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Feasibility and acceptability of menstrual underwear among women in displacement-prone Kalehe, Democratic Republic of Congo

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Menstrual hygiene management (MHM) remains a critical yet often neglected issue in humanitarian settings. Reusable menstrual underwear (MU) offers a sustainable option where disposable products are limited, but evidence from low-income settings is scarce. This mixed-methods study assessed MU acceptability and usability among adult women in Kalehe, Democratic Republic of Congo. Participants received four MU, a hygiene kit, and instructions, with follow-up after three months through a survey ($n = 124$), and focus group discussions ($n = 9$). MU was highly accepted, with 94.3% reporting satisfaction and 98.4% preferring it to their usual MHM method. Reported benefits included comfort, hygiene, and ease of use, while challenges included absorbency, insufficient quantity, drying, and durability. Participants recommended improving MU quality, tailoring sizing, and expanding distribution, especially to adolescents. Finding suggests MU is a feasible, acceptable MHM option in a low-resource, conflict-affected setting, warranting further evaluation as part of emergency kits for displaced populations.

Menstruation is a natural process. Every month, more than two billion people in the world menstruate (https://www.unwomen.org/en/articles/explainer/period-poverty-why-millions-of-girls-and-women-cannot-afford-their-periods#:~:text=Every%20month%2C%20more%20than%20two,their%20menstrual%20health%20and%20hygiene). The World Health Organization (WHO) has called to recognize menstruation as a health matter rather than a merely hygiene issue, since it carries physical, psychological, and social elements (https://www.who.int/news/item/22-06-2022-who-statement-on-menstrual-health-and-rights). A safe, comfortable, and decent management of menstruation often poses significant challenges for women and girls in low-income settings[1–3]. Obstacles include insufficient information, low access to acceptable menstrual products, and a lack of private spaces for changing, washing, drying, and disposal of menstrual health management (MHM) products, among others[4]. The consequences of poor MHM include negative health outcomes to which fragile health systems often cannot respond[5], such as reproductive tract infections[6], bacterial vaginosis, urinary tract infections[7], and even impacts on mental health[8].

The choice of menstrual absorbent products strongly affects how women in underserved contexts experience their menstruation[9]. Factors such as menstrual flow, time of day, physical location, social environment, cost, and availability strongly determine the user's selection of MHM products[10,11]. Disposable menstrual materials are often preferred, as they are perceived to be easier to manage while maintaining privacy and hygiene standards[12]. However, single-use products are less sustainable, require an optimal waste management system, and might incur higher costs[13,14]. Reusable MHM products, such as pads, menstrual underwear (MU), and cups, are viable alternatives, provided that users have access to a safe and private space to change, and, more importantly, to soap and water to clean them properly[15,16]. MU, which consists of a female underwear incorporating an absorbent pad, may serve as a good option thanks to its good absorbency, discretion, and ease of use[13].

MHM in a context of population displacement becomes even more critical, as barriers to menstrual health are exacerbated (https://www.unfpa.org/news/5-reasons-why-menstruation-support-critical-humanitarian-crisis)[17,18]. Shame, infections, and poor sanitation conditions are aggravated in unstable and crowded humanitarian settings[19,20]. Moreover, the monthly distribution of menstrual materials increases costs for already constrained humanitarian agencies[21]. Recent literature highlights major gaps in MHM effectiveness research in this context and calls for partnerships and coordination with humanitarian responses[22,23]. For the specific case of MU, only one qualitative

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study explored their use in a refugee camp in Greece, showing that it was accepted as a complementary product by Middle Eastern populations[13].

The Democratic Republic of the Congo (DRC) has suffered one of the most severe humanitarian emergencies worldwide[24]. The country has been wracked by decades of conflict, which has led to millions of people being forced from their homes. Besides civil unrest, DRC has a particularly fragile health system compared to other countries in Africa (https://www.who.int/publications/m/item/democratic-republic-of-the-congo--who-health-emergency-appeal-2025#:~:text=Overview,of%20the%20Congo%20(DRC)), further deteriorated due to a recent Ebola outbreak[25], COVID-19 pandemic[26], and Mpox resurgence[27], in addition to frequent measles[28] and cholera epidemics[29]. Over 10% of all internally displaced persons (IDPs) worldwide are found in the Eastern provinces of DRC[30], 60% of which are women[31].

