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Prevalence and factors associated with unmet need for menstrual hygiene management in six countries in Sub-Saharan Africa: A multilevel analysis

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Abstract

Background Menstruation is a normal biological process experienced by more than 300 million women globally every day. Women require clean menstrual absorbents that can be changed as often as needed in a private and safe place with proper hygiene and disposal facilities. These needs must be met consistently throughout the duration of the menstrual cycle. Access to menstrual needs is crucial for women's health, wellbeing, and dignity. This study assessed the prevalence and factors associated with unmet need for menstrual hygiene management (MHM) in Ethiopia, Kenya, Uganda, Burkina Faso, Ghana, and Niger.

Methods We used data from the Performance Monitoring for Action (PMA) 2020 surveys. We defined the unmet need for MHM as the "*lack of resources, facilities and supplies for MHM*." Sample characteristics were summarised using frequencies and percentages, while prevalence was summarised using proportions and their respective confidence intervals (CI). Factors associated with unmet need for MHM were assessed using multilevel logistic regression models.

Results The study included 18,048 women of reproductive age from the six countries. The prevalence of unmet need for MHM was highest in Burkina Faso (74.8%), followed by Ethiopia (69.9%), Uganda (65.2%), Niger (57.8%), Kenya (53.5%), and lowest in Ghana (34.2%). Unmet need for MHM was consistently higher among uneducated and multiparous women, those who reused MHM materials, practiced open defecation, and lived in rural areas across all six countries. The odds of unmet need for MHM were higher among younger women under 35 years, unmarried women, those with lower education levels, and those from poorer households. Similarly, the reuse of MHM materials, use of shared or non-improved toilet facilities, and open defecation increased the odds of unmet need for MHM. In contrast, the presence of handwashing facilities reduced the odds of unmet need for MHM.

Conclusion More than half of the women in five of the six countries have an unmet need for MHM, with significantly higher odds among younger women, those with low wealth status, the unmarried, and those with inadequate access

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to sanitary facilities. This study highlights the state of period poverty in Sub-Saharan Africa. Efforts to end period poverty should consider MHM needs as an integrated whole, as addressing each need in isolation is insufficient.

Keywords Menstrual hygiene management, Period poverty, Menstrual needs, Menstrual health, Menstruation

Introduction

Menstruation is a normal biological phenomenon among women and girls of reproductive age. Over 300 million women menstruate globally, daily [1]. At the onset of menstruation (menarche), girls need the correct information about the menstrual cycle to manage it comfortably and effectively, but this is not always the case [2, 3]. Effective management of menstruation requires that girls and women have access to clean materials to absorb menstrual blood that can be changed privately, safely, hygienically, and as often as needed for the duration of the menstrual cycle [4]. Menstrual Hygiene Management (MHM) is defined as “*Women and adolescent girls using a clean menstrual management material to absorb or collect blood that can be changed in privacy as often as necessary for the duration of the menstruation period, using soap and water for washing the body as required, and having access to facilities to dispose of used menstrual management materials*” [5]. Accessing MHM needs for effective management of menstruation is crucial towards achieving menstrual health [6].

Lack of access to MHM materials and facilities is a major challenge faced by girls and women in low income settings [7–10] that results in unhygienic practices during menstruation [11]. Women from low socioeconomic households are not able to afford menstrual products and resort to using unsafe and unhygienic products like tissue papers, mud, and newspapers to absorb menstrual blood [7, 10, 12]. In addition, these women lack a private space to change sanitary materials, water to wash themselves, and a safe place to wash and dry reusable sanitary materials [12, 13]. Another challenge relates to the limited information and lack of knowledge on menstrual hygiene best practices among women [3, 14]. Also, cultural beliefs and taboos, misconceptions, and poor attitudes towards menstruation among communities in LMICs [7] further pose a great challenge to effective MHM.

The process of coping with MHM challenges further imposes on women psychosocial burden, health risks and reduced productivity [15]. Previous studies have reported cases of adolescent girls engaging in transactional sex to acquire sanitary pads thereby exposing themselves to HIV and other sexually transmitted diseases, as well as teenage pregnancy and school dropouts [16, 17]. Inadequate Water Sanitation and Hygiene (WASH) facilities have been positively linked to reproductive tract infections [18]. The use of improvised blood absorbents may lead to leakage and staining of clothes which in turn causes embarrassment and anxiety [19]. Negative

environments due to cultural norms and poor attitudes further promote period shaming and stigma on girls and women [19, 20].

Poor MHM practices have proved disruptive in education with studies reporting absenteeism among school-girls during menses in Bangladesh [21], India [22] and Ghana [23], among others [8, 19, 24, 25]. While most interventions and studies have focused on adolescents and school-aged girls, adult women lose productive time at work [26–28] and other engagements due to menstruation. A study in Burkina Faso reported a reduction in the probability of missing working days by women who used advanced MHM practices [26]. Menstrual pain experienced by some women and girls also reduces their productivity [10, 25]. Meeting menstrual needs for women is key for health, wellbeing, and the overall right to human dignity.

Globally, there is an increasing awareness on menstrual-related challenges that has seen the advancements in menstrual hygiene and health as a field [6, 29, 30]. In LMICs, there are efforts by multiple stakeholders to enhance opportunities for women to access MHM supplies and facilities. Addressing menstrual health is critical in improving global population health and achieving human rights, gender equality and empowerment for adolescent girls and women in general [6, 31]. In an effort to support evidence and understanding of MHM to inform policies and interventions in LMICs, this study examined the prevalence and factors associated with unmet need for MHM in Ethiopia, Kenya, Uganda, Burkina Faso, Ghana, and Niger.

Methods

Data source and study population

We analysed secondary data from the fifth round of Ghana (collected in 2016), the second round of Niger, the fifth round of Ethiopia, the sixth round of Kenya, fifth round of Uganda, and first round of Burkina Faso (collected in 2017) Performance Monitoring and Action (PMA) 2020 surveys. The PMA surveys used multi-stage stratified cluster design with place of residence (urban-rural) and regions/provinces/counties as the strata. Data were collected by trained interviewers using standardised household and female questionnaires from eligible women in sampled households from a representative sample of enumeration areas across the countries. To be eligible for menstrual hygiene questions women must have had a period within the last three months. This was assessed by asking, “*When did your last menstrual period*

start?” The response options included: “a given number of days, weeks, months or years ago”, with additional options to indicate that “women had reached menopause, had a hysterectomy, had not menstruated since their last birth, or had never menstruated”.

