



OPEN WASH services and menstrual hygiene management among reproductive age females in the IDPs camps of Shire town in Tigray region of Ethiopia: a cross-sectional study

Equbit Tesfay¹, Gebru Hailu Redae¹✉, Gidey Goitom² & Akeza Awealom Asgedom¹

Menstruation is a natural cyclic occurrence experienced by reproductive age females in a good health which deemed a proper management, otherwise, it ends with various health complications and impaired quality of life. The aim of this study was to investigate the menstrual hygiene management practice and its determinant factors among reproductive age females living in the IDPs camps of Shire town, Northern Ethiopia. A cross-sectional study was conducted among 633 reproductive age females in Shire town from May to June 2022. Data were entered, cleaned, and analyzed using SPSS version 23. Descriptive analysis and binary and multivariable logistic regression were conducted to obtain the descriptive findings and to investigate the strength of the association respectively. P-value < 0.05 was considered statistically significant. The prevalence of good menstrual hygiene management practice among the reproductive age females was 41.9% (95% CI, 38-45.8%). Menstrual hygiene management practice was significantly ($p < 0.05$) associated with access to sanitary materials, educational level, availability of continuous water supply and sex-separated latrines. The results of this study demonstrated that more than a half of the reproductive age females did not have good menstrual hygiene management practices. Consequently, it is recommended to work collaboratively to enhance the menstrual hygiene practice, especially in IDPs camps.

Keywords Ethiopia, IDPs, Menstrual hygiene management, Reproductive age females, Tigray

Abbreviations

AOR	Adjusted Odds Ratio
CI	Confidence Interval
IDPs	Internally Displaced People
MHM	Menstrual Hygiene Management
NGO	Non-Governmental Organization
SD	Standard Deviation
SDG	Sustainable Development Goals

For healthy reproductive age females, menstruation is a normal, cyclical event¹ that if not managed properly, can result in various health complications and impaired quality of life². Worldwide, there are about 2 billion females who experience menstruation, which accounts for around 25% of the world population in 2022³, and who require good menstrual hygiene management (MHM). Proper and adequate MHM for reproductive age females refers to the ability to use a clean sanitary material to absorb menstrual blood, the availability and utilization of soap and water for washing the genitalia, body, and clothes, access to a private and safe place,

¹Department of Environmental Health Sciences, School of Public Health, College of Health Sciences, Mekelle University, P.O. Box 1871, Mekelle, Ethiopia. ²Department of Midwifery, College of Health Sciences, Mekelle University, P.O. Box 1871, Mekelle, Ethiopia. ✉email: gebru.hailu.2006@gmail.com

which is important to change sanitary materials, and having access to convenient waste disposal facilities for the disposable soiled sanitary^{4–7}.

Achieving Sustainable Development Goals (SDGs), especially SDG 3–6, 8, 10, and 11 requires improving MHM^{8,9}. However, due to lack of sanitary materials, inadequate water supply, lack of private latrine, lack of waste management facilities, and taboos and misconceptions surrounding menstruation, reproductive age females of low income countries including Ethiopia had inabilities to manage their menstruation hygienically^{10–15}. The challenges related to MHM are exacerbated in times of crisis, such as when there are displacements^{7,9,16, 17,18}. Globally, there were about 71.1 million internally displaced peoples (IDPs) as of the end of 2022, with Sub-Saharan Africa accounting for around 45% of all forcibly displaced individuals worldwide. These people are abandoned their homes due to insecurity, armed conflicts, and other disaster related occurrences¹⁹. In this regard, Ethiopia is among the countries with the highest number of IDPs in Africa^{19,20}.

Researches have indicated improper MHM is linked to infections of the urinary and reproductive tracts, cervical cancer^{2,11,21}, as well as psychological and social problems that can impair the quality of life of females^{22,23}. In addition, females are more vulnerable to gender-based violence in situations where there insufficient and unsecured facilities and materials for managing menstruation^{24,25}. Therefore, for the reproductive age females, adequate and proper MHM is necessary to enhance comfort and protect against infections of the urinary and reproductive tracts^{22,23,26,27}.

In Ethiopia, various studies have been conducted on MHM among females of the child bearing age, with the prevalence of good MHM ranging from 28.2–90.9%^{4, 12, 27–31}. Due to the war that erupted in Tigray in November 2020, many people were displaced from their homes and forced to stay in various IDPs camps. To the best of our knowledge, there is a paucity of evidence regarding MHM in IDPs camps in Tigray, Ethiopia. Hence, carrying out this study was unavoidably crucial in order to obtain a better understanding of the current status of MHM practice. Therefore, the purpose of this study was to assess MHM practice among reproductive age females in IDPs camps of Shire town, Northern Ethiopia.