Médecins Sans Frontières (MSF) is established in Eastern DRC, with missions in South Kivu and Maniema provinces, which have been the scene of armed conflict over the past decade. As part of MSF's healthcare and access to essential goods activities and, in an effort to fill the MHM gap, an initial assessment of the feasibility of conducting a study on this sensitive and often taboo topic was conducted with national staff members at the coordination office in Bukavu, the urban capital of South Kivu. The MSF Medical Coordinator distributed two MU to 15 MSF workers, and data collected after 2–4 months showed high levels of acceptability, encouraging MSF to pilot the MU among women in the local rural communities, a proxy for the final users. The present study aimed to explore beliefs and norms surrounding MHM and to assess the use and acceptability of MU in a complex setting, with the ultimate goal of evaluating whether MU should be included in non-food emergency kits for displaced persons in future MSF interventions.

Results

A total of 268 women attended the sensitization sessions, and out of those, 214 were interested in participating in the study. Then, 150 met the inclusion criteria for the pilot study and received the MU, hygiene kit, and instructions.

Socio-demographic characteristics

Among the women who received the MU and the hygiene kit ($N = 150$), 124 (82.7%) were available and participated in the follow-up survey, with a median age of 29 years (IQR = 18–55). Nearly half of the participants reported no formal schooling, and an inverse relationship was identified between age and level of education (Fisher's exact, $p < 0.01$), as shown in Table 1. A total of 100 women were purposively selected for participation in FGD, and 87 (87%) participated in a total of 9 FGDs, in groups of 9–10. Two-thirds of participants identified as ethnically Hutu (66.7%), 31.0% as Tembo, and 2.3% as Shi; and mostly as protestant (80.5%), followed by evangelist (16.1%) and catholic (3.4%). Ages ranged from 18–43, with 55% being 30 years of age or younger.

Table. 1 | Survey participants´ level of schooling by age category

N = 124	Schooling						
	None		Primary		Secondary		Total
Age-group (years)	n	%	n	%	n	%	n
18–24	14	29.8	18	38.3	15	31.9	47
25–34	14	41.2	15	44.1	5	14.7	34
35–55	29	67.4	10	23.3	4	9.3	43
Total	57	46.0	43	34.7	24	19.4	124

Fisher´s Exact $p = 0.003$.

Satisfaction with MU

No women reported problems following the MU pictorial or verbal instructions, and 97.6% found them "useful" (Table 2). When asked about their overall experience, the majority (94.4%) were satisfied with the MU, and only 5.7% provided a neutral response, without significant variance by age group. Most women (91.9%) did not report any negative aspect or inconvenience related to the MU, although 3.2% reported being afraid of or experiencing secondary events, such as abdominal pain or cramps, an increase in menstruation duration, heat, and blood clots. Additionally, 4.8% expressed concerns about rumors that the MU could lead to sterility.

Over 97% of women agreed to statements of MU being hygienic, comfortable, easy to clean, allowing to continue life as normal, not emitting odor, having good absorbance, not staining, and not irritating, while the lowest rating (79.8% agreement) was for a remark stating that it was easy to find a place to dry the MU without shame or comments from the community.

Table. 2 | Summary of responses to the individual survey

N = 124			n	%
Instructions and MU use	Understanding of instructions	Easy	112	90.3
		Normal	12	9.7
	Utility of instructions	Useful	121	97.6
		Somewhat useful	3	2.4
	Overall experience	Satisfactory	117	94.3
		Neutral	7	5.7
	Challenges[a]	None	114	91.9
		Secondary effects or fear of them[b]	10	8.1
Comparison to other MHM methods	Overall comparison of the MU with your usual MHM product	Better	122	98.4
		Same/worse	2	1.6
	Has the MU improved your menstrual experience?	Yes, it has been easier	107	86.3
		No, it has been the same	15	12.1
		No, it has been more difficult	2	1.6
	Aspects in which the MU has outperformed your usual MHM product	Absorption	66	53.2
		Comfort	20	16.1
		Non-irritation	16	12.9
		Other	22	17.7
Future use				
	Would continue to use	Yes	123	99.2
	Recommendations[a]	Increase the number of MU provided	88	70.9
		Improve kit	44	35.4
		Improve MU quality	27	21.7
		Enhance health communication efforts	3	2.4

MU menstrual underwear, *MHM* menstrual health management.
[a]Open-ended question, multiple answers per participant.
[b]Secondary effects include abdominal pain or cramps, an increase in menstruation duration, heat, and blood clots.

