pain in the experimental group was significantly different from that in the control group

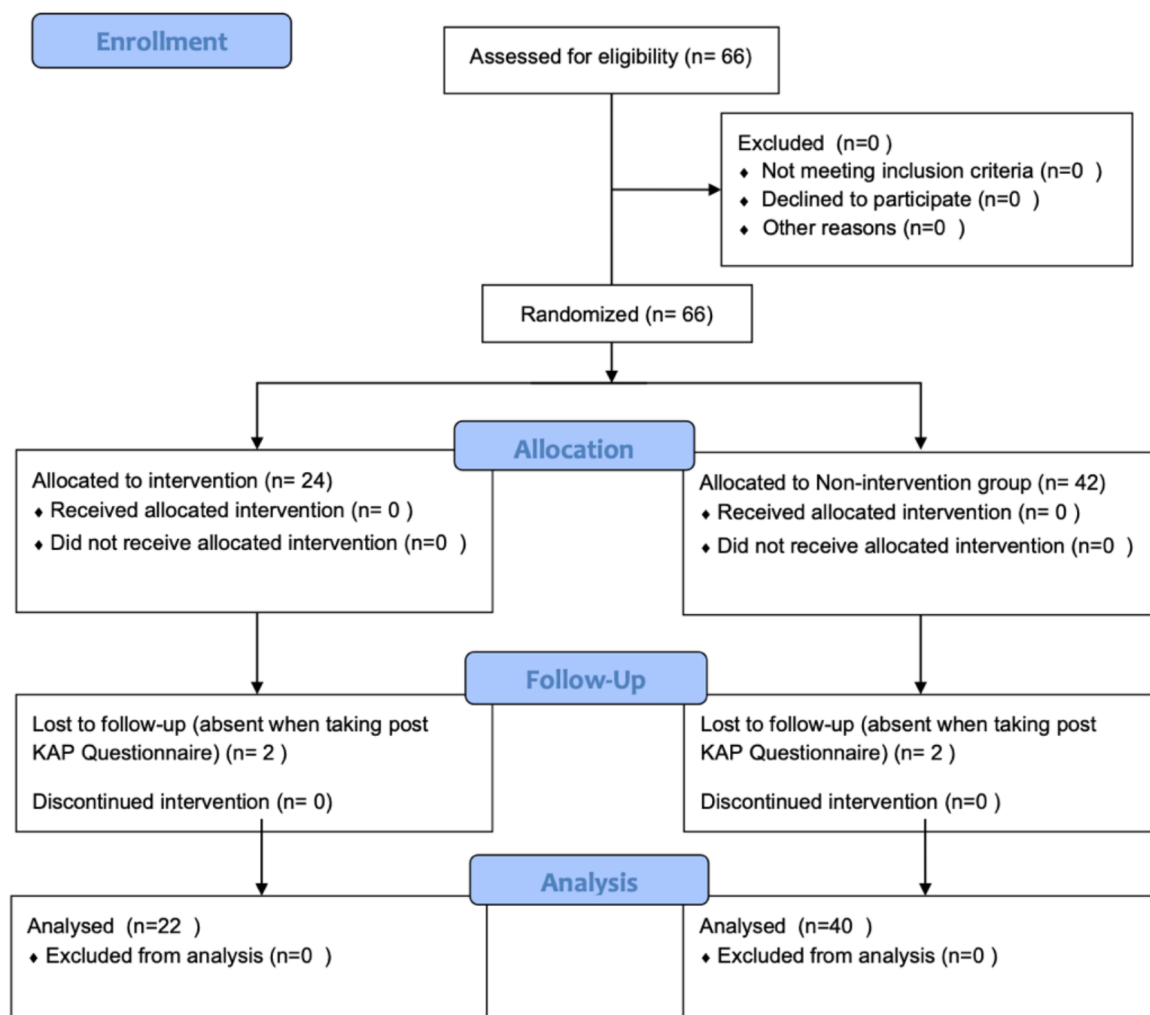


Figure 3. Study flow chart.