Method and materials

Study area

The study was conducted in Shire town, Tigray region of Ethiopia. Shire town is located 307 km away from Mekelle, the Tigray region's capital. According to the Shire Endaslassie interim administration, Shire town has 17 temporary IDPs camps with an estimated total of 657,142 IDPs who were sheltered in schools, colleges, and Aksum University's Shire branch, living in crowded centers and informal settlements.

Study design and period

A cross-sectional study was conducted from May to June 2022.

Source of population

All reproductive age females residing in the IDPs camps located in Shire town.

Study population

All reproductive age females who lived in the selected IDPs camps located in Shire town during the data collection period.

Inclusion and exclusion criteria

Inclusion criteria

All reproductive age females (15–49 years) who at least lived 3 months in the IDPs camps were included.

Exclusion criteria

Pregnant mothers displaced reproductive age females who were hosted in the community or out of the IDPs camps, extremely ill and those who hadn't menstruated at all time while living in the IDPs camps were all excluded.

Sample size and sampling procedure

Sample size calculation

The sample size was calculated using the sample size determination formula for a single population proportion. Using a confidence interval of 95%, a margin of error of 5%, a proportion for good menstrual hygiene management of 50%, 1.5 for design effect, and 10% for non-respondents gave a final sample size (n) of 633.

Sampling procedures

A multistage sampling technique was used to select the study participants. First, six were selected at random out of seventeen IDPs camps. Next, using a proportionate allocation based on each camp's population size, the necessary sample size was assigned (Fig. 1). A sampling frame consisting of reproductive age females was obtained from each IDPs camp, and a systematic random sampling technique was administered to select the study participants. Finally, the data were collected from 633 participants.