In general, the women expressed gratitude for addressing what they considered a neglected issue. In line with quantitative results, participants of the FGDs were generally satisfied with the MU, referred to as "kaleso", the Kinyarwanda term for panty. Even though it was the first time they used this product, they felt it was easy to use and comfortable. The overall feeling was that the MU was hygienic, easy to wash, and as simple to dry as other underwear. Most stated that in the absence of rainy weather, they dried the MU outdoors "without shame", but a few did so indoors out of fear that they would be stolen.

Comparison with other MHM methods

All survey respondents except one reported usually using a loin cloth padded with additional cloth for MHM. Compared to their usual MHM method, 98.4% answered that the MU was a better product (Table2). For 98.6% of the women, the main areas where the MU outperformed their usual MHM were absorption, comfort, and non-irritation. By contrast, when comparing the overall menstruation experience, there was more variability, with 12.1% answering that the experience was similar or more difficult (1.6%) than when using their usual method.

Challenges encountered

The most frequent complaint was about the MU's absorbance. Women reported that to avoid leaks, they were required to change the MU every 3 h, concluding that the absorbent material needed improvement. Several women declared needing, on average, two to four MU per day over 5 days, so the number of MU received was not enough. As the absorbent part of the MU typically required one day to dry, they shifted back to their usual MHM method. Overall, all groups agreed that the number of MU per woman should be higher to completely rely on them for MHM.

"I changed them four times a day because the underwear absorbed for less than three hours."

Another MU-related issue was a poor fit due to having received the incorrect size during distribution or the shape of the product. Difficulties with cleaning the MU were also reported. Access to clean water proved particularly challenging given the high frequency with which women had to wash the MU. There were also comments about discoloration and loss of elasticity after a few washes.

"I received a large size of underwear, and it caused blood to leak quickly."

"The underwear received is too long and narrow in the rear, causing a wedge; I think the underwear is adapted to the size of white women".

Future use and recommendations

All but 2 women (1.6%) responded that they would continue to use the MU, the main reasons were: they "liked it" (44.4%), "found it useful" (19.4%), "comfort" (8.1%), "convenience" (8.1%), "advantages over the usual method" (4.0%), and "felt protected" (4.8%) (Table 2). One woman stated that she would not use the MU in the future due to abdominal cramps.

The most common recommendations for improvement were related to the intervention itself, such as to provide more than four MU (59.7%) and to be able to choose their own size as well as to distribute it more broadly in the community (16.1%), reaching other women, specifically adolescents. Regarding the hygiene kit, 35.5% of women suggested a larger bucket (i.e., at least 15 L capacity), more soap, and a clothesline.

"*I thank MSF for giving me these menstrual panties. I ask that in the future, MSF also consider adolescent girls, as they are the most vulnerable."*

A fifth of the women (21.8%) advised improving MU quality, particularly on absorbance and pad size, as well as on their durability, since they reported material elasticity loss or color fading.

Rumors

Rumors related to the use of MU in the study area were also discussed. For instance, hearsay that MU could cause sterility, abortion, or COVID-19 infection, and that the product was demonic. These rumors were particularly common among older people, religious leaders, and men. Participants said that the rumors were countered by previously built trust in MSF, which they saw as an organization that provides medical services to the community and would not distribute anything harmful, only a few participants mentioned that rumors and doubts should have been addressed better. Moreover, some women who wore the MU became pregnant despite their use, thus contradicting the comments. Besides the negative speculation, participants expressed a great desire from other women in the community to receive and try out the MU.

"I used the underwear during 3 months, and on the fourth I became pregnant, so the [rumors] circulating in the community about the underwear are false."

