Effects of Interventions for Menstrual Health and Hygiene Management for Adolescent Girls: A Systematic Review and Meta-analysis

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Abstract: Menstruation relates to women's well-being, and menstrual health and hygiene are important. However, the effects of menstrual health and hygiene interventions remain unclear. This systematic review assessed the effects of menstrual health and hygiene interventions on adolescent girls and young women. Structured systematic searches were conducted using five databases from 5 August to 30 September 2022 with no restriction. We included individual-, cluster- and quasi-randomized controlled trials that assessed the effects of menstrual health and hygiene interventions on the quality of life and social outcomes. Two researchers independently completed the screening process and assessed the risk of bias using the second version of the Cochrane risk of bias tool for randomized trials.

Ten studies were described in 12 reports, and three ongoing studies were included. Five studies evaluated education interventions, one evaluated the distribution of menstrual products, and four assessed both. No study reported the quality of life. A small but non-significant positive impact on school attendance was found from the meta-analysis of four studies evaluating the distribution of sanitary products compared with no intervention (SMD = 0.23, 95%CI [-0.03, 0.48]). Although this study's result should be used cautiously, menstrual health and hygiene interventions offer positive outcomes. Quality of life should be assessed as well. More comprehensive and innovative interventions and a rigorous research design are required, and nurses have an important role in education, practice and further research on this topic.

Keywords: Adolescents, Female, Feminine hygiene products, Health behavior, Health knowledge, Attitudes, Practice, Menstruation, Systematic review

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Introduction

Menstruation is cyclical bleeding for biological women, and it is estimated that approximately 1.8 billion women of reproductive age experience menstruation every month.[1] Heavy menstrual bleeding causes serious problems in women's lives; therefore, the National Institute for Care Excellence (NICE) guidelines recommend improving quality of life (QOL), not just blood loss.[2] However, more than a few women experience "period poverty," in other words, insufficient access to sanitary products and education.[3-5] Several studies have reported that adolescent girls missed school or had difficulty concentrating on their work due to menstruation and lack of menstrual health and hygiene (MHH).[6-9]

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MHH is a fundamental and essential right for the well-being and empowerment of adolescents and women. According to the WHO/UNICEF Joint Monitoring Programme, MHH is defined as "Women and adolescent girls are using clean menstrual management material to absorb or collect menstrual blood, that can be changed in privacy as often as necessary for the duration of a menstrual period, using soap and water for washing the body as required, and having access to facilities to dispose of used menstrual management materials. They understand the basic facts of the menstrual cycle and how to manage it with dignity and without discomfort or fear."[10(p.16)] MHH contains the following elements: accurate and timely knowledge; available, safe, and affordable materials; informed and comfortable professionals; referral and access to health services; sanitation and washing facilities; positive social norms; safe and hygienic disposal; and advocacy and policy.[11] Promoting MHH through reproductive health education, developing life skills, and strengthening self-efficacy are valuable, especially for adolescents, because it will result in the development of skills to surmount barriers to their health, freedom, and growth, for instance, abuse, dropping out of school, and child marriage.[1] A previous study reported that MHH interventions improved QOL.[12]

Interventions based on the principles of MHH have been progressing; however, situations still exist where the prerequisites for MHH have not been achieved. A previous systematic review to assess the effects of MHH interventions was conducted in 2016.[13] The study target was set for students and working women living in low- and middle-income countries (LIMCs). Eight studies were included and showed no clear evidence. Additionally, the COVID-19 pandemic has adversely affected women's health and wellness, particularly regarding menstrual hygiene health (MHH).[14,15] A systematic review highlighting MHM during emergencies in low- and middle-income countries suggested the need for state-level guidance on MHH.[16] To protect women's human rights and achieve gender equality, the dissemination of MHH interventions is urgently needed.[17] Several primary studies investigating the effects of MHH have been published, including randomized controlled trials. To evaluate and implement the existing MHH interventions, we needed to obtain evidence based on the latest information by evaluating and synthesizing MHH interventions.

The significance of this review is to provide updated and more accurate evidence on the educational and health outcomes of MHH interventions. The reasons are as follows.

a. Since MHH problems existed in LMICs and high-income countries (HICs), we would not limit the target countries by economic indicators. Therefore, we can find more comprehensive and generalizable evidence.

b. We limited participants to students and exclude working women, thus decreasing the risk of influence on the analysis caused by the lifestyle differences of the targets.

Study Aim

This review aimed to evaluate the effects of MHH interventions on QOL, school attendance, and other health-related outcomes of adolescent girls or young women who attend school at a level equivalent to primary and secondary education compared with no MHH or other interventions.

Methods

This systematic review was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement and developed in compliance with the Cochrane Handbook for Systematic Review of Interventions.[18] The review protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO), (Registered ID: CRD42022343796). There were some minor changes in the search strategy and the assignment of the primary/secondary outcomes, which were presented in the protocol after consultation with a librarian.

Eligibility Criteria: The eligibility criteria were decided following the PICO (participant, intervention, comparison, outcome) format and study design.

Type of Studies: Individual randomized controlled trials (RCTs), cluster RCTs, and quasi-RCTs, whether published or not, were included. Excluded were non-randomized controlled trials, controlled before-after studies, case studies, cross-sectional studies, review studies, and case reports. We also excluded commentaries, expert opinions, editorials, and discussion papers. We did not use the year of publication and language restrictions. We used Google Translate to screen articles written in languages other than English or Japanese.

Participants: The participants were adolescent girls or young women who went to school at a level equivalent to primary and secondary education and already had menarche. Participants in higher education, such as university students, were excluded. We did not set the age criteria because there might have been students whose ages were older than we had expected. We did not limit articles by country of residence. If studies included women who had not yet reached menarche, we included studies in which results could only be extracted for women who had reached menarche.

Interventions: We included studies that delivered interventions based on the framework for MHH programming by the United Nations Children's Fund (UNICEF),[1] such as the distribution of menstrual materials, building or improving water, sanitation, and hygiene (WASH) facilities in schools that meet the needs of menstruating people, and sexuality education. All types of control groups were included, such as no-intervention groups or different-intervention groups.

Outcomes: The primary outcomes were quality of life (QOL) (any scale used to measure QOL) and school attendance (any tools that evaluated school attendance). Secondary outcomes were self-confidence (any tools that aimed to measure the confidence to manage menstruation, such as self-efficacy or self-esteem of participants), menstrual knowledge (a change in knowledge of menstruation before and after intervention), and menstrual practices (a change in menstrual management practices; the study authors defined types of practices).

Searching and Screening: The published literature was identified by searching the Cumulative Index to Nursing and Allied Health Literature (CINAHL), The Cochrane Central Register of Controlled Trials (CENTRAL), Excerpta Medica dataBASE (Embase), Education Resource Information Center (ERIC), and PubMed.