The sample size calculation for PMA2020 has been described in detail elsewhere [32]. After excluding males, women not currently menstruating and missing observations, our final sample included 18,048 women of reproductive age (4427 in Kenya, 4406 in Ethiopia, 2667 in Uganda, 1976 in Burkina Faso, 1766 in Niger, and 2806 in Ghana) (Supplementary Fig. 1).

Measures

Outcome variable

Based on the definition of MHM [6], the outcome variable which is unmet need for MHM was defined as “*lack of resources, supplies and facilities for MHM*”. It was measured based on the question: “*Is there anything else that would help you manage your menstrual period that you do not usually have?*” Probe: “*Anything else?*” and Hint: “*Could include resources, materials, changes to your environment, etc.*” Responses were categorized as “no needs,” referring to having no unmet material needs (responding, “*I have all I need*”), or “unmet needs,” referring to having one or more menstrual needs.

Independent variables

The independent variables were selected based on their availability in the dataset and literature review. The selected variables included and were categorised as follows: Age of respondent (15–19 yrs, 20–34 yrs, 35–49 yrs), Level of education (No formal, Primary, Secondary, Tertiary), Marital status (Married/Cohabiting, Widowed/Separated/Divorced, Never married), Parity (None, One, 2–3, 4+), Menstrual absorbent reuse (Yes, No), Current use of modern contraceptive method (Yes, No), Having a handwashing place (Yes, No), Water source (Improved, Unimproved), Sanitation (Improved, Shared, Non-improved, Open defecation), Place of residence (Urban, Rural), and Region/County (with unique categories for each country). Wealth status was computed using data on household assets. Principal component analysis (PCA) was conducted to generate a wealth index which was later categorized into quintiles (Richest, Richer, Middle, Poorer, Poorest).

Statistical analysis

The distribution of sample characteristics for each of the selected countries was summarised using frequencies and percentages. Proportions and confidence intervals were used to summarise the prevalence of unmet need for MHM for each country.

Multilevel mixed effects logistic regression analysis was used to identify the factors associated with unmet need for menstrual hygiene in the selected sub-Saharan African countries. We fitted country-specific models to obtain country-level estimates and an overall pooled model for the combined estimates. The models had three levels to account for the clustering effects; whereby individuals were nested within residences (urban or rural), which were nested within regions in each country. We fitted four regression models for the country-specific and pooled estimates which included (1) a null model excluding all covariates, (2) a model including individual level covariates (age, marital status, level of education, socioeconomic status, age at sexual debut, and current use of family planning), (3) a model including community-level covariates (hand-washing place, water source, type of sanitation facility, average community wealth and education levels), and (4) a full model including both individual- and community-level covariates.

The Intra Class Correlation (ICC) coefficient was used to assess the proportion of variance accounted for by clustering for each model. The Likelihood Ratio Test (LRT), Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) were used to assess the goodness of fit and selection of the final model. Odds ratios (OR) and 95% confidence intervals (CI) were reported. Statistical significance was assessed using a cut-off of 0.05 for p-values. For the pooled analysis, we reported estimates from all the four models fitted whereas only the full models are presented for the country-specific results. Complete case analysis was conducted whereby only variables with complete information on the outcome variable and covariates were included in the final models. We applied survey weights to account for the PMA stratified cluster survey design in all the statistical analyses. All analyses for this study were conducted using STATA 18 (Stata Corporation, College Station, Texas).

Results

Sample characteristics

The study included 4427 women in Kenya, 4406 in Ethiopia, 2667 in Uganda, 1976 in Burkina Faso, 1766 in Niger, and 2806 in Ghana. Most of the participants in the six countries were middle aged (20–34 yrs), were married or cohabiting and were nulliparous. While most of the countries had higher proportion of urban residents, Kenya and Uganda had higher proportions of rural residents. Majority of the participants had access to improved drinking water source and had no handwashing place (Table 1).

Prevalence of unmet need for MHM

The prevalence of unmet need for MHM was 74.8% in Burkina Faso, 69.9% in Ethiopia, 65.2% in Uganda, 57.8% in Niger, 53.5% in Kenya and 34.2% in Ghana. The

	Kenya		Ethiopia		Uganda		Burkina Faso		Niger		Ghana	
	N = 4427		N = 4406		N = 2667		N = 1976		N = 1766		N = 2806	
Variables	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Age group												
35–49 years	1,155	26.1	939	21.3	685	25.7	510	25.8	468	26.5	787	28
20–34 years	2,171	49.0	2,138	48.5	1,313	49.2	955	48.3	853	48.3	1,418	50.5
15–19 years	1,101	24.9	1,329	30.2	669	25.1	511	25.9	445	25.2	601	21.4
Highest education level												
Tertiary	638	14.4	611	13.9	231	8.7	93	4.7	106	6	199	7.1
Secondary	1,646	37.2	1,291	29.3	803	30.1	540	27.3	543	30.7	1,742	62.1
Primary	1,967	44.4	1,572	35.7	1,401	52.5	382	19.3	357	20.2	456	16.3
No formal	176	4.0	932	21.2	232	8.7	961	48.6	760	43	409	14.6
Wealth												
Richest	1,061	24.0	2,391	54.3	696	26.1	608	30.8	582	33	457	16.3
Richer	881	19.9	859	19.5	496	18.6	415	21	274	15.5	615	21.9
Middle	904	20.4	426	9.7	509	19.1	350	17.7	353	20	646	23
Poorer	834	18.8	381	8.6	445	16.7	327	16.5	224	12.7	590	21
Poorest	747	16.9	349	7.9	521	19.5	276	14	333	18.9	498	17.7
Marital Status												
Married/Cohabiting	2,370	53.5	1,981	45	1,426	53.5	1,218	61.6	1,131	64	1,437	51.2
Divorced/Widowed/Separated	334	7.5	527	12	392	14.7	113	5.7	120	6.8	303	10.8
Never Married	1,723	38.9	1,898	43.1	849	31.8	645	32.6	515	29.2	1,066	38
Parity												
None	1,525	34.4	2,286	51.9	875	32.8	678	34.3	648	36.7	1,096	39.1
One	658	14.9	582	13.2	353	13.2	278	14.1	206	11.7	449	16
Two to Three	1,160	26.2	724	16.4	538	20.2	419	21.2	390	22.1	656	23.4
4+	1,084	24.5	814	18.5	901	33.8	601	30.4	522	29.6	605	21.6
Reuses MHM product												
No	3,858	87.1	2,597	58.9	1,557	58.4	868	43.9	853	48.3	2,449	87.3
Yes	569	12.9	1,809	41.1	1,110	41.6	1,108	56.1	913	51.7	357	12.7
Modern contraceptive use												
No	2,028	45.8	3,239	73.5	1,799	67.5	1,420	71.9	1,424	80.6	2,146	76.5
Yes	2,399	54.2	1,167	26.5	868	32.5	556	28.1	342	19.4	660	23.5
Has handwashing place												
No	2,626	59.3	3,826	86.8	1,973	74	1,485	75.2	1,419	80.4	2,379	84.8
Yes	1,801	40.7	580	13.2	694	26	491	24.8	347	19.6	427	15.2
Type of Water Source												
Improved	3,014	68.1	3,878	88	2,235	83.8	1,644	83.2	1,484	84	2,579	91.9
Unimproved	1,413	31.9	528	12	432	16.2	332	16.8	282	16	227	8.1
Type of sanitation facility												