Discussion

This study evaluated the acceptability of reusable MU in a rural community in DRC, where access to health care and menstrual commodities is scarce due to ongoing conflict. The target population was adult women who lived in the Ramba Health Area in Kalehe, where MSF has a humanitarian mission. After four months of use, they revealed a largely positive view of MU but also shared key insights to improve the use of MU. Women's participation in the study reflected strong interest and commitment to MHM, a topic often neglected as it only affects women and is rarely recognized as a pressing health issue.

Most women reported advantages in the overall menstrual experience when using the MU compared to their usual MHM method, which was a cloth-padded loincloth for almost all participants. This method, widely common in low-income countries, is often associated with ineffectiveness in containing heavy flows and lack of comfort[32]. The introduction of MU was perceived by most participants as an improvement. These results are aligned with previous studies in low-income settings on the acceptability of reusable menstrual products, such as sanitary pads[33] and menstrual cups[34], in which user satisfaction was driven by improved comfort and the effective containment of the menstrual flow. Additionally, the majority of the participants found the MU easy to wash, indicating that the difficulties stemmed from a lack of access to clean water. This highlights that, for MU to be a feasible solution, improvements in water access points, provision of basic washing kits, and the creation of private washing spaces must be present or included as part of the intervention. Where these conditions cannot be met, other MHM options should be considered.

Not having enough MU units and absorbency were common concerns raised, in addition to the quality of the underwear material, noting its deterioration after several washes, as well as the design. In response to this feedback, the study team worked with the manufacturer to improve the MU in two aspects. First, the design was adjusted so that the MU sizing and cut better fit African women, and second, the absorbent materials were improved, and the absorbent area was increased. A request that was not feasible was to diversify the MU colors, as the company always uses black to disguise any leakage.

In addition to frequent changing and washing, many women found it difficult to dry the MU during rainy periods or in private, particularly in stigmatized environments. Similar concerns were reported in Malawi, where reusable pads were introduced, and only 20.3% of the women dried them outside, even though that was their usual practice[35]. The need for privacy to dry the MU was also a drawback in a refugee camp with poor infrastructure or cold climates[13]. Therefore, work with the community and camp managers to identify suitable, stigma-free spaces for washing and drying will be required prior to a MU deployment. Lastly, women suggested improvements for the kit, as they preferred a larger washing bucket, and they requested a drying cord to avoid using surfaces in an open area, something that will be added to the next phase of the pilot.

User feedback is essential to adapting innovative MHM products to local contexts, where usability is key for adoption[36]. Such feedback helps refine designs, address cultural concerns, and improve functionality, enhancing both acceptability and long-term sustainability[37]. WHO and UNICEF emphasize that MHM solutions in emergency settings must be

environmentally appropriate and developed with direct user input to ensure dignity and effectiveness (https://www.who.int/news/item/22-06-2022-who-statement-on-menstrual-health-and-rights and https://www.unicef.org/documents/guidance-menstrual-health-and-hygiene). Real-world, holistic feedback, like that gathered in this pilot, which considered the MU, the kit, and the local environment, helps ensure product relevance. This is especially critical in low-resource settings, where even small problems, such as fabric durability or ease of use, can affect uptake. For instance, a study in peri-urban Lusaka, Zambia, found that sociocultural beliefs and inadequate school facilities hindered adolescent girls' menstrual hygiene, underscoring the need for culturally sensitive, context-specific solutions[38]. Thus, these suggestions are not just upgrades, they are essential elements of a broader care system that upholds women's health, dignity, and hygiene in challenging environments.

Another important study outcome was that communication is key to introducing new MHM products, as with any public health innovation[39,40]. Our experience in this setting showed the importance of sensitization sessions, which were a unique opportunity to grasp how women of different ages understand menstruation, how comfortable they are speaking about it, and how open they were to trying a new product. Besides transparent conversations prior to the study, the oral and written instructions were clear to the participants and guaranteed a good use of the MU. However, MU remains to be assessed in a mass distribution context, where group sensitization sessions or detailed instructions might not be possible due to time and budget constraints.