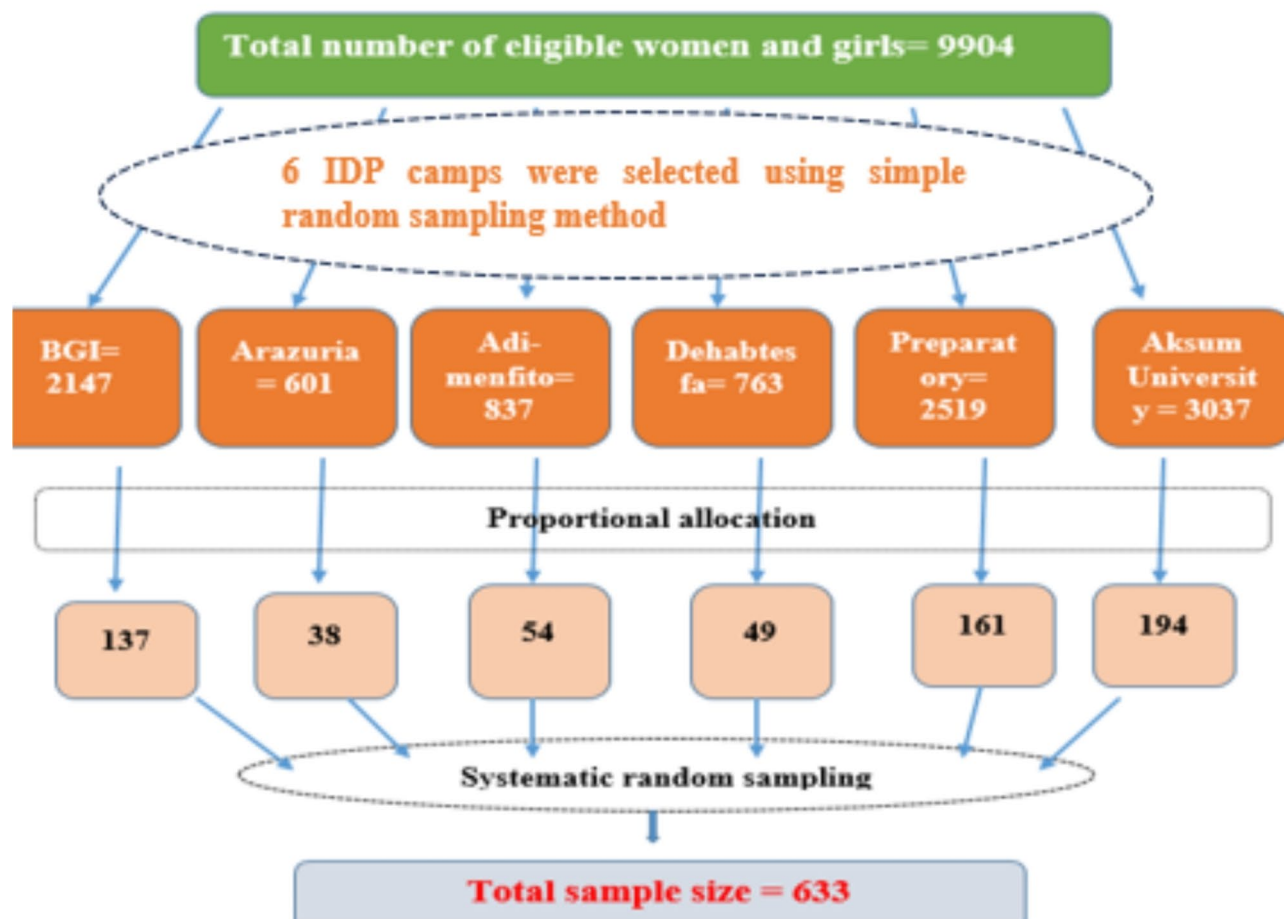


Fig. 1. Sampling scheme of reproductive age females in IDP camps of Shire town, Northern Ethiopia, 2022.

Data collection and data quality control

Semi-structured face-to-face interview questionnaires that were adapted from previous similar literature were used to collect the data^{4,27,28,31–33}. The questionnaire was first prepared in English, then translated to a local language (Tigrigna) and retranslated back to English to maintain its consistency.

The questionnaires were composed of various questions that assessed a variety of factors including the respondents' socio-demographic data (educational level, age, marital status, family size, ethnic group, and religion), WASH services (availability of continuous and adequate water supply, availability of sex separated latrines, availability of bathrooms, access to sanitary materials, access to soap, and access to waste collection and disposal facilities for the used sanitary material), and MHM practice (use sanitary materials, type of sanitary material, whether wash the genitalia during menstruation, frequency of washing the genitalia, a material used to wash the genitalia, whether took bath during menstruation, where to dry washed sanitary materials, change sanitary material, frequency of change of sanitary pad, and disposal of used sanitary material).

Four nurse professionals were recruited to collect the data. Training on the purpose of the study, data collection methods, questionnaire content, and how to approach study subjects was provided in order to guarantee the quality of the data. In addition, a pre-test was undergone on 5% of the sample size among reproductive age females in IDPs camps of Mekelle city. A few changes were made reviewing the pre-test results to make sure the language was clear and to confirm any skip patterns in the questionnaire. Throughout the whole data collection period, the supervisor also monitored interviewers on a daily basis and verified that questionnaires were completed. Additionally, data cleaning and cross-checking were done prior to data analysis.

Measurement of the outcome variable

Considering various literatures^{4,27,28,31} in the context of this study, MHM is the collective outcome of ten statements with a score of 1 for the correct answers to the practice questions and 0 for the incorrect ones. The reproductive age females were asked about ten statements regarding their recent menstruation (Annex 1). In the end, the total scores for all the ten statements were added up to determine the overall practice with females scoring ≥ 5 being deemed to have good MHM practice.

Data processing and analysis

Using SPSS version 23, data entry, cleaning, and analysis were completed. For some of the study's variables, descriptive analysis was performed using common statistical measures like percentages, means, and standard deviations. Binary logistic regression was used to test the association between the dependent and independent variables using a crude odds ratio with a 95% confidence interval. Independent association between the factors determined MHM and MHM practice was also ascertained by using multivariable logistic regression with a p -value < 0.05 were considered as statistically significant. Furthermore, the Hosmer and Lemeshow goodness-of-fit test was checked and gave a value of 0.121, which was greater than 0.05.

Ethical approval and consent to participate Ethical approval was obtained from Mekelle University, College of Health Sciences, and Ethical Review Committee (reference number: MU-IRB 1938/2021). Furthermore, Tigray Regional Health Bureau and Shire town administrative offices granted a formal letter of collaboration. The purpose of the study was explained to the study participants. In addition, study participants who became 18 years old or older provided a written informed consent, and for those who had not yet reached the legal age of consent (18 years), parenteral or guardian consent was acquired prior to the data collection. In addition, privacy and confidentiality were upheld during the data collection process. All methods were performed in accordance with the ethical principles of the Declaration of Helsinki.

Results

Respondents' socio-demographic characteristics

Six hundred thirty-three reproductive age females have participated in the present study. More than half (61.1%) of them were married, and 428 (67.6%) of them were originally rural residents. Three hundred fifty-two (55.6%) respondents were found in the age group "20–34 years" with an arithmetic mean age of 30.17 (SD, ± 7.56) years. Primary school education accounted for a larger share of respondents (45.8%). Furthermore, 94.8% were from the Tigrian ethnic people, and over four-fifth (87.0%) of the participants were Orthodox Christians. Table 1 has the details of the socio-demographic characteristics of the respondents.