Table 1 (continued)

	Kenya		Ethiopia		Uganda		Burkina Faso		Niger		Ghana	
	N = 4427		N = 4406		N = 2667		N = 1976		N = 1766		N = 2806	
Variables	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Improved, not shared	1,433	32.4	512	11.6	423	15.9	515	26.1	595	33.7	518	18.5
Shared Facility	972	22.0	814	18.5	542	20.3	650	32.9	527	29.8	1,469	52.4
Non-improved facility	1,734	39.2	2,507	56.9	1,578	59.2	176	8.9	198	11.2	368	13.1
Open defecation	288	6.5	573	13	124	4.6	635	32.1	446	25.3	451	16.1
Place of residence												
Urban	1,597	36.1	2,793	63.4	811	30.4	1,084	54.9	1,267	71.7	1,621	57.8
Rural	2,830	63.9	1,613	36.6	1,856	69.6	892	45.1	499	28.3	1,185	42.2
Region												
Kenya												
Nairobi	445	10.1										
Kericho	445	10.1										
Kiambu	437	9.9										
Kilifi	430	9.7										
Kitui	458	10.4										
Bungoma	453	10.2										
Nandi	447	10.1										
Nyamira	382	8.6										
Siaya	333	7.5										
Kakamega	369	8.3										
West Pokot	228	5.2										
Ethiopia												
Addis			729	16.6								
Afar			87	2.0								
Amhara			703	16.0								
Oromia			917	20.8								
Somali			93	2.1								
Benishangul-Gumuz (BG)			142	3.2								
Southern Nations, Nationalities and Peoples (SNNP)			971	22.0								
Gambelia			44	1.0								
Harari			21	0.5								
Tigray			679	15.4								
Dire Dawa			20	0.5								
Uganda												
Central					851	31.9						
Eastern					601	22.5						
Northern					588	22.1						
Western					627	23.5						

	Kenya	Ethiopia	Uganda	Burkina Faso	Niger	Ghana	
	N = 4427	N = 4406	N = 2667	N = 1976	N = 1766	N = 2806	
Variables	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Burkina Faso							
Centre				511	25.9		
Cascades				113	5.7		
Boucle du Mouhoun				158	8.0		
Centre-East				125	6.3		
Centre-North				116	5.9		
Centre-West				156	7.9		
Centre-South				54	2.7		
East				125	6.3		
High-Basins				281	14.2		
North				148	7.5		
Plateau-Central				57	2.9		
Sahel				68	3.4		
South-West				64	3.2		
Niger							
Niamey					852	48.2	
Agadez					78	4.4	
Diffa					20	1.1	
Dosso					142	8.0	
Maradi					187	10.6	
Tahoua					154	8.7	
Tillaberi					149	8.4	
Zinder					184	10.4	
Ghana							
Greater Accra						519	18.5
Brong_Ahafo						215	7.7
Central						204	7.3
Eastern						316	11.3
Ashanti						563	20.1
Northern						331	11.8
Upper_East						115	4.1
Upper_West						62	2.2
Volta						168	6.0
Western						313	11.2