(MD=2.85, P=0.000). Those in the control schools with low baseline scores knew whom to speak with when menstruating, which resulted in nonsignificant outcomes (MD=0.45, P=0.283). Average scores in sewing knowledge were lower in the experimental group than in the control group but were nonsignificant (MD=-0.33, P=0.402). This nonsignificant outcome might result in girls from that surrounding are already familiar with sewing something little with their hands.

Intervention effectiveness was then compared between 2 conditions across the 4 domains by adding each item to get a total score. There was a significant difference between the 2 groups. The independent t-test indicated that the intervention significantly improved feelings toward menstruation (MD=3.44, P=0.000), attitudes toward menstruation (MD=4.21, P= 0.002), and knowledge on menstruation (MD=3.03, P= 0.004). Table 5 indicates the data analysis results.

Discussion

For the past couple of years, menstruation has become an over-talked public health issue.^{2,13-16} Several qualitative studies from

Eastern Africa (Kenya, Tanzania, Ethiopia and Uganda) have focused on this increasing issue, which was set for analyzing the impact of insufficient female hygiene products on adolescents' psychosocial well-being.^{3-4,17-20} Previous studies indicated that poor menstrual hygiene management negatively affects young girls' well-being in low-income contexts,⁷ and MHM education is inadequate throughout Uganda.¹⁰ The study in Tigrayan Ethiopia also revealed the challenges in managing menses for girls due to insufficient scientific education concerning reproductive health-related classes.⁴ The provision of knowledge and a beneficial mindset toward the taboo topic of menstruation helped girls discuss menstruation daily at school and increased their comfort with sharing and discussing menstruation in a rural village where primary puberty education is lacking in the school curriculum. By conducting an intervention protocol, our study demonstrates the effectiveness of a health education program intervention (MHM health education and reusable pad sewing) on psychosocial well-being and behavioral change among young adolescent girls (11–15 years old) in East Africa. Previous studies in this area could not show the significant results of improving psychosocial well-being or behavioral change in their research due to a mass dropout in follow-up survey.¹¹ After intervention, more girls were willing to ask

Table 4. Differences between experimental and control groups in four domains.

	Experiment group, mean (SD)	Control group, mean (SD)	Mean difference	Statistics test P-value
Affection				
I feel I can talk to my father about my period issue	3.09 (1.34)	2.22 (1.51)	0.87	0.029
I feel I can talk to my mother about my period issue	0.23 (0.92)	-0.13 (0.65)	0.35	0.084
I feel I can talk to my teacher about my period issue	0.23 (1.48)	0.03 (1.07)	0.2	0.538
I feel I can talk to my classmate about my period issue	1.77 (1.85)	-0.25 (1.53)	2.02	0.000
Attitude				
Having period is shameful	1.77 (2.29)	0.13 (1.95)	1.65	0.004
Comfortable having my period at school	2.86 (1.64)	1.38 (1.66)	1.49	0.001
Comfortable having my period at home	0.36 (1.18)	-0.23 (1.79)	0.59	0.172
Fear to go to school during period	0.55 (2.67)	0.59 (1.86)	-0.04	0.94
Period is affecting my attendance at school	1.32 (2.78)	0.75 (1.75)	0.57	0.328
Behavior				
Avoid to fetch water	1.41 (2.61)	0.55 (1.50)	0.86	0.104
Avoid to fetch firewood	1.68 (2.44)	0.32 (1.59)	1.36	0.01
Avoid to go to the farm	-0.1 (2.92)	0.28 (1.22)	-0.38	0.485
Avoid to exercise	0.14 (2.57)	0.63 (1.19)	-0.49	0.31
Avoid to go to the school	1.27 (2.39)	0.53 (1.30)	0.75	0.115
Avoid playtime at school	0.55 (3.19)	0.53 (1.30)	0.02	0.972
Avoid being around male teacher	-0.86 (2.77)	0.23 (1.80)	-1.09	0.066
Avoid being around male classmate	0.5 (3.05)	0.33 (1.84)	0.17	0.791
Avoid being around father	1.14 (3.08)	0.43 (1.53)	0.71	0.228
Knowledge				
I know when is my next period	1.77 (2.60)	0.13 (1.62)	1.65	0.003
I know how to handle my period	-0.55 (1.41)	1.05 (1.72)	-1.6	0.000
I know what to do to reduce my menstrual pain	3.23 (2.00)	0.38 (1.82)	2.85	0.000
I know who to go to when I have period	0.73 (1.58)	0.28 (1.57)	0.45	0.283
I know how to sew something small with needle and threads	0.32 (1.76)	0.65 (1.31)	-0.33	0.402