IDPs camps' WASH services

About two-third (63.2%) of the study participants reported that they lacked continuous supply of clean water and inadequate daily consumption (66.7%) including for menstrual hygiene. Regarding the sanitation services, the prevalence of sex separated and lockable latrines were 32.2 and 26.5% respectively. Nevertheless, at the time of data collection, none of the respondents had mentioned the presence of hand washing stations with water and soap close to the latrines. Table 2 has details of WASH services of the reproductive age females in IDPs camps of Shire town.

Variables	Categories	Frequency($n = 633$)	Percent
Educational Level	Informal education	172	27.2
	Primary school	290	45.8
	Secondary school	145	22.9
	College and above	26	4.1
Age group	15–19	73	11.5
	20–34	352	55.6
	35–49	208	32.9
Marital status	Never married/single	172	27.2
	Married	387	61.1
	Divorced/separated	68	10.75
	Widowed	6	0.95
Family size	< 4	363	57.3
	≥ 4	270	42.7
Former resident	Urban	205	32.4
	Rural	428	67.6
Religion	Orthodox	551	87.0
	Muslim	77	12.2
	Protestant	5	0.8
Ethnic group	Tigrian	600	94.8
	Irob	6	0.9
	Kunama	27	4.3

Table 1. Socio-demographic characteristics of reproductive age females in IDPs camps of Shire town, Northern Ethiopia, 2022. n = sample size.

Variables	Categories	Frequency(<i>n</i> = 633)	Percent
Availability of continuous water supply	Yes	233	36.8
Adequate daily water consumption	Yes	211	33.3
Availability of shower facility	Yes	49	7.7
Availability of hand washing facility with water and soap near to the latrines	Yes	0	0
Availability of soap	Yes	162	25.6
Availability of sex separated latrines	Yes	204	32.2
Availability of lockable latrines	Yes	168	26.5
Access of sanitary materials	Yes	371	58.6
Source of sanitary material	NGO donated	293	78.9
	Purchased	78	20.1
Availability of waste collection bins		197	31.1

Table 2. WASH services of the reproductive age females in the IDPs camps of Shire town, Northern Ethiopia, 2022. *n* = sample size.

Variables	Categories	Frequency(<i>n</i> = 633)	Percent
Mostly used type of sanitary material	Disposable pads	175	27.6
	Reusable pads	223	35.3
	Piece of rags/cloths	188	29.7
	underwear	47	7.4
Material used to wash genitalia	Only water	471	74.4
	Water and soap	162	25.6
Frequency of washing genitalia per day	< 3 times	447	70.6
	≥ 3	186	29.4
Take a bath during menstruation		171	27.0
Change sanitary material		485	76.6
Frequency of change of sanitary material (<i>n</i> = 485)	< 3 times	393	81.0
	≥ 3	92	19.0
Where dry-washed sanitary materials	Inside the room	465	73.5
	Outside the room	168	26.5
Where dispose of used sanitary material	Burned/ burial	107	29.5
	Get to latrine	187	51.5
	Open field	69	19.0
Prevalence of good MHM practice		265	41.9

Table 3. MHM practice of reproductive age females in the IDPs camps of Shire town, Northern Ethiopia, 2022. *n* = sample size.

MHM Practice

The overall good MHM practice of the reproductive age females in the IDPs camps was 41.9 (95% CI: 38.0–45.8%). Reusable pads were utilized by 223 (35.3%), and pieces of rags or old clothes by 188 (29.7%). Nearly three-fourths of the study participants used only water to wash their genitalia (74.4%) and less than three times per day (70.6%) during their menstruation. The majority, (81.0%) of the reproductive age females changed sanitary materials fewer than three times per day, as shown in Table 3.

Factors associated with MHM Practice

Binary logistic regression was done to filter eligible variables for further analysis through the multivariable logistic regression model. Variables with a *p*-value < 0.25 (educational level, marital status, family size, age group, availability of continuous water supply, daily water consumption, access to sanitary materials, availability of sex-separated latrines, availability of lockable latrines, availability of waste collection bins for the soiled sanitary materials, and accessibility of soaps) were taken into a multivariable logistic regression analysis. According to the multivariable analysis, access to sanitary materials, educational level of respondents, availability of continuous water supply, and availability of sex-separated latrines were associated with MHM practices (Table 4). Reproductive age females with access to sanitary materials were 3.4 times more likely to practice MHM well compared to those who lacked the access (AOR = 3.457; 95% CI = 2.285–5.333). When compared to individuals with informal education, those who completed primary and secondary schools had greater chances of having good MHM practice with an AOR of 2.201 (95% CI = 1.242–3.902) and 2.996 (95% CI = 1.546–5.805), respectively. Moreover, reproductive age females with access to a steady supply of water were shown to be four