Variables	Kenya		Ethiopia		Uganda		Burkina Faso		Niger		Ghana	
	(%)	CI	(%)	CI	(%)	CI	(%)	CI	(%)	CI	(%)	CI
Overall	53.5	[48.3,59.6]	69.9	[65.7,73.8]	65.2	[58.2, 71.6]	74.8	[56.6, 87.1]	57.8	[49.9,65.3]	34.2	[27.9,41.0]
Age group												
35–49 years	57.8	[51.4,63.9]	75.7	[70.9,79.8]	71.5	[63.7,78.3]	75.6	[57.4,87.7]	58.9	[49.3,67.9]	33.0	[25.1,42.1]
20–34 years	52.1	[46.3,57.7]	68.1	[63.6,72.4]	62.3	[54.6,69.5]	74.2	[52.9,88.1]	58.8	[49.4,67.7]	33.7	[27.7,40.2]
15–19 years	54.0	[46.2,61.5]	68.3	[62.4,73.6]	64.4	[57.1,71.1]	75.1	[59.9,85.9]	54.7	[44.9,64.1]	37.0	[29.4,45.3]
Highest education level												
Tertiary	30.4	[23.3,38.5]	39.9	[32.6,47.5]	37.8	[30.7,45.4]	36.4	[31.4,41.7]	39.3	[21.3,60.8]	13.3	[7.61,22.1]
Secondary	50.1	[43.7,56.5]	57.2	[51.3,62.9]	50.8	[41.9,59.7]	64.8	[42.6,82.1]	47.6	[39.0,56.4]	29.6	[22.9,37.2]
Primary	63.1	[56.8,69.0]	74.3	[69.3,78.7]	75.7	[69.7,80.9]	72.9	[51.7,87.1]	50.3	[40.4,60.2]	42.0	[33.7,50.7]
No formal	72.1	[60.8,81.2]	81.8	[76.2,86.3]	77.2	[66.7,85.5]	80.6	[66.1,89.9]	63.8	[53.1,73.3]	56.2	[46.2,65.7]
Wealth												
Richest	28.4	[21.5,36.4]	46.1	[40.2,52.0]	37.8	[31.9,44.2]	48.5	[28.7,68.7]	40.4	[33.1,48.1]	18.2	[11.1,28.1]
Richer	48.0	[40.0,56.0]	74.1	[67.1,80.0]	56.1	[46.8,64.9]	77.1	[57.7,89.3]	56.4	[45.5,66.7]	25.0	[16.0,36.8]
Middle	59.9	[51.4,67.8]	83.2	[75.6,88.9]	74.1	[64.5,81.9]	78.5	[65.8,87.3]	63.7	[51.6,74.2]	31.3	[22.7,41.5]
Poorer	67.8	[59.7,74.9]	80.3	[72.7,86.2]	79.7	[70.5,86.6]	85.1	[77.6,90.6]	66.5	[51.9,78.5]	34.2	[25.8,43.7]
Poorest	70.5	[60.5,78.9]	86.8	[79.8,91.7]	90.1	[84.1,93.9]	84.8	[70.0,93.0]	62.1	[51.5,71.6]	60.5	[45.1,74.1]
Marital Status												
Married/Cohabiting	56.9	[51.1,62.5]	73.0	[68.4,77.2]	67.2	[59.1,74.3]	78.8	[62.6,89.2]	59.5	[50.3,68.0]	36.3	[28.9,44.4]
Divorced/Widowed/Separated	53.5	[45.4,61.4]	70.1	[63.4,75.9]	70.2	[62.3,77.0]	64.9	[42.2,82.4]	63.1	[46.2,77.4]	31.6	[24.1,40.1]
Never Married	50.1	[43.3,56.9]	65.6	[60.2,70.6]	59.3	[52.1,66.0]	66.5	[45.8,82.3]	49.7	[39.7,59.7]	32.2	[25.7,39.5]
Parity												
None	50.7	[43.9,57.4]	64.5	[59.3,69.4]	61.1	[54.4,67.4]	69.1	[48.8,84.0]	51.9	[42.9,60.7]	32.1	[25.5,39.5]
One	45.7	[38.6,52.9]	64.9	[58.6,70.7]	50.2	[39.7,60.6]	70.7	[50.1,85.3]	56.3	[42.5,69.2]	27.4	[20.7,35.2]
Two to Three	51.0	[44.4,57.6]	68.0	[61.9,73.5]	61.3	[53.0,68.9]	70.3	[49.5,85.1]	57.8	[46.2,68.5]	30.9	[23.6,39.4]
4+	66.5	[60.4,71.9]	84.2	[79.7,87.8]	78.0	[71.4,83.4]	83.7	[71.9,91.2]	63.2	[54.2,71.4]	46.3	[46.2,68.5]
Reuses MHM product												
No	49.9	[44.1,55.6]	55.4	[49.2,61.4]	53.4	[45.8,60.9]	56.6	[36.0,75.1]	38.6	[31.8,45.9]	30.8	[24.5,37.9]
Yes	82.2	[73.7,88.4]	81.3	[76.6,85.2]	81.3	[75.5,85.9]	82.4	[69.9,90.5]	64.1	[54.9,72.4]	56.7	[44.2,68.3]
Modern contraceptive use												
No	53.6	[47.5,59.5]	69.2	[64.6,73.5]	66.2	[59.6,72.2]	74.8	[58.0,86.5]	59.5	[51.5,66.9]	34.5	[28.1,41.7]
Yes	54.5	[48.3,60.6]	71.7	[66.4,76.4]	63.2	[54.1,71.4]	74.9</					

Variables	Kenya		Ethiopia		Uganda		Burkina Faso		Niger		Ghana	
	(%)	CI	(%)	CI	(%)	CI	(%)	CI	(%)	CI	(%)	CI
Overall	53.5	[48.3,59.6]	69.9	[65.7,73.8]	65.2	[58.2, 71.6]	74.8	[56.6, 87.1]	57.8	[49.9,65.3]	34.2	[27.9,41.0]
Age group												
35–49 years	57.8	[51.4,63.9]	75.7	[70.9,79.8]	71.5	[63.7,78.3]	75.6	[57.4,87.7]	58.9	[49.3,67.9]	33.0	[25.1,42.1]
20–34 years	52.1	[46.3,57.7]	68.1	[63.6,72.4]	62.3	[54.6,69.5]	74.2	[52.9,88.1]	58.8	[49.4,67.7]	33.7	[27.7,40.2]
15–19 years	54.0	[46.2,61.5]	68.3	[62.4,73.6]	64.4	[57.1,71.1]	75.1	[59.9,85.9]	54.7	[44.9,64.1]	37.0	[29.4,45.3]
Highest education level												
Tertiary	30.4	[23.3,38.5]	39.9	[32.6,47.5]	37.8	[30.7,45.4]	36.4	[31.4,41.7]	39.3	[21.3,60.8]	13.3	[7.61,22.1]
Secondary	50.1	[43.7,56.5]	57.2	[51.3,62.9]	50.8	[41.9,59.7]	64.8	[42.6,82.1]	47.6	[39.0,56.4]	29.6	[22.9,37.2]
Primary	63.1	[56.8,69.0]	74.3	[69.3,78.7]	75.7	[69.7,80.9]	72.9	[51.7,87.1]	50.3	[40.4,60.2]	42.0	[33.7,50.7]
No formal	72.1	[60.8,81.2]	81.8	[76.2,86.3]	77.2	[66.7,85.5]	80.6	[66.1,89.9]	63.8	[53.1,73.3]	56.2	[46.2,65.7]
Wealth												
Richest	28.4	[21.5,36.4]	46.1	[40.2,52.0]	37.8	[31.9,44.2]	48.5	[28.7,68.7]	40.4	[33.1,48.1]	18.2	[11.1,28.1]
Richer	48.0	[40.0,56.0]	74.1	[67.1,80.0]	56.1	[46.8,64.9]	77.1	[57.7,89.3]	56.4	[45.5,66.7]	25.0	[16.0,36.8]
Middle	59.9	[51.4,67.8]	83.2	[75.6,88.9]	74.1	[64.5,81.9]	78.5	[65.8,87.3]	63.7	[51.6,74.2]	31.3	[22.7,41.5]
Poorer	67.8	[59.7,74.9]	80.3	[72.7,86.2]	79.7	[70.5,86.6]	85.1	[77.6,90.6]	66.5	[51.9,78.5]	34.2	[25.8,43.7]
Poorest	70.5	[60.5,78.9]	86.8	[79.8,91.7]	90.1	[84.1,93.9]	84.8	[70.0,93.0]	62.1	[51.5,71.6]	60.5	[45.1,74.1]
Marital Status												
Married/Cohabiting	56.9	[51.1,62.5]	73.0	[68.4,77.2]	67.2	[59.1,74.3]	78.8	[62.6,89.2]	59.5	[50.3,68.0]	36.3	[28.9,44.4]
Divorced/Widowed/Separated	53.5	[45.4,61.4]	70.1	[63.4,75.9]	70.2	[62.3,77.0]	64.9	[42.2,82.4]	63.1	[46.2,77.4]	31.6	[24.1,40.1]
Never Married	50.1	[43.3,56.9]	65.6	[60.2,70.6]	59.3	[52.1,66.0]	66.5	[45.8,82.3]	49.7	[39.7,59.7]	32.2	[25.7,39.5]
Parity												
None	50.7	[43.9,57.4]	64.5	[59.3,69.4]	61.1	[54.4,67.4]	69.1	[48.8,84.0]	51.9	[42.9,60.7]	32.1	[25.5,39.5]
One	45.7	[38.6,52.9]	64.9	[58.6,70.7]	50.2	[39.7,60.6]	70.7	[50.1,85.3]	56.3	[42.5,69.2]	27.4	[20.7,35.2]
Two to Three	51.0	[44.4,57.6]	68.0	[61.9,73.5]	61.3	[53.0,68.9]	70.3	[49.5,85.1]	57.8	[46.2,68.5]	30.9	[23.6,39.4]
4+	66.5	[60.4,71.9]	84.2	[79.7,87.8]	78.0	[71.4,83.4]	83.7	[71.9,91.2]	63.2	[54.2,71.4]	46.3	[46.2,68.5]
Reuses MHM product												
No	49.9	[44.1,55.6]	55.4	[49.2,61.4]	53.4	[45.8,60.9]	56.6	[36.0,75.1]	38.6	[31.8,45.9]	30.8	[24.5,37.9]
Yes	82.2	[73.7,88.4]	81.3	[76.6,85.2]	81.3	[75.5,85.9]	82.4	[69.9,90.5]	64.1	[54.9,72.4]	56.7	[44.2,68.3]
Modern contraceptive use												
No	53.6	[47.5,59.5]	69.2	[64.6,73.5]	66.2	[59.6,72.2]	74.8	[58.0,86.5]	59.5	[51.5,66.9]	34.5	[28.1,41.7]
Yes	54.5	[48.3,60.6]	71.7	[66.4,76.4]	63.2	[54.1,71.4]	74.9	[48.7,90.3]	50.6	[40.8,60.4]	33.2	[25.7,41.6]
Has handwashing place												
No	60.8	[53.9,67.3]	73.0	[68.7,76.9]	69.1	[61.4,75.9]	80.2	[64.5,90.0]	56.5	[48.2,64.5]	35.4	[28.2,43.5]
Yes	43.6	[36.8,50.6]	40.7	[28.2,54.5]	53.1	[43.9,62.1]	57.3	[31.5,79.6]	64.1	[51.6,74.9]	27.3	[16.1,42.3]
Type of Water Source												
Improved	50.0	[43.7,56.2]	66.4	[61.9,70.6]	62.2	[54.9,69.0]	69.1	[49.3,83.8]	59.5	[51.0,67.4]	31.8	[25.1,39.4]
Unimproved	62.7	[52.5,71.9]	82.9	[74.1,89.1]	80.1	[69.3,87.8]	91.5	[83.9,95.7]	52.6	[39.6,65.3]	62.3	[41.4,79.5]
Type of sanitation facility												