The search strategy was constructed based on the following population: adolescents and woman, intervention: MHH, and study design: RCT or quasi-RCT, concerning the search strategy of the previous systematic review.[13] A complete search strategy for each database is shown in the **Appendix**. We searched published articles from 5 August 2022 to 30 September 2022 and set the alert of the notification for any newly uploaded studies fitting the criteria. When the alert came, the studies were put in the screening process. Furthermore, we manually searched the reference lists of relevant articles.

All results from the electronic databases were combined into RefWorks, a reference management software. After removing duplicate records, two reviewers (HH & MN) independently screened the titles and abstracts of the retrieved articles using Rayyan, a tool for systematic reviews to exclude irrelevant studies.[19] In the next phase, the same two reviewers determined which ones to include or exclude. Any disagreement in the selection process was resolved through discussion. The PRISMA flow chart was prepared to provide an overview of the decisions that were made in this process.[18]

Data Collection: The first reviewer (HH) extracted the data using the Microsoft Excel format developed for this study, and the second (MN) confirmed it. The following data were extracted: title, first author, year of publication, study design, settings, sample size, interventions, comparisons, and outcomes. If the studies did not provide sufficient data, we contacted the study authors.

Assessment of Risk of Bias in the Included Studies: The same reviewers assessed the risk of bias independently, following version 2 of the Cochrane risk of bias tool for randomized trials (RoB 2.0) of the Cochrane Handbook for Systematic Review of Interventions.[20] Disagreements were resolved through discussion, and, if necessary, a third reviewer (NY) was invited to judge. We evaluated the following biases: from the randomization process, resulting from variations in the implemented interventions due to incomplete outcome data, in how outcomes were measured, and in the choice of reported results. Additionally, for cluster-RCTs, we included 'bias stemming from the identification or recruitment of participants', leading to a total of six areas of assessment. The overall bias was determined based on these factors.

Assessment and Data Synthesis: MHH included various interventions, and we conducted a meta-analysis of each intervention, such as the distribution of sanitary items, MHH education, and a combination of these. We performed meta-analyses by pooling data when outcomes measured the same concept. If it cannot be integrated, we describe each result narratively. Two reviewers (HH & MN) independently assessed whether to include studies in the meta-analysis. Disagreements were resolved through discussion, and, if necessary, a third reviewer (NY) was invited to judge. The standardized mean difference (SMD) was used for continuous variables with the corresponding 95% confidence intervals if the included studies evaluated the outcomes using the different measurement tools.

Statistical analysis was conducted using the Review Manager V.5.4 (Cochrane Collaboration software), grounded in the intention-to-treat analyses as much as possible. The results were presented narratively if it was irrelevant to analyze the data due to insufficient data or high heterogeneity. I-squared statistics and chi-squared tests were applied to measure heterogeneity among the included studies in the meta-analysis and interpretation, following the definitions in the Cochrane Handbook for Systematic Reviews of Interventions.[20] A random-effects model was used if the data were expected to have substantial heterogeneity among the included studies. Otherwise, a fixed-effects model was used to pool the effect sizes. The effect estimates from cluster RCTs were extracted and put in the meta-analysis if appropriately adjusted for cluster design. Although we planned to present the funnel plot, we did not do so because the number of included studies was limited.

A sensitivity analysis was conducted in meta-analyses of primary outcomes, including school attendance, excluding studies with a high risk of allocation concealment or incomplete outcome data.

Assessment of the Certainty of Evidence: We used the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach to rate the certainty of evidence for each outcome (QOL, school attendance, confidence, menstrual knowledge, menstrual practices) by assessing five domains: risk of bias inconsistency, indirectness, imprecision, and publication bias. The certainty of evidence was classified as high, moderate, low, or very low.[21]

Ethical Considerations: Since a systematic review is a secondary analysis, and because we did not handle personal data, ethical considerations did not arise.

Results

Study Screening: As a result of searching the databases, 1197 records were identified, and 512 duplicate studies were removed. We screened 685 articles and 14 additional articles from registration alerts and citation searches through title and abstract screening. Twenty-nine records were eligible for full-text screening, and ten studies (12 reports),[22-33] and three ongoing studies,[34-36] were included in this review (**Figure 1**).

PRISMA Flow Chart

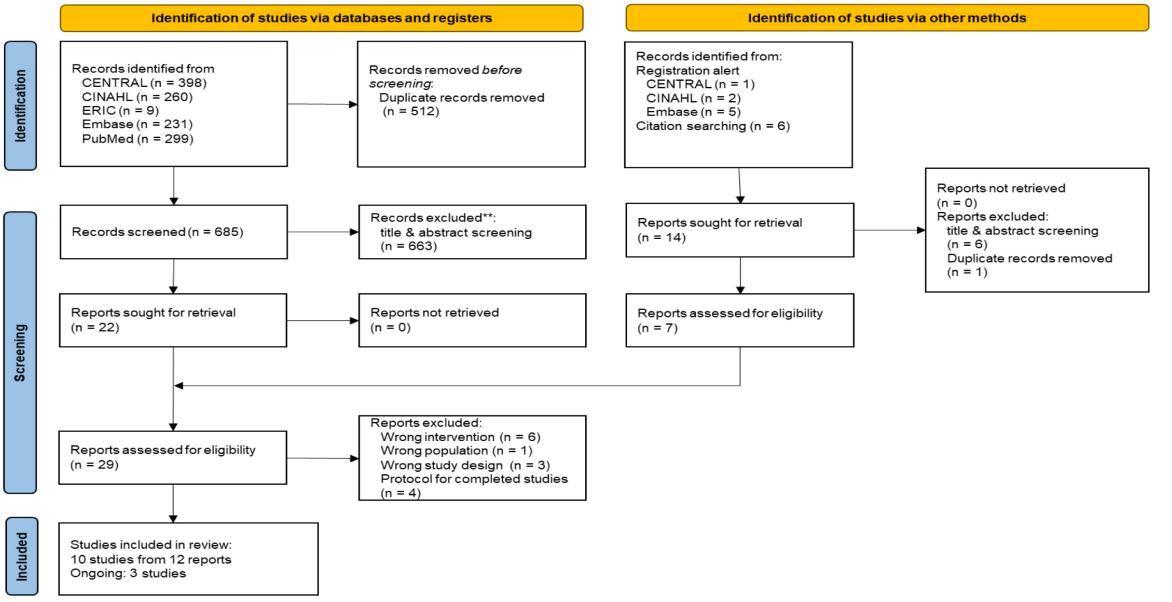


Figure 1

Study Characteristics: The study characteristics are described in **Appendix Table 1.** Eight studies were cluster RCTs (including one cluster-quasi-RCT),[22-27,29,31] and two were individual RCTs.[28,30] One study was a conference abstract,[25] and the others were original articles. We could not obtain further information for the conference abstract because there was no contact information. There were four studies that stated the inclusion criteria for achieving menarche; four included non-menarche girls as participants but were excluded from the analysis, and two did not state clearly.