Independent T-test, Fisher's Exact (gamma coefficient); SD, standard deviation.

Table 5. Differences in four domains between experiment group and control group.

	Experiment group, mean (SD)	Control group, mean (SD)	Mean difference	Statistics test P-value
Affection	5.31 (3.5)	1.88 (2.78)	3.44	0.000
Attitude	6.86 (4.99)	2.65 (4.85)	4.21	0.002
Behavior	5.82 (8.85)	3.93 (6.49)	1.89	0.339
Knowledge	5.5 (4.14)	2.48 (3.65)	3.03	0.004

Independent T-test, Fisher's Exact (gamma coefficient); SD, standard deviation.

their classmates ($P=0.000$) and father figures ($P=0.029$) for help. Sharing with male figures can be interpreted as reducing the gender taboo regarding menstruation. In addition, the feeling of shame toward menstruation was reduced significantly in the experiment group compared to that of the control group ($P=0.004$). It suggests that long-term health education and reusable pad provision study would be even more responsive to an intervention such as the present one in the future. Furthermore, we selected only enthusiastic teachers about the program and were willing to adhere to the protocols during the intervention. Therefore, teachers were already open-minded toward taboo topics and provided a sense of comfort for girls in menstruation during the intervention. After the intervention, girls in the experimental group reported a more positive attitude of *I feel comfortable having my period at school* ($P=0.001$). Teachers might have played a crucial role in improving the psychosocial well-being of their students. Future research may consider including uncooperative authorities to separate this effect from the trial. Contrary to the uncooperative authorities, a limitation of our study is the trial occurred in a rural village, where many resources were extremely scarce. When new ideas or resources were introduced, some teachers and authorities aggressively responded to the research team on students' behalf of the interest of the trial, and they forced students to provide particular answers to survey questions *to gain the researchers' favor*. For example, some students responded yes to «would you like to try reusable pads» even though they might have not been interested. To reduce such influence, the researcher needs to work with NGOs already familiar with the school circumstances; even without this specific intervention, the other project will give the teacher or authority a sense of security. In the pilot study in Ghana, the provision of health education and pads reduces the absence rate by 9%.⁷ The following research conducted in Uganda can replicate the same outcome with a significant reduction in the absence rate.¹¹ However, the results of our study were not able to replicate a substantial improvement in the attendance rate. We believe the reason might be that the baseline attendance rate is considerably low due to a severe lack of pads in this rural setting. The limitations of this study include its short follow-up time and small sample size. The sample of 62 girls provided a reasonable model for the preliminary assessment of MHM, psychosocial well-being, and behavioral change. The short-term intervention did not allow us to determine its long-term effects, but we could hypothesize that it could bring more appreciation and impactful results. For such crucial health and social needs, these positive results require more trials to replicate and assess the efficacy of this health education and reusable pad sewing intervention in improving psychosocial well-being and behavior among girls.

Conclusions

Puberty education and reusable pad sewing lessons were strongly associated with a reduction of shame and increased sharing and discussing with male figures. More research and replication are warranted.