[illegible]

prevalence was consistently high among women who had no formal education, parity of 4+, reused MHM materials, practiced open defecation and lived in rural areas in the six countries in the study. Moreover, the prevalence of unmet need for MHM was highest in Siaya County in Kenya, Southern Nations, Nationalities and Peoples (SNNP) region in Ethiopia, Northern Uganda, Centre North in Burkina Faso, Diffa region in Ghana, and Upper west region of Ghana (Table 2).

Factors associated with unmet need for MHM

Model 4 was selected as the model of choice because it had the lowest AIC (16358.17) and BIC (16599.99) compared to models 1–3. Based on the pooled multilevel model, there was a statistically significant association between unmet need for MHM and age, education level, wealth status and marital status.

Younger women aged 15–19 years and 20–34 years were more likely to have unmet need compared to their older counterparts (35+ years). The odds of unmet need for MHM increased as the education levels and wealth status decreased. Unmarried women had increased odds of unmet need for MHM compared to the married women. Additionally, women who had more than four children had 58% increased odds of unmet need. Women who reused menstrual absorbents and those who practiced open defecation (OD) were more than two times highly likely to have unmet need for MHM. Compared to Ethiopia, Ghana (OR: 0.15, 95%CI 0.08–0.27) and Niger (OR: 0.23, 95%CI 0.13–0.4) had reduced odds of unmet need (Table 3).

The models for each of the six countries revealed a similar pattern of association as the pooled model. The “never married” category of unmarried women were highly likely to experience unmet need in Uganda (OR: 1.84, 95%CI 1.23–2.75), Ethiopia (OR: 1.67, 95%CI 1.22–2.28) and Niger (OR: 2.29, 95%CI 1.38–3.79). In Burkina Faso, having an unimproved water source (OR: 2.2, 95%CI 1.24–3.9) increased the odds while having a handwashing place (OR: 0.62, 95%CI 0.43–0.88) reduced the odds unmet need for MHM by 38%. Also, teenagers in Burkina Faso (OR: 1.8, 95%CI 1.02–3.16) and Ghana (OR: 2.11, 95%CI 1.31–3.41) were highly likely to experience the unmet need (Table 4).

Discussion

The prevalence of unmet need for menstrual hygiene management was high for most of the countries with Burkina Faso having the highest reported prevalence while Ghana had the lowest. Ghana has benefited from extensive MHM interventions targeting schoolgirls in recent years. This study found that younger women were more likely to have unmet need for MHM compared to older women aged 35 and above. This finding

is attributable to the fact that younger women are more likely to be exposed to MHM barriers in school [15, 33, 34], work [28] and other physical activities like sporting [19]; and are highly likely to be impacted by menstrual challenges [35]. Younger women therefore present as the age-group with a greater need for adequate MHM, which explains why most previous studies have focused on adolescent girls and school-age women. This could also explain why the unmarried, most of whom are the never married younger women, had increased odds of unmet need in this study. In some settings, younger girls are reportedly knowledgeable on appropriate MHM practices but do not adequately practice good MHM [20, 36, 37]. Other studies have also reported poor access to menstrual needs [19, 38]. However, the increased focus on younger women in schools has promoted proper interventions for MHM hence improving access to menstrual needs by younger women and adolescent girls [39–42]. The increased focus on younger women and girls may however mask the menstrual needs of older women.