In a series of studies exploring menstrual health education, researchers across various countries implemented and assessed a range of interventions (**Table 1**). The study by Austrian et al.[22] in Kilifi County, Kenya, which ranked low in education and reproductive health indicators, involved a sample of 3489 7th graders and evaluated the impact of sanitary pad distribution, reproductive health education, and a combination of both. The findings showed significant improvements in school engagement and health knowledge.[22] Similarly, in Iran, Jarrahi et al. targeted 64 students in 7th and 8th grades with peer and mother education programs, leading to enhanced menstrual health behaviors.[23] In South Korea, Min and Ahn's study involved 103 first-year high school students in an educational program (four sessions for nine days) about menstruation and hygiene, showing positive results in self-management of menstruation.[24] The research by Fazio et al. in Kenya with 99 7th- and 8th-grade girls combined puberty education with sanitary aid, demonstrating an improvement in school test scores.[25]

The study by Montgomery et al. was conducted in Kamuli district, Uganda, where key indicators of education, health and welfare were low. The study encompassed 1008 girls from the 3rd to 5th grades, combined education on puberty and health with pad distribution, noting improvements in school attendance and psychological well-being.[26] The research by Phillips-Howard et al. in Kenya with 751 students aged 14-16 compared the effectiveness of pads and menstrual cups, coupled with training, observing a reduction in school absence and health issues.[27] In Iran, the study by Djalalinia et al. with 1823 middle school students employed training by health trainers or parents to enhance menstrual knowledge and practices.[28] The research by Wilson et al. in Kenya, involving 302 students, focused on training for making sanitary pads and reducing menstruation-related absenteeism.[29] Oster and Thornton's

2011 study in Nepal with 198 students in the 7th and 8th grades used menstrual cups, finding an improvement in school attendance.[30] Finally, Fetohy's study in Saudi Arabia with 248 secondary school students implemented a menstrual education program, leading to better menstrual knowledge and practices. The methods of teaching were lectures and group discussions.[31] The above studies collectively highlight the impact of educational and sanitary product interventions on menstrual health and related menstrual knowledge, self-care, school attendance, menstrual practices, and well-being.

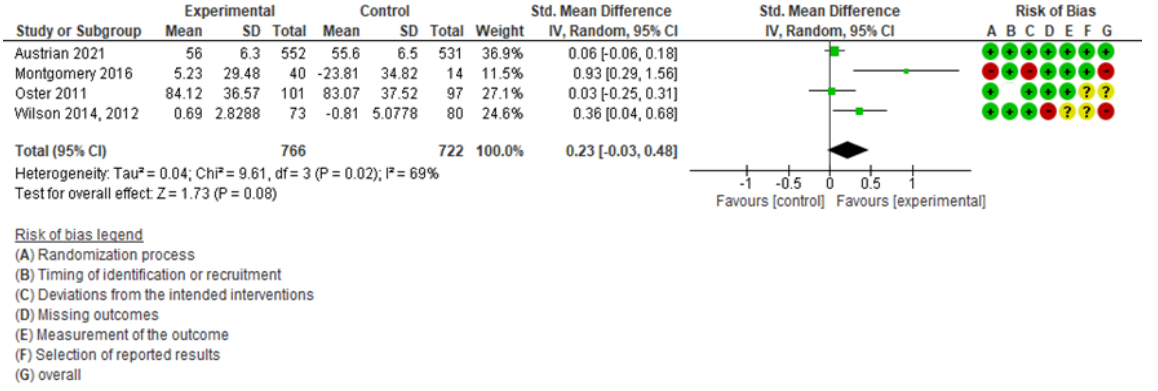
Effects of Menstrual Health and Hygiene (MHH) Interventions - Primary Outcomes

Quality of Life: No included studies measured QOL.

School Attendance: Five studies evaluated school attendance.[22,26,27,29,30] All studies delivered a menstrual product distribution intervention or a combination of menstrual product distribution and menstrual/reproductive health education programs. A meta-analysis was conducted for results that could be synthesized: mean attendant days for 60 days,[22] attendance rate for three weeks,[26] mean absent days for a month,[29] and attendance rate during menstruation.[30] For the mean absent days for a month, we calculated the mean attendant days and analyzed them. Phillips-Howard et al. also measured self-reported school days' absence, but few participants reported the data, and they were not assessable.[27] Two studies had multiple intervention groups; therefore, analysis was performed by each intervention group.[22,26]

Montgomery et al. made pairs of schools to maximize the distance between clusters and then quasi-randomized. Therefore, the study has a high risk of bias from the randomization process. Regarding bias due to deviations from intended interventions, the authors reported errors in intervention delivery because participants did not receive the assigned intervention. Therefore, the study was considered at a high risk of bias in this domain.[26] The study by Wilson et al. was judged as having a high risk of bias in missing outcome data because they reported that they could not collect the data from one school at follow-up (reasons were not mentioned). Regarding bias in measuring the outcome, the outcome was influenced by the participant's knowledge of the intervention received; therefore, the judgment resulted in some concerns.[29] Wilson et al. and Oster and Thornton were judged to have some concerns in the selection of reported bias because the study protocols or registered information were not available.[29, 30]

Distribution of Sanitary Products vs. Control: **Figure 2** shows that there was a small positive impact on school attendance by the distribution of sanitary products compared with no intervention (standard mean difference: SMD = 0.23; 95% CI [-0.03, 0.48]; participants = 1488; study = 4; I^2 = 69%; very low certainty of evidence).[22,26,29,30]



Note. For the risk of bias, (B)Timing of identification or recruitment is applicable for cluster RCTS; therefore it was not assessed in the individual RCT.[30]

Figure 2 School Attendance Distribution of Sanitary Products vs Control

The study by Montgomery et al. was a cluster quasi-randomized control trial. Since there was a possibility of a high risk of bias of selection bias, a sensitivity analysis was conducted.[26] The result did not change, and there was a minimal positive impact on school attendance (SMD = 0.11; 95%CI [-0.05, 0.27]; participants = 1434; study = 3; I^2 = 36%).[22,29,30]

Reproductive Health/Menstrual Health Education vs. Control: There was a non-significant, small positive impact on school attendance by education intervention compared with no intervention (SMD = 0.45; 95%CI [-0.47, 1.37]; participants = 1129; study = 2; I^2 = 88%; very low certainty of evidence).[22,26]

Combined Intervention vs. Control: There was a small positive impact on school attendance by the combined intervention (distribution of sanitary products and education) versus no intervention (SMD = 0.39; 95%CI [-0.30, 1.08]; participants = 1177; study = 2; I^2 = 82%; very low certainty of evidence).[22,26]

