Schoolgirls' experiences of changing and disposal of menstrual hygiene items and inferences for WASH in schools

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Menstrual hygiene management (MHM) challenges during changing and disposal of menstrual items are important in low-income countries (LICs) where schools lack sufficient water and sanitation. Changing in poorly maintained latrines may expose girls to excrement and infection. We examine the frequency of dropping menstrual items and disposal of waste by schoolgirls in a menstrual solutions feasibility study in western Kenya. Drops when changing were reported in 17 per cent (20 per cent <16 years; 16.5 per cent 16 years plus; p=0.04) of girls' reports overall. Differences by socio-economic status were not evident. Fifty-four per cent of girls dropped at least once. A quarter of girls using pads and cups reported drops in the first few months, reducing to 10 per cent over time, compared with ~30 per cent among traditional item users. One in four accidental drops occurred at school during the study. When dropped at school, most girls swapped the dropped item for a new one, but 24 per cent brushed/washed the item and reused it. While no clinical events occurred during this study, data suggest dropping within latrines could place girls at potential risk of exposure to infection. Disposal of items, or emptying cups, was mostly into the latrine. We conclude that accidental dropping of menstrual items while changing is common, including at school. Prevention will be helped by improving poorly constructed sanitation facilities, shelving, privacy, and staggering/increasing break time for girls to change. Provision of special garbage bins to prevent clogging and overflow of latrines is recommended.

Keywords: latrine, MHM, menstrual management disposal, accidental dropping, schoolgirls

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ALTHOUGH THE ONSET OF MENSTRUATION is an important landmark in the transition to adulthood, menstrual hygiene management (MHM), particularly among schoolgirls in low-income countries (LICs), is a major concern (Sommer, 2010; Sommer and Sahin, 2013). Women and girls have developed their own personal strategies to cope with MHM, depending on available resources, local tradition, cultural beliefs, and knowledge or education (Sumpter and Torondel, 2013). School-aged girls often have to manage their menstruation with unhygienic or inconvenient methods, including old cloths, pieces of mattress or socks, or grass (Mason et al., 2013; McMahon et al., 2011). Use of these materials reportedly affects girls' engagement and participation at school due to fear of leakage and odour (Sommer, 2010; McMahon et al., 2011; Mason et al., 2013).

Further research is required to evaluate the effects of improved MHM on girls' schooling and health parameters (Sumpter and Torondel, 2013), and other MHM challenges in school (Sommer and Sahin, 2013). Changing and hygienic disposal of the menstrual items is a significant problem in LICs where schools lack sufficient latrines and struggle to maintain high levels of water and sanitation hygiene (Saboori et al., 2011; Alexander et al., 2013). A review by Sommer et al. (2013) concluded that there is insufficient research in LICs on the interplay between menstrual management and sanitation systems; however the knowledge that we do have points to unmet needs for women and girls, particularly with regard to changing or disposing of used menstrual items (Sommer et al., 2013). One study in Uganda noted girls disposed of their pads in the latrine causing them to fill quickly, and blocking suction pipes when latrines were emptied (Crofts and Fisher, 2012). Studies which look at the effects and impacts of menstrual solutions, such as reusable or disposable sanitary pads (Montgomery et al., 2012), have not to date reported issues around emptying or changing, despite this potentially being a time of increased exposure to excrement and infection. Here we present results from our study conducted in western Kenya, where the acceptability, use, and safety of menstrual products were evaluated among primary schoolgirls. The data describes patterns and challenges related to the changing and disposal of menstrual cups, sanitary pads, and traditional items by these schoolgirls in rural western Kenya.

Methods

Study area and population

This research was conducted in Gem district, Siaya County (within part of the former Nyanza Province), in western Kenya, as part of the Menstrual Solutions Study (MS Study). It was nested within the KEMRI, CDC, and collaborators' health and demographic surveillance system (HDSS) which follows a population of ~230,000 individuals, with a typical rural African population profile (Odhiambo et al., 2012). A rural district, Gem lies 400 km west of Nairobi. The population are mostly members of the Luo ethnic group, mainly subsistence farmers and fisherfolk (Cohen and Atieno-Odhiambo, 1989). The education system in Kenya consists of eight years of primary schooling, four years of secondary and four years of university (Omwami

and Omwami, 2009). Around 98 per cent of children aged 6–16 years enrol into public primary school in Nyanza Province (Mugo et al., 2012). Primary schools in this part of western Kenya often struggle with access to a water source, sufficient or improved latrines, and a lack of hygiene facilities (Blanton et al., 2010; Dreibelbis et al., 2013; Migele et al., 2007).