Variables		Good MHM (n,%)		AOR (95% CI)	p-value
		Yes	No		
Access to sanitary material	No	74 (22.8)	251 (77.2)	Ref	
	Yes	191 (62)	117 (38)	3.457 (2.285–5.233)	0.000**
Educational level	Informal education/illiterate	31 (18)	141 (82)	Ref	
	Primary school	134 (46.2)	156 (53.8)	2.201(1.242–3.902)	0.007*
	Secondary school	85 (58.6)	60 (41.4)	2.996 (1.546–5.805)	0.001*
	College and above	15 (57.7)	11 (42.3)	1.203 (0.451–3.205)	0.712
Access to continuous water supply	No	111 (27.8)	289 (72.3)	Ref	
	Yes	154 (66.1)	79 (33.9)	4.050 (2.734–5.998)	0.000**
Access to separate latrine	No	155 (36.1)	274 (63.9)	Ref	
	Yes	110 (53.9)	94 (46.1)	1.617 (1.073–2.434)	0.021*

Table 4. Factors associated with good MHM practice among reproductive age females in IDP camps of Shire town, Northern Ethiopia, 2022. CI: Confidence Interval, AOR: Adjusted Odds Ratio, Ref: Reference, *: significant at $p < 0.01$, **: significant at $p < 0.001$.

times more likely to have good MHM practices (AOR = 4.050; 95% CI = 2.734–5.998). Additionally, another variable that was significantly linked with good MHM practice was access to sex separated latrines (AOR = 1.617; 95% CI = 1.073–2.434).

Discussion

In this study, less than half of the reproductive age females had good MHM, which is higher compared to studies conducted among Rohingya refugee adolescent girls (11.9%)³² and schoolgirls in central Ethiopia (28.2%)⁴. This disparity may be explained by variations in the study participants' demographics, sample sizes, and methods used to measure MHM practice. On the other side, this finding was lower compared to various studies conducted among school girls in Ethiopia, such as a study conducted in Mehal-Meda (90.9%)²⁹, Addis Ababa (77.6%)²⁸, Fnote-selam (68.0%)⁵, East Ethiopia (68%)³¹, Northeast Ethiopia (53.9%)³⁰, Boset district of Ethiopia (51.2%)¹, among prisoners of Southern Ethiopia (50.6%)¹², and abroad studies such as Southwest Delhi (81.7%)³⁴, Kenya (71.2%)³⁵, and Nigeria (57.58%)²². Variations in socio economic status of respondents, study settings, and WASH services could be the cause of this discrepancy. MHM supportive materials and facilities are anticipated to be limited in emergency scenarios, which could have a significant impact on MHM practice. Reproductive age females lived in IDPs camps faced a number of constraints to practice MHM, such as inadequate access to sanitary absorbent materials, a lack of sex-separated latrines, a lack of clean water supply, and improper waste management facilities⁷. Hence, for their unmet MHM, they might be forced to use unsafe practices.

Our study illustrated that access to sanitary material, access to continuous water supply, access to separate female latrines, and higher educational level were associated with satisfactory MHM practice of the study participants. Access to sanitary material was significantly associated with the good MHM practices of participants (AOR = 3.441; 95% CI = 2.279–5.177), which was consistent with studies conducted in Addis Ababa²⁷, Kenya³⁴, and Myanmar³⁵. Access to sanitary materials is a necessary prerequisite for appropriate MHM practice³⁶. Similarly, it was shown that reproductive age females who had access to continuous water supply were observed four times more likely to practice good MHM (AOR = 4.050; 95% CI = 2.734–5.998). Other similar studies done in Ethiopia²⁸ and in Kenya³⁴ confirmed this connection. Studies suggest that water is an essential part of WASH, which is inevitably important to exercise menstrual hygiene, while adequate MHM is impossible in the absence of a clean water supply³⁷. Furthermore, this study demonstrated that educational level was also a significant determinant factor of MHM practice. The odds of good MHM among reproductive age females who completed primary and secondary school were 2–3 times higher compared with those who have informal education or are illiterate, and this association was supported by previous studies carried out among schoolgirls in East Ethiopia³⁰ and among prisoners in South Ethiopia¹². Studies suggest that education is a significant driver of a good MHM^{31,38} and reproductive age females who have higher educational level should naturally be more aware of the need to practice MHM practice. Moreover, this study found that access to sex separated latrines was significantly associated with good MHM (AOR = 1.617; 95% CI = 1.073–2.434). This could be explained by the idea that access to sanitation facilities, including private latrines, has been identified as a vital component of good MHM^{10,39}.