Effective, timely communication and community awareness were also crucial to minimize rumors around MU. Similar to another study in Ghana[41], this required culturally-sensitive engagement normalizing menstruation, as well as the involvement of trusted community stakeholders. Besides MSF's efforts to prevent false beliefs, participants heard rumors mostly from people who were not involved in the study, probably due to a lack of conversations about MHM on top of the novelty of the product and the modernity that it represents. However, most women expressed their trust in MSF thanks to their long-term presence in the area and their support for the communities affected by armed confrontations and displacement.

Our study had several limitations. First, since the survey employed an intercept sampling approach, respondents were recruited based on attendance rather than a random selection, potentially introducing bias. Moreover, women younger than 18 years old were excluded to ease the informed consent process and because this was the first time that a sensitive topic as MHM was addressed in the community. Interestingly, this was something that concerned the participants, as they saw adolescents as the most vulnerable group. Lastly, men's views would have been valuable, as they are key players of the social dynamics and support systems (https://www.afripads.com/blog/why-boys-and-men-need-to-be-included-in-menstrual-health-and-hygiene-discussions/)[42]. Thus, future studies that include adolescents, men, and that are set in different settings should be carried out to generalize the present findings. Second, since the product was provided for free, social desirability bias might have influenced the responses, despite a robust informed consent process encouraging honest responses. However, this limitation is partly mitigated by the alignment between survey results and FGDs, where participants could speak more freely. Lastly, the study team carried out two consecutive language translations, which may have distorted the original meaning of the statements provided in the FGDs.

The ultimate aim of this pilot was to assess the feasibility of including MU in kits designed for IDPs. These kits are intended to meet the basic needs of displaced populations and typically contain items such as a water container, bed net, plastic sheet or tarp, and kitchenware, though the exact contents vary depending on the context. Based on the results of this study, MSF's next step will be to test an improved model of the MU, developed using the feedback from this pilot, in communities experiencing active displacement in the DRC or other contexts, such as Southeast Asia or additional regions of Africa.

In summary, our findings demonstrate high acceptability of the MU among adult women of Kalehe, DRC. The study obtained important local information to adapt future MHM interventions in humanitarian settings, where the reusability of the product can be especially beneficial due to the low access to resources. The study participants advised to distribute a higher number of MU per woman and provided relevant suggestions to improve the acceptability of the MU product and the hygiene kit. Most participants unanimously expressed their satisfaction with MU and their intention to continue using it. The new product was perceived as an effective solution to improve MHM, and the users would recommend it to their peers. This pilot represents an important step toward integrating MHM alternatives into emergency kits for displaced populations.

Methods

Study site and population

The study was part of the menstrual health component of the MSF medical humanitarian intervention in DRC, which aims to improve the overall health of the population. It took place between February and June 2022 in five localities of the Health Area (*Area de Santé*) of Ramba, which is part of the Bunyakiri Health Zone, Kalehe territory, in South Kivu Province, DRC. The Ramba Health Area had an estimated population of 49,945 people in 2019. The selected localities were those in which MSF is present: Citazungulwa, Musenge, Nyamashea, Makutano/Ramba, and Chitebeka (Fig. 1). All five localities were chosen to ensure generalizability by reaching populations from varied ethnicities, languages, and past conflict histories.

The population in Kalehe is mostly rural and has been previously displaced due to conflict, but there had not been a recent displacement at the time of the study. They belong mostly to the Hutu, Tembo, and Shi ethnises, and are protestant, catholic, or part of the Evangelical church. People live from subsistence agriculture (e.g., cassava, peanuts), palm oil extraction, and small livestock farming.

Study design and intervention

This was a mixed-methods design, which included an individual survey and focus group discussions (FGD). This design was chosen to quantify the feasibility and acceptability of MU in this community, as well as to further explore any issues identified in the survey results through the open space provided by the FGDs and the richness of an open discussion. Feasibility was defined as the extent to which the MU intervention could be practically implemented and used as intended under real-life conditions, considering logistical, contextual, and user-related factors[39,43]. Acceptability was defined as the degree to which the MU was perceived by users as appropriate, satisfactory, and usable for its intended purpose, including practical issues encountered during menstruation and how effectively these were addressed by the MU provided[40,44].