Menstrual Solutions Study overview

The MS Study was a mixed-methods cluster randomized controlled feasibility study. Thirty of 71 schools in the area were selected based on agreement to participate and their achieving the minimum water, sanitation, and hygiene (WASH) criteria, described elsewhere (Alexander et al., 2014; Mason et al., 2013; Phillips-Howard, 2013). Randomization of schools into three groups (menstrual cups, sanitary pads, or usual practice) took place in the community, with participation of school head teachers and district officials. Parent and pupil meetings discussed the study prior to obtaining informed written parental consent at home and participant assent at school. Pre-intervention, girls received puberty and hygiene education, training on their menstrual item, and on how to use field netbooks (2go™ Convertible Classmate PC). Girls were eligible if they were in classes 5 through (final year) 8, aged between 14 and 16 years old, and had experienced three or more menstrual periods. The study examined the acceptability, use, and safety of menstrual products, and social and schooling experiences of girls followed across a full academic year. Study nurses provided girls with the assigned menstrual items after baseline screening. Follow-up screening ran from August 2012 to November 2013 (the end of the school year). At each nurse screening participants received bar soap and new menstrual calendars, and schools received detergent for making soapy water to support hand washing. Girls in the pad and cup groups were told to continue usual practice for disposal, according to what was available in the schools. Our pilot aimed to examine common practice, and adding a new intervention, such as receptacles for disposal, would have influenced this.

Quantitative data collection

Examination of schools' WASH, including the supply of water and soap, and the number, type, and quality of latrines, was conducted at baseline and has been presented in detail elsewhere (Alexander et al., 2014). Pupil-latrine ratios were calculated for each school, using the total number of pupils divided by the total number of latrines. Data from study participants was collected in their school, at the time of screening by research nurses who were attached to study schools. Screening took place, on average, twice per school term. At each visit nurses performed face-to-face interviews with girls about their menstruation, menstrual item use, and problems encountered, including dropping and disposal, and other questions regarding illness or discomfort. Separately girls completed a private survey answering similar questions using netbooks. Questions were in English and translated in Duluo. Survey instruments were piloted in the target age group as paper questionnaires prior to use to ensure comprehension. The question

on accidental dropping asked, 'This recent period, did you drop your menstrual item while changing or emptying?'. Data were downloaded weekly onto external hard drives before transferring to the SQL server databases at the KEMRI research station. Recognizing girls may not use items allocated, we asked them, 'What was the main menstrual item you used for this recent period?'.

Qualitative data collection

Focus group discussions (FGDs) were held with girls, parents, and teachers before, during, and after the study, reported elsewhere (Mason et al., 2013, 2015). In summary, each school was visited by field staff and a meeting held with girls participating in the MS Study. The FGD methods were discussed, with question and answer sessions enabling girls to understand the purpose of the FGD. Parents of girls wishing to participate were visited at home to request approval and written consent for their daughter to participate in a school-based FGD. Once parental consent was received, the girls provided written assent. Following completion of girls' FGDs, parents of participating girls were invited to join a parent FGD, and consented if they agreed. FGDs had a maximum of 12 participants per group, each lasting ~1.5 hours. All discussions were held in classrooms, except one in a centrally located church hall for parents.

MHM items

Girls in the menstrual cup group were provided with one Mooncup®, size B for nulliparous women, or size A for those who had given birth. This brand was selected because it has been tested internationally (Stewart et al., 2010; Oster and Thornton, 2012), and was approved by the US Food and Drug Administration, and by the Kenyan Pharmacy and Poisons Board for pilot testing in Nairobi. When inserted into the vagina it collects ~30 ml of menstrual blood, lasting 4–8 hours before emptying is required, according to the manufacturer. Girls in the sanitary pad arm were each given two packs (total 16 pads) monthly of Always®, a brand commonly available in Kenya. Girls in the usual practice group purchased their own pads if they had the resources, or continued using traditional items such as cloths (Mason et al., 2013, 2015). Our study used FDA-approved and well-known brands, to minimize any risk of unforeseen adverse events that could have been ascribed to products with an unknown safety record. We acknowledge that such products are expensive for purchase in most low-income communities, and other cheaper local products may be available.