Distribution of Sanitary Products with/without Menstrual Health Education vs. Control: There was a small positive impact on school attendance by any intervention compared with no intervention (SMD = 0.25; 95%CI [-0.02, 0.52]; participants = 2704; study = 4; I^2 = 76%; very low certainty of evidence).[22,26,29,30]

Sensitivity analysis was performed without Montgomery et al. The result did not change, and there was a minimal positive impact on school attendance (SMD = 0.11; 95%CI [-0.05, 0.26]; participants = 2540; study = 3; I^2 = 37%).[22,29,30]

Other Measurement Tools for School Attendance: Austrian et al. evaluated the school engagement score with a score of 0-8, reflecting the answer to eight agree/disagree questions.[22] The authors reported that there were no differences in the arms. (Difference-in-differences (DID) coefficient [95%CI]: -0.05 [-0.33, 0.22], 0.14 [-0.14, 0.42], 0.16 [-0.14, 0.47]; p-value 0.703, 0.329, 0.294; participants = 606, 600, 633 in pads distribution, reproductive health education, pads and education arms, respectively).

Phillips-Howard et al. measured school dropout rates, defined as non-attendance for one term with no return to school.[27] They found that the cumulative dropout risk did not differ significantly by the arm (11.2%, 10.2%, 8.0% in the distribution of menstrual cups or menstrual pads, and the control arm), and the dropout was mainly pregnancy-related.

Wilson et al. evaluated the number of school days missed due to menstruation. The authors reported that absent days were reduced between baseline and follow-up in both the control and intervention groups.[29] However, the difference was slightly greater in the intervention group than in the control group (mean absent days: 1.88, 1.43 at baseline; 1.59, 1.04 at follow-up, in the control arm and the intervention arm, respectively). The authors also assessed the effect of menstruation on school absenteeism. The answer was chosen from "Never," "Once or twice," and "Several times." The authors reported that the percentage of respondents who answered "once or twice" and "several times" at follow-up was 52.9% in the control group and 38.3% in the intervention group.

Secondary Outcomes

Confidence: Austrian et al. measured self-efficacy using the Generalized Self-Efficacy Scale with a 0-10 score.[22] There were no factors that increased the risk of bias. There was an increase in the reproductive health education intervention arm (MD = 0.9; 95%CI [0.64, 1.16]; participants = 1256; low certainty of evidence).[22]

Menstrual Knowledge: Three studies evaluated menstrual knowledge.[24,26,31] Both the studies of Min and Ahn,[24] and Fetohy,[31] were judged to have a high risk of bias in the measurement of the outcome. This was because the outcome assessors were participants and they could not be blinded to the intervention assignment. Furthermore, this knowledge may have influenced the outcome assessment. For bias in the selection of the reported result, the protocols of the two studies were unavailable; therefore, we judged them as "some concerns." Min and Ahn made a measurement tool based on the menstrual knowledge tool used in

a previous study.[24] The reliability was 0.32 in the pre-study and 0.77 in the post-study, as calculated by Kuder-Richardson 20. They reported that the experimental group (menstrual self-management education intervention) significantly improved menstrual self-management knowledge compared with the control group (mean pre-post difference [SD] = 6.64 [2.40], 0.50 [2.17]; participants = 50, 50 in the experimental group, control group; t = 13.37; p < 0.001). Fetohy also developed a measurement tool and assessed its reliability in a pilot test.[31] The author compared the scores between the intervention group (menstrual education program) and the control group and reported that the scores of the intervention classes were significantly higher than those of the control classes (t = 15.840 for the first graders, 9.408 for the second graders; p < 0.001; mean menstrual knowledge score [SD] for the first graders = 27.84 [2.30], 19.75 [3.96]; n = 82, 80 in the intervention group and control group; mean menstrual knowledge score [SD] for the second graders = 27.98 [2.16], 21.23 [4.21]; n = 42, 44 in the intervention group and control group). Montgomery et al. also measured menstrual knowledge, but the authors could not obtain enough data to assess.[26]

Menstrual Practices: Six studies evaluated menstrual practices.[22-24,26,28,31] Austrian et al. evaluated two outcomes: having enough sanitary pads and reporting leakage at school; therefore, we assessed and presented both outcomes separately.[22] All studies were judged as having a "high risk of bias" or "some concerns" for bias in measuring the outcome. The reason is that outcome assessors were the participants, and it was impossible for them not to be aware of the intervention. In addition, we could not deny that knowledge of the intervention received influenced the assessment of the outcome. For bias in the selection of the reported result, we were unable to obtain the protocols of Fetohy,[31] Jarrahi et al.,[23] and Min and Ahn;[24] therefore, we judged it as "some concerns." They could not be synthesized for meta-analysis since each study used a different measurement tool.

Having enough sanitary pads was presented by Austrian et al. with binary measures, and there was a positive increase in the pads distribution arm (DID coeff: 0.28 [95%CI: 0.20, 0.36]; n = 632) and combined (pads distribution and reproductive health education) arm (DID coeff: 0.25 [95%CI: 0.17, 0.33]; n = 655), compared to the control arm (n = 626).[22] Austrian et al. reported leakage at school and found that there were fewer leakages in both the pad distribution (DID coeff: -0.10 [95%CI: -0.18, -0.03], N = 606) and combined arm (DID coeff: -0.11 [95%CI: -0.20, -0.02], N = 633) compared with the control arm (N = 593).[22]

The menstrual health behavior score was measured by Jarrahi et al.[23] The tool was developed by the authors and established content validity and reliability with a Cronbach's alpha of 0.7. They reported that the mean score increased in both the intervention (menstrual health peer education with mothers) and control groups. Still, the change in score of the intervention group was significantly higher than that of the control group (mean of changes from baseline to the end of the first menstrual cycle [SD]: 7.7[40.4], 5.4[6.4]; n = 30, 30 in the intervention group, control group; p <0.001 / mean of changes from baseline to the end of the second menstrual cycle [SD]: 8.1[49.1], 5.9[7.1]; n = 30, 30 in the intervention group, control group; p < 0.001).

The self-management of menstruation was evaluated by Min and Ahn,[24] using an original measurement tool based on the women's personal hygiene management tool by Czerwinski.[37] The authors checked its reliability before the study (Cronbach's α = 0.53). The total score ranged from 12 to 60 points; a higher score indicates better self-management. They reported that the score was significantly increased in the experimental group compared with the control group (mean of pre-post difference [SD] = 5.82 [4.48], -1.00 [3.59] in the experimental group, control group; t = 8.38; p < 0.001; n = 50 each).