Women who had attained lower education levels were more likely to have unmet need for MHM compared to those attaining tertiary level. This finding is consistent with other studies reporting inappropriate MHM practices among the uneducated [43] and safer MHM practices among the highly educated [36, 44–46]. In addition, educational interventions have been shown to promote good MHM practices [47]. The odds of unmet need for MHM increased down the wealth quintiles with women from lower wealth quintiles highly likely to experience menstrual need challenges compared to the richest. The richest can afford menstrual material and are likely to have better and improved hygiene facilities compared to the poor, and can effectively manage their menstruation [48]. Affordability of menstrual material has been reported as a major barrier to effective MHM [13, 49, 50].

Women who utilized reusable MHM materials were 2.7 times more likely to have unmet need compared to those who used disposable materials. Compared to disposable sanitary pads, reusable MHM materials are of low cost [51] and therefore preferred by persons of low socioeconomic status with already unmet need. Additionally, reusable materials not only require adequate water for washing but are also constrained by menstrual taboos and social stigma [20, 52, 53] making it difficult for the users to freely clean and hang the materials to dry, which may lead to unmet needs.

Odds of unmet menstrual needs decreased by 24% among women with a handwashing place compared to those without. Availability and access to a handwashing facility is an essential component and a proxy metric for efficient management of menstruation [31, 54]. Previous studies [17, 18], including one that used the PMA survey [55] have reported improved menstrual hygiene

Table 3 Factor associated with unmet need for MHM (Pooled Analysis)

Characteristics	Model 1 (Null model) OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
Age group				
35–49 years		1		1
20–34 years		1.22 (1.08–1.38)		1.20 (1.06–1.36)
15–19 years		1.24 (1.04–1.48)		1.19 (1.00–1.42)
Highest education level				
Tertiary		1		1
Secondary		1.41 (1.21–1.65)		1.42 (1.22–1.66)
Primary		2.03 (1.72–2.40)		1.99 (1.68–2.34)
No formal		1.81 (1.48–2.22)		1.74 (1.42–2.13)
Wealth				
Richest		1		1
Richer		1.58 (1.38–1.82)		1.54 (1.34–1.77)
Middle		1.97 (1.67–2.32)		1.88 (1.59–2.23)
Poorer		2.18 (1.80–2.63)		2.05 (1.69–2.49)
Poorest		2.68 (2.17–3.30)		2.44 (1.96–3.04)
Marital Status				
Married/Cohabiting		1		1
Divorced/Widowed/Separated		1.28 (1.10–1.48)		1.29 (1.11–1.49)
Never Married		1.44 (1.24–1.68)		1.47 (1.26–1.71)
Parity				
None		1		1
One		1.02 (0.87–1.21)		1.03 (0.87–1.22)
Two to Three		1.17 (0.98–1.39)		1.18 (0.99–1.40)
4+		1.57 (1.29–1.91)		1.58 (1.29–1.92)
Reuses MHM product				
No		1		1
Yes		2.79 (2.48–3.15)		2.67 (2.37–3.01)
Modern contraceptive use				
No		1		1
Yes		1.04 (0.94–1.15)		1.03 (0.93–1.15)
Has handwashing place				
No		1		1
Yes		0.78 (0.69–0.88)		0.78 (0.69–0.88)
Type of Water Source				
Improved		1		1
Unimproved		1.16 (0.98–1.38)		1.07 (0.9–1.27)
Type of sanitation facility				
Improved, not shared		1		1
Shared Facility		1.25 (1.10–1.43)		1.29 (1.14–1.48)
Non-improved facility		1.55 (1.34–1.79)		1.49 (1.29–1.72)
Open defecation		2.25 (1.80–2.80)		2.06 (1.65–2.57)
Place of residence				
Urban			1	1
Rural			1.05 (0.67–1.65)	0.91 (0.57–1.46)
Community average wealth			1.80 (1.44–2.25)	1.34 (1.06–1.70)
Community average education			3.09 (1.92–4.96)	1.85 (1.12–3.05)
Country				
Ethiopia			1	1
Kenya			0.53 (0.32–0.88)	0.76 (0.45–1.3)
Uganda			0.92 (0.55–1.52)	1.02 (0.60–1.73)
Ghana			0.12 (0.07–0.21)	0.15 (0.08–0.27)
Niger			0.20 (0.12–0.35)	0.23 (0.13–0.40)

Table 3 (continued)

Characteristics	Model 1 (Null model) OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
Age group				
Burkina Faso			0.62 (0.36–1.07)	0.73 (0.41–1.29)
Intercept	1.98 (1.65–2.37)	0.23 (0.17–0.3)	0.04 (0.01–0.10)	0.04 (0.01–0.12)
Model diagnostics				
ICC	0.6316167	0.5738305	0.5159883	0.5368264
AIC	17478.42	16457.49	17201.85	16358.17
BIC	17494.02	16636.91	17279.86	16599.99

Bold: Significant at $p < 0.05$ **Table 4** Factors associated with unmet need for MHM in each of the six countries in SSA