Analysis

Quantitative. Data analysed to evaluate girls' experience of accidentally dropping their menstrual item, and their disposal of items, such as pads, or emptying menstrual cups is derived from girls' reported experience. We did not use intention-to-treat analysis (i.e. by study arm), but instead conducted analysis according to the

menstrual item girls reported using in their private surveys. Data were analysed in STATA 13 (StataCorp. 2013, College Station, TX: StataCorp LP). General frequencies and proportions were generated on variables of interest (i.e. dropping of item and method of disposal) and comparisons made between intervention groups using Chi-squared analysis, with 0.05 significance level. Characteristics were stratified by age and duration since menstrual items were provided, aggregated into three-month intervals. Age categories were collapsed into younger (below 16 years) and older (16 years and above) girls. Duration of use of menstrual items was aggregated into three-month categories, starting from initial provision of menstrual product to girls by nurses. To evaluate socio-economic status (SES), we constructed five quintiles based on asset ownership using multiple component analysis. This was then collapsed into the poorest (lower two quintiles) and less poor (upper three quintiles).

Qualitative. Thematic analysis was conducted (Boyatzis, 1998) on transcripts prepared from girls' focus group discussions, as previously described (Mason et al., 2013, 2015). Transcripts were entered in NVIVO version 10 and codes assigned to relevant sections of the transcripts. Text assigned to the theme of water and sanitation, and changing of menstrual items was extracted from prior analysis of main themes (Mason et al., 2013, 2015).

Ethics

The MS Study was granted ethical approval by the Scientific and Ethical Review Boards of the Kenya Medical Research Institute (SSC No 2198), the Institutional Review Board of the US Centers for Disease Control and Prevention, and the Ethics Committee of the Liverpool School of Tropical Medicine (12.11).

Results

The study enrolled 766 girls, who fulfilled the eligibility criteria, across the 30 study schools. The average pupil-latrine ratio for girls in study schools was 37:1 (range 11:1 to 70:1). The Kenyan national girls' target ratio of 25:1 was met by 25 (40 per cent) schools (Alexander et al., 2014). The majority of latrines at school were ventilated improved pit latrines with concrete floors, in various states of cleanliness and structural integrity. At baseline four in five girls reported some sanitary pad use but also improvised with cloth, bedding, socks, and other items (Mason et al., 2013). During repeat screening from August 2012 to November 2013, 6,198 girls' reports were completed, of which 5,771 recorded actual use of item in most recent menstruation.

Overall reported dropping of menstrual items while changing/emptying

Of 5,771 recorded responses to the question on accidental dropping of menstrual items when changing or emptying during their previous menstruation; there were 971 (17 per cent) reported drops. Of the 725 girls who completed the private surveys,

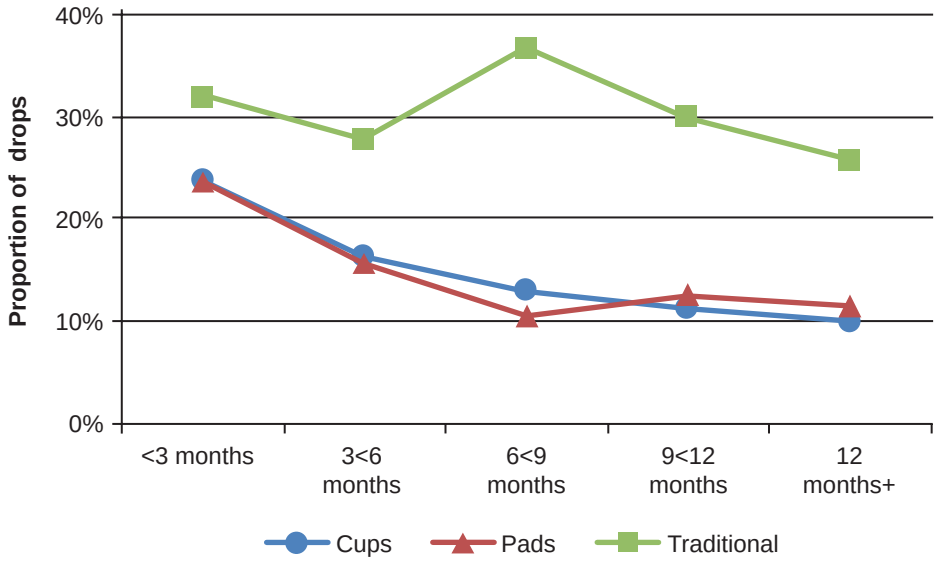

Figure 1 Overall frequency of accidental dropping of different menstrual items, by menstrual item

388 (54 per cent) reported drops at least once. Overall, there was no statistically significant relationship between socio-economic status and dropping (p=0.153). Younger girls were more likely to accidentally drop items than older girls (20 per cent among <16 years vs. 16.5 per cent among 16 years plus; p=0.04). Frequency of drops in most recent menstruation was inversely proportional to time since introduction of menstrual items (Figure 1). A quarter of girls who reported actual use of cups and pads recorded drops in the first three months after introduction. This reduced to 10 per cent as the study progressed. This compares with around a third of girls using traditional items, which appeared to continue throughout the study. Older girls (16 years or more) initially reported more accidental drops than younger girls, but this reversed over time.