Behavior during menstruation was evaluated by Fetohy using a menstrual behavior questionnaire whose reliability was confirmed by their pilot test.[31] The authors reported that the scores for the intervention class were significantly higher than those of the control

class (t = 6.240 for the first grade, 4.433 for the second grade, p < 0.001; mean attitude score [SD] for the first graders = 99.23 [9.01], 89.33 [11.07], n = 82, 80 in the intervention and control groups, respectively; mean attitude score [SD] for the second graders = 95.60 [8.36], 85.73 [12.04], n = 42, 44 in the intervention and control groups, respectively).

Djalalinia et al. asked about the bathing/washing habits during menstruation and the use of menstrual absorbents; however, the information was limited.[28] Thus, we could not evaluate these outcomes. Montgomery et al. also measured menstrual practices, but the authors could not obtain enough data to evaluate them.[26]

Summary of Findings: We assessed the certainty of evidence associated with school attendance and confidence. The results are presented **Table 2.**

Discussion

Summary of Results

Women's QOL scores are significantly lower than men's,[38,39] and they are related to women's menstruation. Therefore, QOL is an essential aspect of health and well-being for adolescent girls and women.[40,41] However, the included studies in our review did not report QOL. In this systematic review of ten studies, we could conduct a meta-analysis for only one outcome, school attendance, and found that the MHH interventions had a very small to small positive impact. Furthermore, although we could not meta-synthesize the data, menstrual/reproductive health education interventions showed positive results in confidence, menstrual knowledge, and menstrual practices. However, these results need to be carefully interpreted because of the high heterogeneity of the included studies and the low certainty of evidence.

Distribution of Sanitary Products

School Attendance: The distribution of sanitary products positively impacted school attendance, but the impact was small or very small. Compared with the previous systematic review by Hennegan and Montgomery,[13] although two new RCTs that assessed the effects of the distribution of sanitary products were added for this meta-analysis, the results are similar, and the effect was less. There are several possible reasons for this result: 1) heterogeneity in measurement methods for outcomes of the same concept, 2) inclusion of participants other than eligibility criteria, 3) the need for comprehensive interventions, and 4) heterogeneity due to differences in research design.

First, the definitions of school attendance differed between studies, which may have increased heterogeneity when conducting a meta-analysis. Most of the studies in this review evaluated school attendance, including non-menstrual days. However, this method may not have measured the exact effect of interventions. Studies that focused on the distribution of menstrual products were conducted in low-income countries, and in these countries, the preventing factors for female students from attending school are various; families cannot afford school fees because of poverty, and girls need to do housework, marriage, or pregnancy. Therefore, if attendance, including non-menstrual periods, is used as an outcome, it may not accurately assess the effect of absence caused by menstruation, compared with the case in which only the menstrual period is included. Further research is needed using globally harmonized outcome criteria.

Second, this study included participants who had yet to reach menarche. Some studies included female students who had not reached menarche, and at the end of the intervention, researchers checked the status of menstruation and excluded them from the analysis. In addition, some studies did not report the status of menstruation. As a result, fewer students were included in the analysis than planned; thus, the effect may not have been measured correctly. When researching MHH interventions, it is necessary to investigate participants' menstrual status before providing the interventions.

Third, isolated interventions, such as distributing sanitary products or education, may be less effective. Menstrual absenteeism is not only caused by the lack of menstrual products, and a comprehensive intervention

can promote the effect of the distribution of sanitary products. According to mixed-method research exploring how menstrual factors are associated with school absenteeism in Gambia, menstrual pain and the fear of staining clothes were the main causes of missing school during menstruation.[42] The authors also reported a relationship between WASH facilities and missing school. For example, being happy to use school latrines during menstruation reduced the odds of missing school, and the fact that toilets are not gender-specific increases the odds of missing school. These facts suggest that even though menstrual products are provided to adolescent girls, they cannot use them at school unless WASH facilities are adequate. Therefore, when conducting the distribution program of sanitary products, researchers also need to intervene to improve WASH facilities. In fact, Alam et al. reported the positive effect of the combined intervention in their pilot study.[43] Their interventions included the provision of sanitary products, MHH education, and improvements in school sanitation, such as the provision of disposable sanitary pads in the school office and the installation of a chute disposable system for menstrual materials. As a result, schoolgirls reported less absence during menstruation and felt less anxious at school. UNICEF also calls for comprehensive MHH programs for adolescent girls and women.[1] Although the impact differences between the distribution of sanitary products and the combined intervention (the distribution of sanitary products and menstrual education) were small in our meta-analysis, further combinations of interventions to improve WASH facilities may increase the impact on school attendance.

Menstrual Practices: There were positive changes in "having enough pads" and "leaking at school," due to distribution of sanitary products. However, we can also state that girls used sanitary products properly.

Menstrual Health Education

School Attendance: Education intervention had a small positive impact on school attendance, but only two studies were included in the meta-analysis. More studies are needed to understand the contents of education programs and their effects.

Confidence, Menstrual Knowledge and Practices

Although we could not perform a meta-analysis, there were improvements in confidence, menstrual knowledge, and menstrual practices. There was a variety of contents or methods of the programs. Menstrual education should be age and developmentally appropriate,[1] and it is also important to consider the cultural background of the target population. Evidence developed through various educational interventions would be helpful for future programs. For example, there were two menstrual educational studies in which the students' mothers participated. Previous studies have indicated that female adolescents generally obtain information about menstruation from their mothers.[31] If further evidence is collected, teaching mothers and mothers may be an effective way to conduct an educational program.

The Relation between the Intervention and the Outcome

From the perspective of a theory or logic model that explains the relationship between MHH intervention and outcomes,[1,44] researchers need to consider the contents of the intervention and the outcome carefully.

These models illustrate that outcomes or goals can be divided from proximal to distal or short to long-term. For example, school attendance belongs to ultimate goals, menstrual practices and confidence belong to medium-term changes, and menstrual knowledge belongs to short-term changes. Lower-level changes need to be gained if ultimate goals are to be achieved. That is, if researchers aim to improve school absenteeism due to menstruation, they first need to ensure that they can achieve medium-term changes (e.g., girls and women manage their menstruation safely with dignity) or short-term changes (e.g., education and health systems can implement MHH programs, and girls and women have access to MHH support facilities, services, and supplies). However, most of the included studies that evaluated school attendance did not address these issues. In future studies, the researchers must check whether the outcome was appropriate for the intervention.

Implications for Nursing Practice

To improve the MHH situation worldwide, we need to develop more effective interventions with solid evidence. For example, the evidence of comprehensive intervention that delivers not only menstrual product distribution or menstrual health education but also improves WASH facilities has not been sufficiently investigated. Furthermore, a unified outcome measurement tool is needed to measure and evaluate the MHH intervention's effects accurately. Considering that MHH dramatically impacts women's lives, measuring QOL and school attendance rates is necessary. It is also essential to take measures to reduce missing data. For example, the risk of inaccurate analysis caused by the proportion of women who have not yet menstruated was larger than expected. However, it can be reduced by including only menstruating participants.