References

- Jabbour HN, Kelly RW, Fraser HM, Critchley HOD. Endocrine regulation of menstruation. *Endocr Rev* 2006;27:17–46.
- Sommer M, Caruso BA, Sahin M, et al. A time for global action: addressing girls' menstrual hygiene management needs in schools. *PLoS Med* 2016;13:e1001962.
- Eijk AMV, Sivakami M, Thakkar MB, et al. Menstrual hygiene management among adolescent girls in India: a systematic review and meta-analysis. *BMJ Open* 2016;6:e010290.
- Wall LL, Teklay K, Desta A, Belay S. Tending the 'monthly flower': a qualitative study of menstrual beliefs in Tigray, Ethiopia. *BMC Womens Health* 2018;18:183.
- Sperling GB, Winthrop R. What works in girls' education: evidence for the world's best investment. Washington D.C.: Brookings Institution Press; 2015.
- Adams J, Bartram J, Chartier Y, Sims J. Water, sanitation and hygiene standards for schools in low-cost settings. Geneva: World Health Organization; 2009. Available from: <https://apps.who.int/iris/handle/10665/44159>
- Montgomery P, Ryus CR, Dolan CS, et al. Sanitary pad interventions for girls education in Ghana: a pilot study. *PLoS One* 2012;7:e48274.
- Wilson E, Reeve J, Pitt A. Education. Period. Developing an acceptable and replicable menstrual hygiene intervention. *Dev Pract* 2014;24:63–80.
- Hyttel M, Thomsen CF, Luff B, et al. Drivers and challenges to use of menstrual cups among schoolgirls in rural Uganda: a qualitative study. *Waterlines* 2017;36:109–24.
- Miiró G, Rutakumwa R, Nakiyingi-Miiró J, et al. Menstrual health and school absenteeism among adolescent girls in Uganda (MENISCUS): a feasibility study. *BMC Womens Health* 2018;18:4.
- Montgomery P, Hennegan J, Dolan C, et al. Menstruation and the cycle of poverty: a cluster quasi-randomised control trial of sanitary pad and puberty education provision in Uganda. *PLoS One* 2016;11:e0166122.
- North S, Bishop E, Denavit C. MHM in Ten: advancing the MHM agenda in WASH in schools report. New York: UNICEF, 2016. Available from: <https://menstrualhygieneday.org/wp-content/uploads/2017/03/2016-MHM-in-Ten-Meeting-Report.pdf> (please confirm link) it is correct
- Sommer M, Sutherland C, Chandra-Mouli V. Putting menarche and girls into the global population health agenda. *Reproductive Health* 2015;12:24.
- Sommer M, Sahin M. Overcoming the taboo: advancing the global agenda for menstrual hygiene management for schoolgirls. *Am J Public Health* 2013;103:1556–9.
- Kuhlmann AS, Henry K, Wall LL. Menstrual hygiene management in resource-poor countries. *Obstet Gynecol Surv* 2017;72:356–76.
- Chandra-Mouli V, Patel SV. Mapping the knowledge and understanding of menarche, menstrual hygiene and menstrual health among adolescent girls in low- and middle-income countries. *Reprod Health* 2017;14:30.
- McMahon SA, Winch PJ, Caruso BA, et al. The girl with her period is the one to hang her head. Reflections on menstrual management among schoolgirls in rural Kenya. *BMC Int Health Hum Rights* 2011;11:7.
- El-Gilany AH, Badawi K, El-Fedawy S. Menstrual hygiene among adolescent schoolgirls in Mansoura, Egypt. *Reprod Health Matters* 2005;13:147–52.
- Sumpter C, Torondel B. A systematic review of the health and social effects of menstrual hygiene management. *PLoS ONE* 2013;8:e62004.
- Sommer M, Hirsch JS, Nathanson C, Parker RG. Comfortably, safely, and without shame: defining menstrual hygiene management as a public health issue. *Am J Public Health* 2015;105:1302–11.