Limitation of the study

Since this study is cross-sectional, it is difficult to establish a true cause-and-effect relationship between the independent and dependent variables. This study was also prone to social desirability bias as it was conducted on such a sensitive issue. As this study focused on the implication of WASH services on MHM practices, factors related to cultural and social norms were not in the scope of our study. Furthermore, this study used a quantitative approach and might have lacked a deep exploration of the root causes of the MHM practice. Moreover, though the authors declared the limitation of quantitative studies among reproductive age females in IDPs camps, it may not be appropriate to compare MHM practice between displaced reproductive age females with those who are

living in a normal situation. However, we used studies conducted among non-IDPs reproductive age females to assess the implications of the limited services on MHM practice.

Conclusion

More than half of the internally displaced reproductive age females did not have good MHM practices. Access to sanitary pads, availability of water supply, sex-separate latrines, and the educational level of reproductive age females were independent determinant factors for the MHM practice. Hence, Collaborative efforts of government, NGOs and the community are deemed to improve menstrual hygiene practices by ensuring the provision of adequate sanitary materials, establishing private and safe places for washing the genitalia and changing sanitary materials, educating the community about the importance proper menstrual hygiene practices, and involving women in the development and execution of MHM-supporting initiatives and activities, particularly in humanitarian situations.

Data availability

All data relevant to the study are available with the corresponding author for reasonable request.

Annex 1

The ten statements of MHM practice

1. Use sanitary material during menstruation (scored 1 for “yes”).
2. Type of sanitary material used ((scored 1 for “disposable pad/reusable sanitary material”).
3. Whether they change sanitary material (scored 1 for “yes”).
4. Frequency of change per day (scored 1 for “ ≥ 3 times”).
5. Whether they wash genitalia during menstruation (scored 1 for “yes”).
6. Frequency of washing the genitalia per day (scored 1 for “ ≥ 3 times”).
7. Material used to wash genitalia (scored 1 for “water and soap”).
8. Take a bath during menstruation (scored 1 for “yes”).
9. Where to dry washed sanitary materials (scored 1 for “outside”).
10. Disposal of used sanitary material (scored 1 for “burn/burial”).