Strengths and Limitations of Review

We conducted this systematic review using a rigorous process following the Cochrane Handbook to prevent potential bias. This review sought to gain in-depth knowledge of effective MHH interventions. We used RoB 2.0 for the risk of bias assessment. However, there are some limitations to this study. First, the included studies were heterogeneous, with the contents of intervention and different outcome measures. Therefore, a meta-analysis was not possible for all outcomes of this review. Second, one of the included studies was quasi-cluster RCT; thus, it had a high risk of selection bias. Third, further systematic review is needed because three ongoing studies were identified in the screening process.

Conclusion

The MHH intervention had a non-significant and small positive impact on school attendance. However, studies had high heterogeneity in the contents of the intervention and outcome. Thus, the results of this study should be used with caution. Although a limited number of studies did not show clear evidence, MHH interventions may improve school attendance. However, no studies have evaluated QOL, and this review could not conclude the effects of MHH. Further, well-designed studies, including QOL assessments, are required to clarify the effects of MHH.

Registration and Conflict of Interest

The research protocol was submitted to the International Prospective Register of Systematic Reviews (registered ID: CRD42022343796). The authors declare no conflicts of interest associated with this review.

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Appendix

Table 1. Characteristics of the included studies

Author/ year/study design	Country/ setting	Sample size/ grade or age of sample	Intervention	Control
Austrian 2021[22] cRCT	Kenya/ 140 public primary schools	N = 3489 7th grade (mean age = 14.8)	[Arm1] Sanitary pads distribution: 10 pads/1pacs (every month), 2 underwear (at the start of the intervention and the end of each subsequent school term) [Arm2] Reproductive health (RH) education: by trained facilitators (25-session curriculum), distribution of health magazine (at the start of each school term for a five-term period) [Arm3] Same intervention as arm 1 & 2	None
Outcome: school attendance, school engagement, having enough sanitary pads, RH attitudes, pregnancy knowledge score, whether a girl could spontaneously name a modern method of contraception, STI knowledge score, HIV knowledge score, gender norms in marriage, equitable adolescent gender norms, gendered sexual norms, acceptability of intimate partner violence (IPV), general self-efficacy				
Jarrahi 2021,[23] (Jarrahi 2020[32]) cRCT	Iran / 2 high schools	N = 64 7th grade & 8th grade	Peer education among students and education for mothers [For peer educators] 45-60 minute sessions for 2 days and distribution of booklets ⟹ peer educators provide educational contents to 4-7 classmates [For mothers] 2-hour sessions (lecture, question and answer, discussion) twice **Content of education**: generalizations on menstruation, genial anatomy, personal hygiene, nutrition, physical activity, pain relief, psychological support about menstruation	The routine instruction of secondary schools (with similar educational content) conducted by a health instructor
Outcome: menstrual health behavior score				
Min 2018[24] cRCT	South Korea / 1 high school	N = 103 1st year	50 minutes ×4 sessions/9 days (2 times a week), including lecture, discussion time **Topics**: understanding menstruation, coping with menstrual discomfort, menstrual hygiene management 1, and menstrual hygiene management 2	1st session of the program
Outcome: menstrual self-management knowledge, self-management of menstruation				
Fazio 2017[25] cRCT	Kenya / 14 schools	N = 99 7th & 8th grade girls	Puberty education, provision of sanitary pads and ibuprofen	Puberty education
Outcome: the mean difference in school test scores				
Montgomery 2016[26] c quasi-RCT	Uganda / 8 primary schools	N = 1008 3rd-5th grade girls (approx. 10-13years old)	[Arm1] Education (puberty changes, menstruation, early pregnancy, life skills, HIV prevention, strategy for avoiding sexual assault, healthy relationships, friendship formation, and goal setting) by locally trained community health nurses from the partner. 1.25hrs	None

Table 1. Characteristics of the included studies (Cont.)

Author/ year/study design	Country/ setting	Sample size/ grade or age of sample	Intervention	Control
			[Arm2] Pads distribution: a pack of AFRIpads (locally-made reusable sanitary pad) ×2 times, 3 pairs of underwear, and a small quantity (one sachet, 45grams) of Omo (soap) with which to wash the pads [Arm3] Same intervention as arm 1 & 2	
Outcome: school attendance (baseline and follow-up), dropout, menstrual practices, menstrual knowledge, overall psychological well-being, well-being in relation to menstruation				
Phillips-Howard 2016[27] cRCT	Kenya / 30 primary schools	N = 751 14-16 years old	[Arm1] Provision of 16 pads (2 packs per month), menstrual product-specific training, puberty & hygiene training, handwashing soap, a calendar, and pencils [Arm2] Provision of one menstrual cup with written and verbal instruction, menstrual product-specific training, puberty & hygiene training, handwashing soap, a calendar, and pencils	Provision of puberty & hygiene training, hand washing soap, a calendar, pencils
Outcome: school absence, dropout, the prevalence of confirmed STIs and RTI, the incidence of TSS, the prevalence of vaginal *S. aureus*				
Djalalinia 2012[28] iRCT	Iran / 15 middle schools	N = 1823 11-15 years old	[Arm1] Training by school health trainers (who were trained by project experts) [Arm2] Designed training by their parents who are trained by project experts (the contents are with emphasis on puberty health)	None
Outcome: menarche experience, menstrual information, menstrual and hygiene practices, menstrual pain				
Wilson 2014,[29] (2012[33]) cRCT	Kenya / 4 primary and 6 secondary schools	N = 302 mean age: control group = 15.5, intervention group = 15.4	Training workshop with teaching, provision of equipment to make three pads and instruction booklet (how to make, wash and dry sanitary napkins, and information on the risk of infection or irritation of a damp or poorly washed pad)	None
Outcome: general absenteeism, menstruation-related absenteeism, evaluation of the pad and training session				
Oster 2011[30] iRCT	Nepal / 4 schools	N = 198 7th and 8th grade	Distribution of a booklet of time-diary for each month, a menstrual cup and its instruction	Distribution of a booklet of time- diary for each month
Outcome: the impact of a girl's period on school attendance, impact of menstrual cup on attendance				
Fetohy 2007[31] cRCT	Saudi Arabia/ 1secondary school	N = 248 1st and 2nd grade	Menstrual education program (lecture and group discussion with posters, handouts, and pamphlets), 3 usual class times (= 120 minutes)	None
Outcome: menstrual knowledge, attitude and practices				

Note: iRCT = individual-randomized controlled trial, cRCT = cluster-randomized controlled trial, c quasi-RCT = cluster quasi-randomized controlled trial

Table 2. Summary of findings table

MHH intervention compared to control groups for female students

Patient or population: female students
Setting: all over the world
Intervention: MHH intervention
Comparison: comparisons