Characteristics	Kenya OR (95% CI)	Ethiopia OR (95% CI)	Uganda OR (95% CI)	Burkina Faso OR (95% CI)	Niger OR (95% CI)	Ghana OR (95% CI)
Age group						
35–49 years	1	1	1	1	1	1
20–34 years	0.97 (0.76–1.25)	1.27 (0.96–1.67)	1.13 (0.82–1.57)	1.35 (0.9–2.03)	1.29 (0.9–1.84)	1.59 (1.13–2.23) **
15–19 years	0.84 (0.57–1.22)	1.20 (0.84–1.71)	1.18 (0.74–1.87)	1.80 (1.02–3.16) *	1.06 (0.64–1.77)	2.11 (1.31–3.41) **
Highest education level						
Tertiary	1	1	1	1	1	1
Secondary	1.59 (1.17–2.15) **	1.42 (1.08–1.87) *	1.39 (0.94–2.06)	0.72 (0.4–1.29)	1.17 (0.63–2.18)	1.84 (1.05–3.22) *
Primary	2.09 (1.51–2.90) ***	2.24 (1.68–2.99) ***	2.10 (1.39–3.17) ***	0.99 (0.53–1.85)	1.16 (0.60–2.26)	2.36 (1.26–4.43) **
No formal	2.31 (1.25–4.26) **	2.55 (1.77–3.67) ***	1.43 (0.78–2.61)	1.03 (0.55–1.95)	0.92 (0.47–1.82)	2.15 (1.09–4.22) *
Wealth						
Richest	1	1	1	1	1	1
Richer	1.48 (1.09–2.01) **	2.63 (1.92–3.60) ***	1.29 (0.90–1.84)	1.41 (0.96–2.07)	1.52 (0.99–2.32)	0.96 (0.62–1.49)
Middle	2.16 (1.51–3.09) ***	3.23 (1.89–5.52) ***	1.44 (0.93–2.24)	1.36 (0.85–2.17)	2.13 (1.46–3.12) ***	1.67 (1.03–2.70) *
Poorer	2.78 (1.82–4.24) ***	2.77 (1.55–4.95) ***	1.73 (1.05–2.84) *	1.02 (0.57–1.85)	2.26 (1.38–3.69) **	2.22 (1.31–3.79) **
Poorest	3.45 (2.15–5.54) ***	4.09 (2.13–7.87) ***	2.28 (1.20–4.31) *	1.04 (0.52–2.07)	2.32 (1.53–3.53) ***	2.55 (1.31–4.96) **
Marital Status						
Married/Cohabiting	1	1	1	1	1	1
Divorced/Widowed/Separated	1.12 (0.8–1.56)	1.43 (1.07–1.92) *	1.35 (0.98–1.87)	0.65 (0.37–1.12)	1.57 (0.95–2.59)	1.34 (0.91–1.95)
Never Married	1.2 (0.87–1.65)	1.67 (1.22–2.28) **	1.84 (1.23–2.75) **	1.12 (0.64–1.95)	2.29 (1.38–3.79) **	1.3 (0.87–1.93)
Parity						
None	1	1	1	1	1	1
One	0.89 (0.62–1.26)	1.29 (0.93–1.79)	1.04 (0.67–1.60)	1.08 (0.60–1.95)	1.82 (1.04–3.17) *	0.74 (0.48–1.14)
Two to Three	0.99 (0.67–1.45)	1.26 (0.90–1.76)	1.35 (0.85–2.17)	1.09 (0.59–2.03)	1.67 (0.99–2.82)	1.21 (0.77–1.89)
4+	1.23 (0.80–1.90)	1.41 (0.94–2.13)	2.09 (1.25–3.49) **	1.89 (0.94–3.83)	1.93 (1.10–3.38) *	1.61 (0.97–2.66)
Reuses MHM product						
No	1	1	1	1	1	1
Yes	3.84 (2.71–5.43) ***	2.3 (1.82–2.89) ***	2.85 (2.21–3.68) ***	2.19 (1.55–3.11) ***	2.56 (1.86–3.52) ***	3.45 (2.3–5.17) ***
Modern contraceptive use						
No	1	1	1	1	1	1
Yes	1.04 (0.84–1.29)	1.03 (0.82–1.3)	1.08 (0.85–1.37)	1.27 (0.93–1.74)	0.79 (0.56–1.12)	0.87 (0.66–1.16)

Table 4 (continued)

Characteristics	Kenya OR (95% CI)	Ethiopia OR (95% CI)	Uganda OR (95% CI)	Burkina Faso OR (95% CI)	Niger OR (95% CI)	Ghana OR (95% CI)
Has handwashing place						
No	1	1	1	1	1	1
Yes	0.85 (0.66–1.09)	0.53 (0.39–0.71)	0.98 (0.73–1.32)	0.62 (0.43–0.88) **	1.03 (0.73–1.46)	0.75 (0.51–1.09)
Type of Water Source						
Improved	1	1	1	1	1	1
Unimproved	1.02 (0.76–1.38)	0.92 (0.58–1.47)	1.2 (0.79–1.81)	2.2 (1.24–3.9) **	0.6 (0.39–0.92)	1.71 (0.94–3.1)
Type of sanitation facility						
Improved, not shared	1	1	1	1	1	1
Shared Facility	1.07 (0.81–1.42)	1.79 (1.28–2.49) **	1.44 (1.01–2.05) *	0.95 (0.67–1.34)	1.64 (1.17–2.31) **	1.57 (1.08–2.26) *
Non-improved facility	1.05 (0.79–1.40)	2.53 (1.84–3.47) ***	1.33 (0.95–1.85)	1.32 (0.67–2.59)	2.09 (1.30–3.36) **	1.05 (0.63–1.77)
Open defecation	3.74 (1.99–7.04) ***	3.51 (2.21–5.57) ***	1.31 (0.58–2.99)	1.58 (0.90–2.77)	2.19 (1.24–3.88) **	1.67 (0.95–2.94)
Place of residence						
Urban	1	1	1	1	1	1
Rural	0.33 (0.11–1.03)	2.45 (0.74–8.14)	0.74 (0.31–1.75)	0.96 (0.25–3.67)	0.73 (0.23–2.28)	3.73 (0.98–14.3)
Community average wealth	1.73 (0.90–3.30)	0.71 (0.42–1.18)	2.43 (1.26–4.67) *	1.69 (0.72–3.97)	0.90 (0.47–1.70)	0.30 (0.12–0.73) **
Community average education	3.70 (0.8–17.15)	1.53 (0.66–3.52)	0.72 (0.17–2.95)	0.62 (0.16–2.45)	2.45 (0.74–8.11)	11.0 (1.27–95.5)
Region						
Kenya						
Nairobi	1					
Kericho	0.23 (0.04–1.30)					
Kiambu	0.53 (0.11–2.66)					
Kilifi	0.41 (0.07–2.41)					
Kitui	1.58 (0.26–9.56)					
Bungoma	1.30 (0.23–7.46)					
Nandi	0.42 (0.07–2.47)					
Nyamira	1.98 (0.31–12.6)					
Siaya	2.58 (0.40–16.5)					
Kakamega	1.63 (0.26–10.1)					
West Pokot	0.26 (0.04–1.90)					
Ethiopia						
Addis		1				
Afar		1.05 (0.14–7.65)				
Amhara		0.93 (0.31–2.81)				
Oromia		1.19 (0.41–3.42)				
Somali		0.77 (0.11–5.36)				
BG		0.19 (0.03–1.20)				
SNNP		2.45 (0.90–6.71)				
Gambelia		2.87 (0.14–57.3)				
Harari		0.68 (0.04–12.7)				
Tigray		0.64 (0.22–1.84)				
Dire Dawa		0.01 (0.00–0.39)*				
Uganda						
Central			1			
Eastern			1.40 (0.51–3.85)			
Northern			1.03 (0.25–4.24)			
Western			0.57 (0.23–1.40)			
Burkina Faso						
Centre				1		
Cascades				1.17 (0.18–7.41)		