Received: 15 March 2024; Accepted: 23 September 2024

Published online: 30 September 2024

References

1. Gebre, W. et al. Assessment of menstrual hygiene management knowledge, practice, and associated factors among girls in Boset District, Ethiopia: a school-based cross-sectional study. *Contracept. Reproductive Med.* **8**, 34. <https://doi.org/10.1186/s40834-023-00233-z> (2023).
2. Ademas, A. et al. Does menstrual hygiene management and water, sanitation, and hygiene predict reproductive tract infections among reproductive women in urban areas in Ethiopia? *PLoS ONE.* **15**(8), e0237696. <https://doi.org/10.1371/journal.pone.0237696> (2020).
3. Joint Monitoring Program. Progress on household drinking water, sanitation and hygiene 2000–2022: 2023 special focus on gender. New York: United Nations Children’s Fund (UNICEF) and World Health Organization (WHO), JMP. (2023). <https://www.who.int/publications/m/item/progress-on-household-drinking-water--sanitation-and-hygiene-2000-2022---s>
4. Deriba, B. S. et al. Safe menstrual hygiene management practice and associated factors among female adolescent students at high schools in central Ethiopia: a mixed-method study. *Front. Public Health.* **10**, 913262. <https://doi.org/10.3389/fpubh.2022.913262> (2022).
5. Abita, Z., Ali, R. & Admassu, B. Menstrual hygiene management practice and associated factors among secondary school girls in Finot Selam town, Northwest Ethiopia. *Int. J. Sex. Reprod. Health Care.* **4**(1), 053–061. <https://doi.org/10.17352/ijshr.000024> (2019).
6. Kaur, R., Kaur, K. & Kaur, R. Menstrual hygiene, management, and waste disposal: practices and challenges faced by girls/women of developing countries. *J Environ Public Health.* <https://doi.org/10.1155/2018/1730964> (2018).
7. Odey, G. O. et al. Period during a pandemic: the neglected reality of Nigerian girls and women. *Public Health Pract.* **2**, 100196. <https://doi.org/10.1016/j.puhip.2021.100196> (2021).
8. Shibeshi, B. Y., Emiru, A. A. & Asresie, M. B. Disparities in menstrual hygiene management between urban and rural schoolgirls in Northeast, Ethiopia. *PLoS ONE.* **16**(9), e0257853. <https://doi.org/10.1371/journal.pone.0257853> (2021).
9. Sommer, M. Understanding the menstrual hygiene management challenges facing displaced girls and women: findings from qualitative assessments in Myanmar and Lebanon. *Confl. Health.* **11**, 19. <https://doi.org/10.7916/d8tb1kh2> (2017).
10. Anbesu, E. W. & Asgedom, D. K. Menstrual hygiene practice and associated factors among adolescent girls in sub-saharan Africa: a systematic review and meta-analysis. *BMC Public Health.* **23**(1), 33. <https://doi.org/10.1186/s12889-022-14942-8> (2023).
11. Asumah, M. N., Abubakari, A., Aninanya, G. A. & Salisu, W. J. Perceived factors influencing menstrual hygiene management among adolescent girls: a qualitative study in the West Gonja Municipality of the Savannah Region, Ghana. *Pan Afr. Med. J.* **41**(146). <https://doi.org/10.11604/pamj.2022.41.146.33492> (2022).
12. Degefu, S., Tadesse, A., Ashagir, K. & Ezo, E. Assessment of menstrual hygiene management practice and associated factors among prisoners in South Nation nationalities and people region. *Ethiopia Heliyon.* **9**(6), e16224. <https://doi.org/10.1016/j.heliyon.2023.e16224> (2023).
13. Elledge, M. F. et al. Menstrual Hygiene Management and Waste Disposal in Low- and Middle-Income Countries. Review of the literature. *Int. J. Environ. Res. Public Health.* **15**(11), 1–20 (2018).
14. Hennegan, J., Shannon, A. K., Rubli, J., Schwab, K. J. & Melendez-Torres, G. J. Women’s and girls’ experiences of menstruation in low- and middle-income countries: a systematic review and qualitative Meta synthesis. *PLoS Med.* **16**(5), e1002803. <https://doi.org/10.1371/journal.pmed.1002803> (2019).
15. Sahiledengle, B. et al. Menstrual hygiene practice among adolescent girls in Ethiopia: a systematic review and meta-analysis. *PLoS ONE.* **17**(1), e0262295. <https://doi.org/10.1371/journal.pone.0262295> (2022).
16. Parker, A. H. et al. Menstrual management: a neglected aspect of hygiene interventions. *Disaster Prev. Manage.* **23**(4), 437–454 (2014).