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparisons	The risk with MHH intervention				
QOL	No included studies evaluated QOL.			(0 studies)	-	
School attendance (Distribution of sanitary products vs control) assessed with attendance rate, mean attendant days, mean absent days	-	SMD **0.23 higher** (-0.03 to 0.48)	-	1488 (4 RCTs)	⊕◯◯◯ Very low[a,b,c]	
School attendance (reproductive/menstrual health education vs control) assessed with attendance rate, mean attendant days	-	SMD **0.45 higher** (-0.47 to 1.37)	-	1129 (2 RCTs)	⊕◯◯◯ Very low[a,b,c]	
School attendance (combined intervention vs control) assessed with attendance rate, mean attendant days	-	SMD **0.39 higher** (-0.3 to 1.08)	-	1177 (2 RCTs)	⊕◯◯◯ Very low[a,b,c]	
School attendance (Distribution of sanitary products with/without menstrual health education vs control) assessed with attendance rate, mean attendant days, mean absent days	-	SMD **0.25 higher** (-0.02 to 0.52)	-	2704 (4 RCTs)	⊕◯◯◯ Very low[a,b,d]	
Confidence assessed with: Generalized Self-Efficacy Scale		MD **0.9 higher** (0.64 to 1.16)	-	1256 (1 RCT)	⊕⊕◯◯ Low[c,d]	

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval; **MD:** mean difference; **SMD:** standardised mean difference

GRADE Working Group grades of evidence

High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Explanations

a. high heterogeneity
b. different intervention and measurement tools
c. small sample size
d. 95% CI cross the standard line

Appendix

Search strategy

CENTRAL

#1 MeSH descriptor: [Toilet Facilities] explode all trees

#2 MeSH descriptor: [Menstrual Hygiene Products] explode all trees

#3 MeSH descriptor: [Sex Education] explode all trees

#4 ((“menstrual health education” OR “menstrual education” OR “Menstrual Hygiene Product*” OR “tampon*” OR “menstrual cup*” OR “sanitary napkin*” OR “sanitary pad*” OR “menstrual pad*” OR “sanitary product*” OR “menstrual product*”)):ti,ab,kw (Word variations have been searched)

#5 (((“Sex Education” OR “sexuality education” OR “water suppl*” OR “lavator*” OR “bathroom*” OR “toilet*”) AND menstrua*)):ti,ab,kw (Word variations have been searched)

#6 MeSH descriptor: [Young Adult] explode all trees

#7 MeSH descriptor: [Adolescent] explode all trees

#8 MeSH descriptor: [Menstruation] explode all trees

#9 MeSH descriptor: [Students] explode all trees

#10 (“student*” OR “adolescent*”):ti,ab,kw (Word variations have been searched)

#11 #1 or #2 or #3 or #4 or #5

#12 #6 or #7 or #8 or #9 or #10

#13 #11 and #12 in Trials

CINAHL

S12 S9 AND S10 AND S11

S11 S1 OR S2 OR S3 OR S4 OR S5

S10 TI ((“random*” or “rct*”)) OR AB ((“random*” or “rct*”))

S9 S6 OR S7 OR S8

S8 TI ((“adolescent*” OR “student*”)) OR AB ((“adolescent*” OR “student*”))

S7 (MH “Adolescence”)

S6 (MH “Young Adult”)

S5 TI ((“menstrual health education” OR “menstrual education” OR “Menstrual Hygiene Product*” OR “tampon*” OR “menstrual cup*” OR “sanitary napkin*” OR “sanitary pad*” OR “menstrual pad*” OR “sanitary product*” OR “menstrual product*”)) OR AB ((“menstrual health education” OR “menstrual education” OR “Menstrual Hygiene Product*” OR “tampon*” OR “menstrual cup*” OR “sanitary napkin*” OR “sanitary pad*” OR “menstrual pad*” OR “sanitary product*” OR “menstrual product*”))

S4 (MH “Sex Education”)

S3 (MH “Menstrual Hygiene Products”)

S2 (MH “Toilet Facilities”)

S1 TI (((“Sex Education” OR “sexuality education” OR “water suppl*” OR “lavator*” OR “bathroom*” OR “toilet*”) AND menstrua*)) OR AB (((“Sex Education” OR “sexuality education” OR “water suppl*” OR “lavator*” OR “bathroom*” OR “toilet*”) AND menstrua*))

Embase

('toilet'/exp OR 'feminine hygiene product'/exp OR 'sexual education'/exp OR 'water supply'/exp OR 'sex education'/exp) OR ('menstrual health education' OR 'menstrual education' OR 'menstrual hygiene product*' OR 'tampon*' OR 'menstrual cup*' OR 'sanitary napkin*' OR 'sanitary pad*' OR 'menstrual pad*' OR 'sanitary product*' OR 'menstrual product*') OR (('sex education' OR' sexuality education' OR 'water suppl*' OR 'lavator*' OR 'bathroom*' OR 'toilet*') AND menstrua*) AND ('young adult'/exp OR 'adolescent'/exp OR 'menstruation'/exp OR 'student'/exp) OR ('student*' OR 'adolescent*')

ERIC

S18 S12 AND S16 AND S17

S17 S11 OR S15

S16 S10 OR S13 OR S14

S15 TI ("student*" OR "adolescent*") OR AB ("student*" OR "adolescent*")

S14 TI ((("Sex Education" OR "sexuality education" OR "water suppl*" OR "lavator*" OR "bathroom*" OR "toilet*") AND menstrua*)) OR AB ((("Sex Education" OR "sexuality education" OR "water suppl*" OR "lavator*" OR "bathroom*" OR "toilet*") AND menstrua*))

S13 TI (("menstrual health education" OR "menstrual education" OR "Menstrual Hygiene Product*" OR "tampon*" OR "menstrual cup*" OR "sanitary napkin*" OR "sanitary pad*" OR "menstrual pad*" OR "sanitary product*" OR "menstrual product*")) OR AB (("menstrual health education" OR "menstrual education" OR "Menstrual Hygiene Product*" OR "tampon*" OR "menstrual cup*" OR "sanitary napkin*" OR "sanitary pad*" OR "menstrual pad*" OR "sanitary product*" OR "menstrual product*"))

S12 (DE "Randomized Controlled Trials")

S11 DE "Adolescents" OR DE "late adolescents" OR DE "preadolescents" OR DE "early preadolescents" OR DE "elementary school students" OR DE "secondary school students" OR DE "junior high school students" OR DE "middle high school students" OR DE "high school students" OR DE "senior high school students"

S10 DE "Sex Education"

S9 S3 AND S7 AND S8

S8 S2 OR S6

S7 S1 OR S4 OR S5

S6 TI ("student*" OR "adolescent*") OR AB ("student*" OR "adolescent*")