Dropping of menstrual items while changing/emptying at school

Among reported accidental drops, 26 per cent occurred at school over the entire study. For pad users, 29 per cent were at school, 25 per cent for cup users, and among traditional item users, 20 per cent of drops occurred at school. Moreover, among reported drops, 74 per cent occurred in schools with latrine ratios greater than 25:1 for girls.

The main place at school where dropping occurred was inside the latrine pit or on the latrine floor (Figure 2). Of the girls who dropped while at school, 40 per cent reported they swapped the item for a new one, 24 per cent either washed or brushed off the dirt and reused the item, 14 per cent took it home to clean before using again, 6 per cent gave or sold it to someone, 5 per cent left it on the floor, and 11 per cent did other things (Figure 3). When we broke it down by menstrual item,

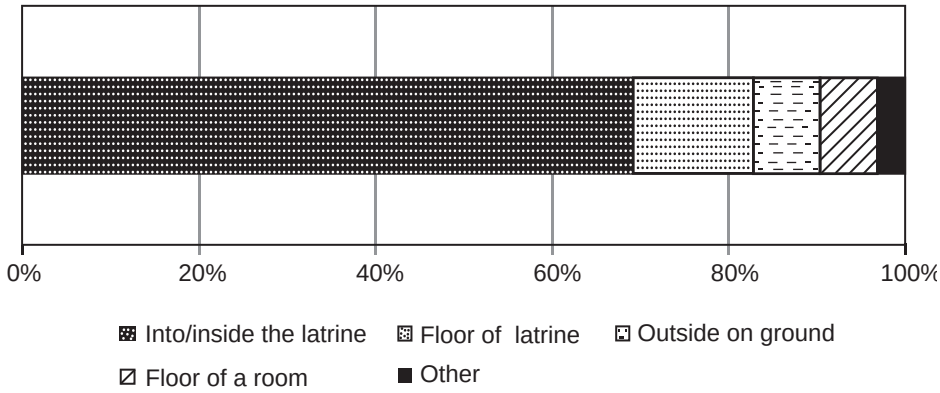

Figure 2 Place where menstrual item is accidentally dropped at school while changing or emptying

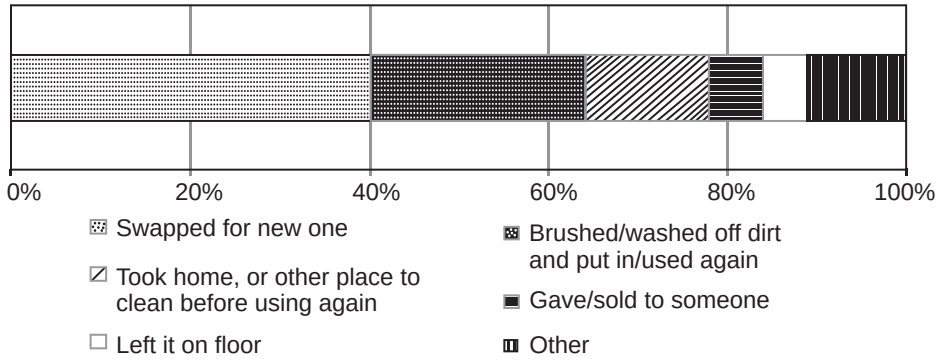

Figure 3 Girls' reported response after dropping menstrual item while changing or emptying

we saw distinct behavioural differences. Cup users were most likely to brush or wash it off then insert it, while pad users were more likely to swap the dropped pad for a new one (Figure 4). We note that girls reported similar behaviour when items were dropped at home.

Focus group discussion responses describe the challenges girls face while changing menstrual items, creating situations where they are at risk of dropping menstrual items. Most importantly, girls report insufficient time is available to change during school break time, forcing girls to rush in and out of the latrines to get back to class.