17. Schmitt, M. L. et al. Menstrual material maintenance, disposal, and laundering challenges among displaced girls and women in Northeast Nigeria. *J. Water Sanitation Hygiene Dev.* **12**(7), 517. <https://doi.org/10.2166/washdev.2022.213> (2022).
18. VanLeeuwen, C. & Torondel, B. Improving menstrual hygiene management in emergency contexts: a literature review of current perspectives. *Int. J. Women's Health.* **10**, 169–186. <https://doi.org/10.2147/IJWH.S135587> (2018).
19. Internal Displacement Monitoring Center. Global Report on Internal Displacement. Internal Displacement Monitoring Center. (2023). <https://www.internal-displacement.org/publications/2022-global-report-on-internal-displacement>
20. Africa Center for Strategic Studies. Record 36 million Africans Forcibly Displaced. Africa Center for Strategic Studies. (2022). <https://africacenter.org/spotlight/record-36-million-africans-forcibly-displaced-is-44-percent-of-global-total-refugees-asylum/>
21. Nnennaya, E. U., Atinge, S., Dogara, S. P. & Ubandoma, R. J. Menstrual hygiene management among adolescent school girls in Taraba state, Nigeria. *Afri Health Sci.* **21**(2), 842–851. <https://doi.org/10.4314/ahs.v21i2.45> (2021).
22. Viseck, N. Menstrual Hygiene Management in the context of displacement: challenges and Next steps. *Confl. Health.* **1**(5), 65–68 (2020).
23. Patel, K. et al. Systematic review of menstrual hygiene management (MHM) during humanitarian crises and/or emergencies in low- and middle-income countries. *Front. Public Health.* **10**, 1018092. <https://doi.org/10.3389/fpubh.2022.1018092> (2022).
24. Corburn, J. & Hildebrand, C. Slum sanitation and the social determinants of women's health in Nairobi, Kenya. *J. Environ. Public Health.* **1–6** <https://doi.org/10.1155/2015/209505> (2015).
25. Soeiro, R. E., Rocha, L., Surita, F. G., Bahamondes, L. & Costa, K. L. Period poverty: menstrual health hygiene issues among adolescent and young Venezuelan migrant women at the northwestern border of Brazil. *Reprod. Health.* **18**, 238. <https://doi.org/10.1186/s12978-021-01285-7> (2021).
26. Ilo, C. I., Nwimo, I. O. & Onwunaka, C. Menstrual Hygiene Practices and Sources of Menstrual Hygiene Information among Adolescent Secondary School Girls in Abakaliki Education Zone of Ebonyi State. *J. Educ. Pract.* **7**(31), 88–95 (2016).
27. Melaku, A. et al. Menstrual hygiene management practices and determinants among schoolgirls in Addis Ababa, Ethiopia: the urgency of tackling bottlenecks - water and sanitation services. *Heliyon.* **9**, e15893. 2023 (2023).
28. Gultie, T. K. Practice of Menstrual Hygiene and Associated Factors among Female Mehalmeda High School students in Amhara Regional State, Ethiopia. *Sci. J. Public Health.* **2**(3), 189–195. <https://doi.org/10.11648/j.sjph.20140203.18> (2014).
29. Habtegiorgis, Y. et al. Menstrual hygiene practices among high school girls in urban areas in Northeastern Ethiopia: A neglected issue in water, sanitation, and hygiene research. *PLoS ONE.* **16**(6): e0248825. (2021). <https://doi.org/10.1371/journal.pone.0248825>.
30. Hussein, J., Gobena, T. & Gashaw, T. The practice of menstrual hygiene management and associated factors among secondary school girls in eastern Ethiopia: the need for water, sanitation, and hygiene support. *Wom Health.* **18**, 1–12. <https://doi.org/10.1177/17455057221087871> (2022).
31. Upashe, S. P., Tekelab, T. & Mekonnen, J. Assessment of knowledge and practice of menstrual hygiene among high school girls in Western Ethiopia. *BMC Women Health.* **15**(1), 1–8 (2015).
32. Pandit, K., Hasan, M. J., Islam, T. & Rakib, T. M. Constraints and current practices of menstrual hygiene among Rohingya adolescent girls. **8**(5), (2022). <https://doi.org/10.1016/j.heliyon.2022.e09465>
33. Kumar, G., Prasuna, J. G. & Seth, G. Assessment of menstrual hygiene among reproductive age women in South-west Delhi. *J. Family Med Prim Care.* **6**(4), 730–734. https://doi.org/10.4103/jfmpc.jfmpc_24_17 (2017).
34. Korir, E., Okwara, F. N. & Okumbe, G. Menstrual hygiene management practices among primary school girls from a pastoralist community in Kenya: a cross sectional survey. *Pan Afr. Med. J.* **31**, 222 (2018).
35. Htun, N. N., Laosee, O. & Rattanapan, C. Factors that Influence Menstrual Hygiene Management in adolescent girls in Mudon Township, Mon State, Myanmar. *J. Health Sci. Med. Res.* **39**(3), 207–217. <https://doi.org/10.31584/jhsmr.2021778> (2021).
36. Sharma, M. How International Medical Corps is Helping to Fight Period Poverty. International Medical Corp. (2022). <https://internationalmedicalcorps.org/story/how-international-medical-corps-is-helping-to-fight-period-poverty/>
37. Water Aid. Water. Sanitation and menstruation: lessons from the East and Southern Africa Menstrual Hygiene Management Symposium, Water Aid. (2018). <https://washmatters.wateraid.org/blog/lessons-east-and-southern-africa-menstrual-hygiene-management-symposium>
38. Daniel, N., Kejela, G., Fantahun, F., Desalegn, M. & Fantahun, G. F. Menstrual hygiene management practice and its associated factors among in-school adolescent girls in Western Ethiopia. *Contracept. Reproductive Med.* **8**, 1 (2023).
39. Torondel, B. et al. Effect of a combined household-level piped water and sanitation intervention on reported menstrual hygiene practices and symptoms of urogenital infections in rural Odisha, India. *Int. J. Hyg. Environ. Health.* **239**, 113866. <https://doi.org/10.1016/j.ijheh.2021.113866> (2022).

Acknowledgements

We would like to thank the coordinators and respondents of the IDP camps of Shire town for their voluntary participation in this study.

Author contributions

ET, GHR and AAA designed and conceptualized the study, ET, GHR, and AAA propose the methodology of this study, and all authors involved in data entry and analysis, wrote the first draft manuscript, reviewed, edited, and approved the final version manuscript.

Declarations

Competing interests

The authors declare no competing interests.

Additional information

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1038/s41598-024-73896-6>.

Correspondence and requests for materials should be addressed to G.H.R.

Reprints and permissions information is available at www.nature.com/reprints.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Open Access This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

© The Author(s) 2024