S5 TI ((("Sex Education" OR "sexuality education" OR "water suppl*" OR "lavator*" OR "bathroom*" OR "toilet*") AND menstrua*)) OR AB ((("Sex Education" OR "sexuality education" OR "water suppl*" OR "lavator*" OR "bathroom*" OR "toilet*") AND menstrua*))

S4 TI (("menstrual health education" OR "menstrual education" OR "Menstrual Hygiene Product*" OR "tampon*" OR "menstrual cup*" OR "sanitary napkin*" OR "sanitary pad*" OR "menstrual pad*" OR "sanitary product*" OR "menstrual product*")) OR AB (("menstrual health education" OR "menstrual education" OR "Menstrual Hygiene Product*" OR "tampon*" OR "menstrual cup*" OR "sanitary napkin*" OR "sanitary pad*" OR "menstrual pad*" OR "sanitary product*" OR "menstrual product*"))

S3 (DE "Randomized Controlled Trials")

S2 DE "Adolescents" OR DE "late adolescents" OR DE "preadolescents" OR DE "early preadolescents" OR DE "elementary school students" OR DE "secondary school students" OR DE "junior high school students" OR DE "middle high school students" OR DE "high school students" OR DE "senior high school students"

S1 DE "Sex Education"

PubMed

(((("Toilet Facilities"[MeSH Terms] OR "Menstrual Hygiene Products"[MeSH Terms] OR "Sex Education"[MeSH Terms]) OR (("menstrual health education"[Title/Abstract] OR "menstrual education"[Title/Abstract] OR "Menstrual Hygiene Product*"[Title/Abstract] OR "tampon*"[Title/Abstract] OR "menstrual cup*"[Title/Abstract] OR "sanitary napkin*"[Title/Abstract] OR "sanitary pad*"[Title/Abstract] OR "menstrual pad*"[Title/Abstract] OR "sanitary product*"[Title/Abstract] OR "menstrual product*"[Title/Abstract]))) OR (((("Sex Education"[Title/Abstract] OR "sexuality education"[Title/Abstract] OR "water suppl*"[Title/Abstract] OR "lavator*"[Title/Abstract] OR "bathroom*"[Title/Abstract] OR "toilet*"[Title/Abstract]) AND menstrua*[Title/Abstract]))) AND (("Young Adult"[MeSH Terms] OR "Adolescent" [MeSH Terms] OR "Menstruation"[MeSH Terms] OR "Students"[MeSH Terms]) OR ("student*"[Title/Abstract] OR "adolescent*"[Title/Abstract])) Filters: Randomized Controlled Trial

ผลของมาตรการช่วยเหลือสำหรับสุขภาพและการจัดการสุขอนามัยเกี่ยวกับประจำเดือนของหญิงวัยรุ่น : การทบทวนวรรณกรรมอย่างเป็นระบบและการวิเคราะห์อภิมาน

Hitomi Hamada, Mika Ninohei, Noyuri Yamaji, Erika Ota*

บทคัดย่อ: การมีประจำเดือนเกี่ยวข้องกับความผาสุกของผู้หญิง และ สุขภาพและสุขอนามัยเกี่ยวกับประจำเดือนเป็นสิ่งสำคัญ อย่างไรก็ตาม ผลของมาตรการช่วยเหลือด้านสุขภาพและสุขอนามัยประจำเดือนยังคงไม่ชัดเจน การทบทวนวรรณกรรมอย่างเป็นระบบนี้ประเมินผลของมาตรการช่วยเหลือด้านสุขภาพและสุขอนามัยเกี่ยวกับประจำเดือนในหญิงวัยรุ่นและหญิงสาว ดำเนินการค้นหางานวิจัยอย่างเป็นระบบและมีโครงสร้าง โดยใช้ฐานข้อมูล 5 แหล่ง ตั้งแต่วันที่ 5 สิงหาคม ถึง 30 กันยายน พ.ศ. 2565 โดยไม่กำหนดข้อจำกัด ผู้ศึกษารวบรวมงานวิจัยที่เป็นการทดลองแบบมีกลุ่มควบคุมแบบรายบุคคล แบบกลุ่มก้อน และแบบกึ่งทดลองที่ประเมินผลของมาตรการช่วยเหลือด้านสุขภาพและสุขอนามัยเกี่ยวกับประจำเดือนต่อคุณภาพชีวิตและผลลัพธ์ทางสังคม ผู้ศึกษาสองคนต่างดำเนินการคัดกรองงานวิจัยอย่างเป็นอิสระต่อกันจนเสร็จสิ้นและประเมินความเสี่ยงต่อการมีอคติโดยใช้แบบประเมินความเสี่ยงต่ออคติของคอเครน (Cochrane) ฉบับรุ่นที่สองสำหรับการทดลองแบบสุ่ม

ในการศึกษานี้ พบงานวิจัย 10 เรื่องซึ่งรายงานในบทความ 12 ฉบับ และมี 3 เรื่องที่กำลังดำเนินการอยู่ โดยงานวิจัย 5 เรื่องประเมินผลของวิธีการให้ความรู้ งานวิจัย 1 เรื่องประเมินการกระจายผลิตภัณฑ์เกี่ยวกับประจำเดือน และ 4 เรื่องประเมินทั้งสองประเด็นดังกล่าว แต่ไม่พบว่ามีการศึกษาใดรายงานเกี่ยวกับคุณภาพชีวิต นอกจากนี้ พบผลกระทบเชิงบวกเล็กน้อยแต่ไม่มีนัยสำคัญต่อการไปโรงเรียนของหญิงวัยรุ่นจากการวิเคราะห์อภิมานของงานวิจัย 4 เรื่องที่ประเมินการกระจายของผลิตภัณฑ์สุขอนามัยเมื่อเปรียบเทียบกับงานวิจัยที่ไม่ได้ให้การช่วยเหลือใดๆ SMD = 0.23, 95%CI [-0.03, 0.48]) แม้ผลการศึกษาครั้งนี้อาจมีข้อจำกัดที่ควรใช้อย่างระมัดระวังก็ตาม แต่มาตรการช่วยเหลือด้านสุขภาพและสุขอนามัยเกี่ยวกับประจำเดือนก็ให้ผลลัพธ์เชิงบวก อย่างไรก็ตาม ควรมีการประเมินด้านคุณภาพชีวิตด้วย ดังนั้น มาตรการช่วยเหลือที่ครอบคลุมหลายมิติ เชิงนวัตกรรม และการออกแบบการวิจัยที่เข้มงวดมากขึ้นจึงเป็นสิ่งจำเป็น และพยาบาลมีบทบาทสำคัญในการศึกษา การปฏิบัติ และการศึกษาวิจัยเพิ่มเติมในหัวข้อนี้

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