Prior to the intervention, 18 sensitization sessions in reduced groups on sexual and reproductive health were held with any women in the study area who desired to attend. The goal of these sessions was to explore beliefs and taboos related to menstruation and related hygiene practices, two topics that are not typically part of the MSF field activities. Additionally, the conversations served to present the MU and gather interest in participating in the study. Several sessions were conducted in order to provide several options for the attendees, who were summoned with the assistance of the community health workers (CHWs). On top of the sensitization sessions with women, community engagement sessions were carried out with local stakeholders such as the community leaders (*chef du village)*, the men's groups, and the health authorities. The aim of these sessions was to understand the beliefs and taboos related to menstruation, the source of information about the topic, as well as the difficulties associated with it.

Following convenience sampling, women 18–50 years of age, resident in the area, who menstruate and were neither pregnant nor menopausal were selected for participation out of those who attended the sensitization sessions and wanted to participate. Those who fulfilled the inclusion criteria received four MU (Cocoro®, outer layer:95% organic cotton, 5% elastane; middle layers (bridge only) Natural fibers and polyester; inner layer (bridge only) 100% organic cotton; waistband 90% polyamide (60% recycled polyamide, 30% polyamide), 10% elastane) of sizes from XXS to XXL,

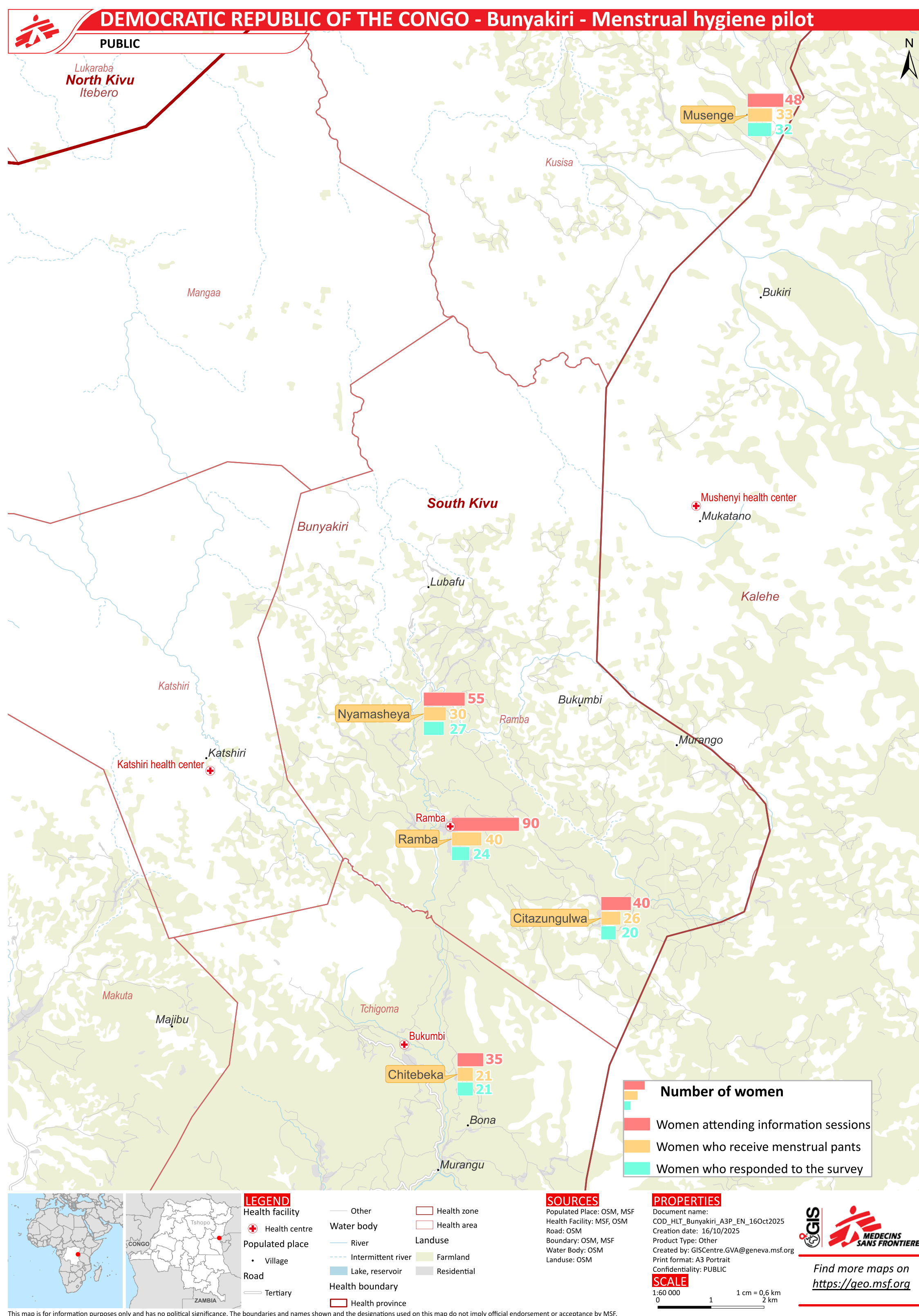

Fig. 1 | Study site map. Map of the five rural localities of Kalehe (Democratic Republic of Congo), where the study was carried out. Map produced by the authors using the MSF GeoPortal.

according to measured hip circumference; along with oral and printed pictorial instructions on how to use them available in French, Kinyarwanda and Kiswahili (a and c Fig. 2). The pilot team also provided a hygiene kit composed of a bucket, soap for washing MU, and a plastic bag to carry the dirty MU (b, Fig. 2).

Data collection

Participants were asked to be available for data collection four months after the distribution of MHM materials. The individual surveys were paper-based and consisted of closed-ended and a few open-ended questions to collect information on participant demographics, MU use, and feedback on