Table 4 (continued)

Characteristics	Kenya OR (95% CI)	Ethiopia OR (95% CI)	Uganda OR (95% CI)	Burkina Faso OR (95% CI)	Niger OR (95% CI)	Ghana OR (95% CI)
Boucle du Mouhoun				5.94 (1.19–29.7) *		
Centre-East				1.77 (0.27–11.7)		
Centre-North				45.4 (3.4–608.5) **		
Centre-West				2.07 (0.44–9.72)		
Centre-South				3.95 (0.3–51.11)		
East				1.24 (0.22–6.89)		
High-Basins				1.42 (0.39–5.16)		
North				5.62 (0.92–34.2)		
Plateau-Central				1.93 (0.2–18.86)		
Sahel				9.99 (0.6–154.6)		
South-West				2.51 (0.2–31.73)		
Niger						
Niamey					1	
Agadez					0.27 (0.05–1.50)	
Diffa					0	
Dosso					0.22 (0.06–0.79)**	
Maradi					0.88 (0.29–2.72)	
Tahoua					1.10 (0.33–3.66)	
Tillaberi					1.60 (0.46–5.62)	
Zinder					4.83 (1.49–15.7) **	
Ghana						
Greater Accra						1
Brong_Ahafo						1.46 (0.23–9.35)
Central						15.0 (2.48–90.8) **
Eastern						2.78 (0.48–16.1)
Ashanti						2.75 (0.64–11.78)
Northern						17.63 (2.55–121.7) **
Upper_East						45.39 (3.15– 653.43) **
Upper_West						0
Volta						1.53 (0.22–10.69)
Western						1.02 (0.17–5.93)
_cons	0.01 (0–0.15)	0.07 (0.01–0.47)	0.08 (0.01–1.28)	0.51 (0.02–11.92)	0.01 (0–0.2)	0 (0–0.04)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

associated with having a handwashing station. Loughnan et al. showed a 75% improvement in menstrual hygiene needs for women with access to a handwashing station [56]. Consistent with this finding, the World Bank underscored handwashing as an essential component while advocating for a holistic approach to tackling poor menstrual hygiene [1].

Shared sanitation facilities were found to increase the chances of unmet menstrual hygiene compared to having access to non-shared facilities. This could be attributed to shared sanitation facilities such as household structures or public facilities being unable to offer safe spaces for management of menstrual needs including changing, disposal and cleaning [8, 57]. Since lower socioeconomic

status often coincides with higher unmet MHM needs, community-level factors such as shared sanitation facilities might indirectly reflect a greater prevalence of unmet needs within the population. Hennegan et al. presented a different perspective arguing that shared facilities would in some cases offer a better MHM where such facilities were within households that pooled resources in making them safer [55] although this was not a sufficient indicator for safety of shared facilities.

Non-improved facilities increase the risk of unmet menstrual hygiene by 49%. According to WHO's Joint Monitoring Program, non-improved sanitation facilities include structures like latrines that lack sufficient privacy and safety, either lacking a slab or platform or proper

wall [58]. In Myanmar and Lebanon, non-improved facilities were reported as dirty and uncomfortable to use for MHM [57]. In Nigeria, women avoided using non-improved facilities and instead opted to sleeping areas or sought alternative places where they could achieve a safe MHM [55]. These findings suggest that improvement of sanitation facilities could lead to better MHM.

Strengths and limitations

This study is among the first to assess factors associated with unmet need for MHM in Sub-saharan Africa to the best of our knowledge. Our study contributes to evidence in access to MHM materials and will be useful in influencing policies for the new focus of making menstruation a normal fact by 2030. The use of nationally representative PMA datasets makes our results generalizable to each of the countries while still pointing to the general state of MHM in SSA and could be applicable to other LMICs. The study has several limitations. First, we cannot infer causation due to the cross-sectional design of the study. Secondly, the study does not provide a breakdown of all the specific MHM needs. Another limitation that should be considered when interpreting the findings is the possibility of undercoverage bias resulting in overestimation of prevalence in some regions like Diffa in Niger and Upper West in Ghana. Finally, we did not explore the drivers of the cross-country variation in MHM.

Conclusion

Our study found that more than half of women in five of the six countries lacked all that they needed to manage their menstruation hygienically. While Ghana had the lowest proportion of women with unmet need for MHM, the portion is still relatively high within the country context. The odds of unmet need were significantly higher among younger women, those with low wealth status, the unmarried, and those with poor access to sanitary facilities. Education level was negatively associated with unmet need for MHM. The reported unmet need for MHM in these countries reflects the state of period poverty in SSA. While collaborative efforts are being made by multi-agency teams to reduce period poverty, there is need to approach MHM needs as a comprehensive unit; each need in isolation is insufficient. Every woman should have access to all the resources necessary for managing menstruation effectively, whenever they need them. Policymakers and MHM programme implementers should promote affordability of menstrual products and ensure access to sanitary and disposal facilities, especially among the poor, uneducated, unmarried, women under 35 years, and those living in rural areas. Future studies should map the specific needs in different locations to facilitate more focused, context-based interventions.

Abbreviations

aOR	Adjusted odds ratio
cOR	Crude odds ratio
CI	Confidence Interval
MHM	Menstrual Hygiene Management
PMA	Performance Monitoring for Accountability
SDGs	Sustainable development goals
SSA	Sub-Saharan Africa
WHO	World Health Organization

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12905-024-03211-y>.

Supplementary Material 1

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Author contributions

CA conceptualized the idea and acquired the datasets. CA, EOAW and JOO analyzed the data. All the authors interpreted the results, contributed to drafting the manuscript text, revised, reviewed and approved the final version for submission.

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Data availability

Data used in this study are publicly available for request on the Performance Monitoring for Accountability (PMA2020) website at <https://www.pma2020.org/request-access-to-datasets>.

Declarations

Ethics approval

The study used secondary data from the Performance Monitoring for Accountability (PMA2020) surveys. The data were accessed upon approval of the data request to the PMA2020 and were used as per the data agreement. Guided by the updated World medical Association Declaration of Helsinki, the surveys were approved by the Institutional Review Board of the Addis Ababa University College of Health Sciences and National Research Ethics Review Committee in Ethiopia, Kenya Medical Research Institute Ethics Review Committee, Comité Consultatif National d'Ethique and University of Kinshasa Ethics Review Committee. All participants provided informed consent before interviews.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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