> It is worse at school since there are fewer latrines compared to the number of pupils, so if you either knock this or the other one someone is inside thus you will just have to wait and if you go back to class you find the teacher already in (P4, girl, School 5).

Girls suggested more latrines should be built but restricted to older (menstruating) girls, as younger children take up time in the latrines and do not understand older girls' needs.

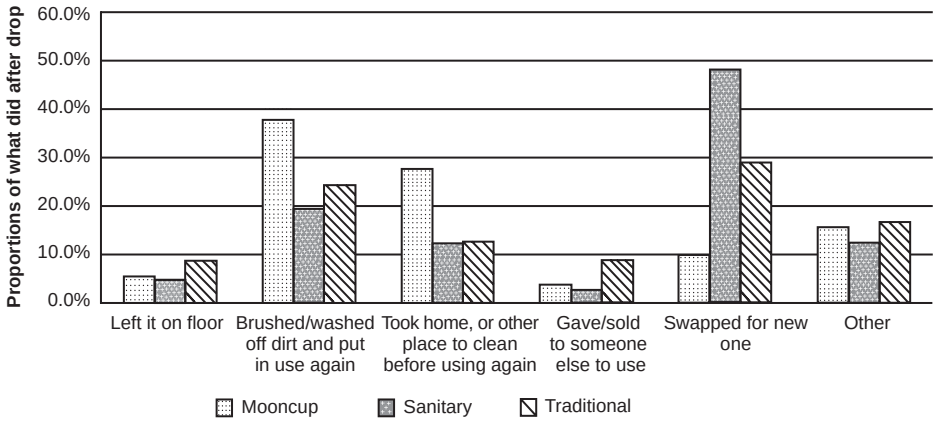

Figure 4 Girls' reported actions by intervention group

> We do not get enough time because at break time is when everybody even the children in the lower classes goes to the latrine, so when you are going to change the pad your fellow girl might follow you then she surprises you, then she wonders why is this girl taking too long (P8, girl, School 4).

Rushed changing, which leads to dropping or spilling of menstrual blood while emptying the cup was seen to be further complicated by a frequent lack of locks, reducing privacy, and requiring girls to hold the door shut with one outstretched hand, or to rush before someone opens the door.

> Do we feel comfortable when we want to change them in the school latrine? (Moderator, School 3)
>
> Aaa! (No!) (Chorus, all girls, School 3)
>
> Why? (Moderator)
>
> The doors are not lockable so you are force to hold it with your one hand so that it closes (P6, girl, School 3).
>
> Here in school, once you have just entered the latrine, someone is by the door, so you will be hurrying. And maybe you were changing in school and you did not hold the cup properly and some blood spills on the surface of the latrine around the hole. You know, someone will start wondering, X was here! I do not know what is wrong with her (P8, girl, School 10).

Lack of space or amenities were also blamed:

> Sometimes the [water] tank is closed, sometimes you can empty it wrongly and it pours in the wrong place in the latrine (P8, girl, School 9);
>
> Because in the latrine sometimes when you are squatting to insert, it can slide then it falls in the latrine, and you know when it falls in the latrine it becomes another problem (P, girl, School 9).

Parents also reported their daughter's difficulties with changing or emptying menstrual cups at school:

> My daughter also dropped hers, she told me that hers dropped into the pit latrine and then she reported to the madam; (talking to herself) what is her name? This one who always teaches them? Their school nurse, but she [daughter] was lucky she got another one (P2, parent, School 5).

Many girls mentioned that dirty latrines were off-putting, and that they would prefer to go without changing their menstrual item. One girl reported: 'I don't change pad and just go back to class since the latrines are dirty' (P9, girl, School 5). Delayed changing of items often caused what the girls called 'over-staying', or keeping items in longer than they want to, leading to chafing, or overall discomfort for the girls. Over-staying was mentioned in multiple FGDs by girls using pads or traditional items (Mason et al., 2013).

Dropping of pads and traditional items such as cloths and bits of blankets was frequently noted during FGDs, raising relevant concern for girls' well-being and dignity. One cup user noted: 'and before when we had the pads on, we used to worry that maybe the pads or cloths can fall'.