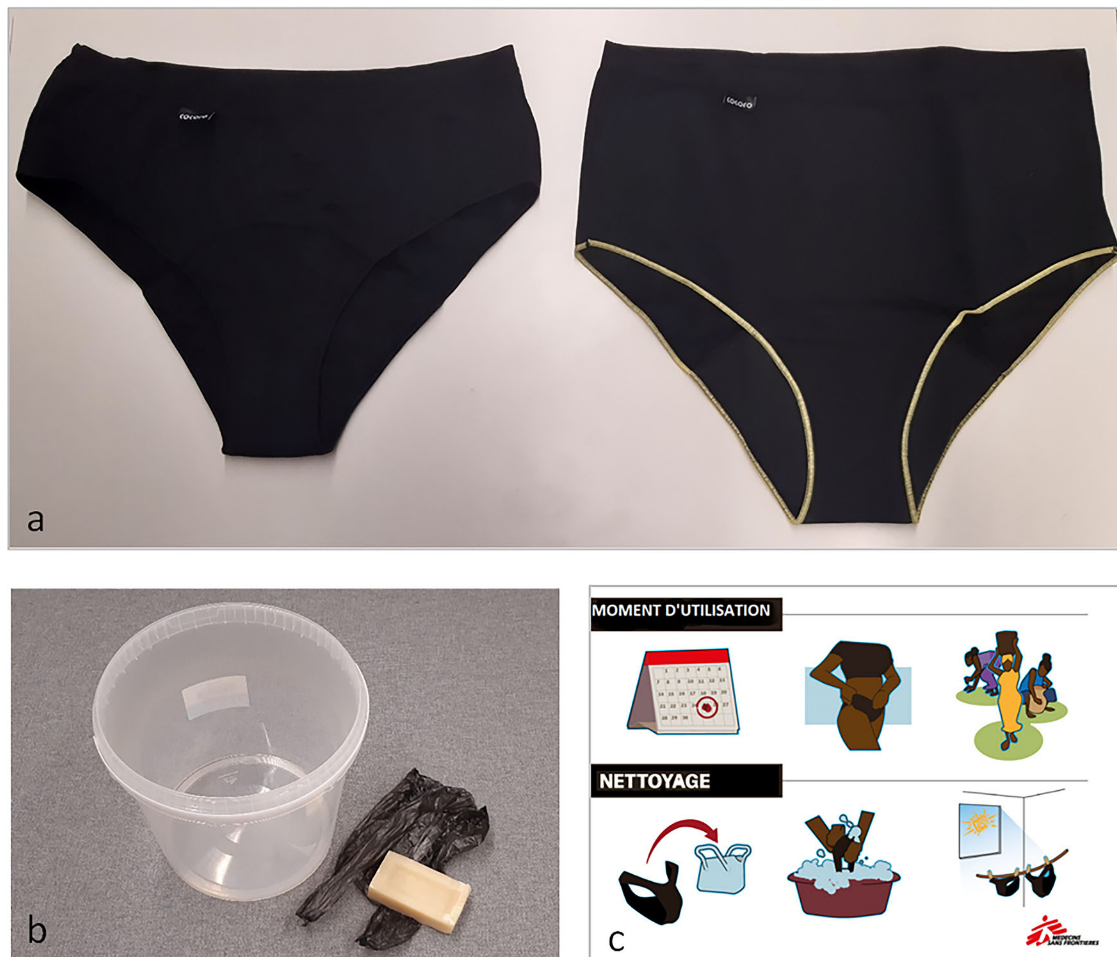

Fig. 2 | Materials provided for the study. a Cocoro® MU in sizes XXS and XXL; (**b**) Hygiene kit soap, bucket, and plastic bag; (**c**) Pictorial instructions on when and how to use the MU, and how to clean them. Photographs taken by the authors.

the overall experience (e.g., fit, comfort, comparison to other MHM products, recommendations for improvement, etc). All the women who received the intervention were targeted for the survey. Women were summoned for the survey on two or three different dates based on their availability. Three female interviewers trained during three days on ethical principles of research, obtaining informed consent, interview techniques, MHM, and the study questionnaire, conducted the survey in spaces lent by the community, such as the school or the church.

FGDs were conducted after the survey to include survey findings into the topic guideline, which was divided into three broad themes to assess acceptability: (1) Knowledge and access to information, (2) Perception and experiences, (3) Rumors and misinformation. An MSF midwife with qualitative research experience trained an MSF midwife and an MSF nurse from Kalehe on how to conduct and take notes for the FGDs. The data were collected on paper in the local language. The target was 10 FGDs, 2 per locality to ensure diversity and to keep them to reduced groups of 9-10 women who were sampled purposively based on two age ranges: 18–30 and 31–43 years old. Topics such as overall satisfaction with the MU, challenges faced, recommendations for improvement, and comparison to their usual MHM method were discussed.

Data analysis

Survey data were digitized, and all descriptive analyses presented here were conducted using Stata (version 14.2). Data from the FGDs were digitized and translated from Swahili or Kinyarwanda into French for analysis by the two researchers who collected the data. The results of the analysis were translated into English by the Study Lead for the presentation of results. The team was trained on thematic analysis by Yux, a Senegal-based organization with expertise in qualitative methods. The analysis was performed in Excel through inductive coding, following the steps (1) familiarization with the data, (2) selection of keywords, i.e., those relevant to the research questions and most frequently occurring and repeated across multiple participant's answers, for instance "absorbance", (3) coding independently by each team member and compared among them (discrepancies were resolved through consensus from all researchers), (4) iterative theme development through discussion among team members, (5) interpretation of themes and codes.

Ethical considerations

Oral consent for participation in the survey and FGD was obtained from study participants. Data were pseudonymized, password-protected and stored in a secure institutional server to protect participant confidentiality. The study was exempted from full review by the MSF Ethics Review Board, and it was approved by the Direction Provincial de la Santé in South Kivu and the Ministry of Health in DRC.

Data availability

The datasets generated and/or analyzed during the current study are not publicly available due to internal regulations on data protection for MSF, but are available from the corresponding author on reasonable request.

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Author contributions

L.P. conceived the pilot study, C.B., S.N., and S.M. ran the information, distribution sessions and collected the data, L.M. ran FGSs and supervised data collection, A.E.L. conducted data analysis and contributed to the interpretation of the findings, C.B., S.N., and S.M. drafted the manuscript, L.P. and A.E.L. reviewed the manuscript for substantial intellectual content. All authors read and approved the final manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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