Disposal of menstrual product while changing/emptying

Disposal or emptying of menstrual flow in girls using traditional items, pads, and menstrual cups was mostly in the latrine, with over 80 per cent reporting this method of disposal at school. As the study continued, disposal in the latrine increased to 90 per cent of all girls. Qualitative studies highlight a lack of alternatives to disposing in the school latrine. Teachers reported satisfaction that girls no longer threw used items 'carelessly' but instead disposed of them inside the latrine:

> They use the latrines to dispose them … I think they dispose them, because so far I have not come across any that is thrown carelessly … They are taught well, you will never meet any pads along here unlike high school (P, teacher, School 6);

> So that when they are in school, she knows when to change and where she is going to keep it, she just don't dispose it, and even at home she knows after using she doesn't dispose in the around the fence or behind the house she knows where to dispose it, even if it is the latrine (P6, teacher, School 2).

The majority of parents considered throwing pads or cloth into the latrine to be the best disposal solution: 'You know in the latrine, it is not a sin to carry it going to dispose it in the latrine' (P2, parent, School 2). A minority considered the dumping of cloths and rags to be a careless act: 'You will find your cloth missing and later when you go to the latrine, you find it dumped in the latrine, yes, they are just carelessly thrown like that' (P4 parent School 3).

Teachers also commented on development projects improving the quality of latrines, recognizing menstrual needs for girls, and the problems encountered by disposal in the latrines:

> Our school is even lucky because right now, we are building a latrine that will contain almost the whole of it, so that we even get a changing room and a bucket for them, because we don't want them to fill the toilet with the pads they have used, we are working towards that if it succeeds I believe we shall be somewhere (P10, teacher, School 5).

Discussion

Our study indicates that over half of menstruating primary schoolgirls reported, at some time during follow-up, to have accidentally dropped their menstrual items while changing or emptying. Overall, 17 per cent reported they had accidentally dropped a menstrual item while changing; a quarter of these had occurred in school. Dropping menstrual items is a health concern, particularly for cup users or girls who may insert traditional items, given that a quarter of girls reported when dropping at school they either brushed or washed off the dirt and then proceeded to reuse the item. This also suggests the limited options girls have (such as spares at school) and their difficulty leaving the latrine without the item *in situ* to seek alternatives. Schoolgirls thus need further support when dealing with changing in the latrine, beyond educational advice (in this study provided by nurses allocated to study schools). We note that accidental dropping fell over time among girls receiving pads or the cup, which may have been associated with nurses counselling girls during follow-up screening. If girls reported dropping their cup into the latrine the nurse replaced them with a new cup, and physically checked cups each screening, to maintain good hygiene, and minimize infection risk. The higher rate of dropping traditional items is a worry, suggesting girls have difficulty maintaining hygiene and further reinforcing the need for provision of menstrual products and the importance of improving latrine structure to allow girls, irrespective of menstrual item, to change in comfort.

In this research setting no adverse events have been identified, but such findings indicate a need for attention when developing MHM within WASH in Schools programmes. Our data suggest that dropping of menstrual items, albeit at a lower frequency, continues after longer-term use and despite nurse presence and counselling of girls. It raises the need for dialogue and action on how to provide ongoing guidance to girls on MHM, how to improve latrines to minimize such accidents, and the need to have emergency stocks available to replace soiled items in school. Studies investigating the physical challenges associated with changing menstrual items at school are limited in the research literature (Sommer, 2010; Crofts and Fisher, 2012). A study in Uganda noted girls opted to change in the latrine because that was the only private place in school (Crofts and Fisher, 2012). Our qualitative data provides contextual information from girls, parents, and teachers, clearly illustrating the difficulties they face using the latrines for MHM. Figure 5 illustrates a typical latrine in our study schools showing how little space girls have for changing, forcing girls to hold the item while manoeuvring to change in the narrow space, often with little light. Provision of shelving could be a convenient addition

Figure 5 Typical school latrine in the study area
Photo credit: KEMRI-CDC Communications/KENYA 2013/Sharon Dianga

to latrines with limited space. As reported by the girls in focus group discussions, changing is complicated by a frequent lack of locks, reducing privacy, and requiring girls to hold the door shut with an outstretched hand, or to rush before someone opens the door. Qualitative data demonstrated that in cup schools, girls found water to rinse the latrines when their menstrual blood had spilled.

Our study noted that disposal of menstrual items was mostly inside the latrine. Disposal of non-biodegradable pads such as Always® in pit latrines is a subject that has not been sufficiently addressed in policy or research. The Kenyan National School Health Strategy recognizes this issue stating a 'lack of appropriate disposal mechanism for sanitary towels in school' (MOPHS, 2010). Studies in India have shown that many women and girls feel uncomfortable with the options they have for disposal, particularly that of burial or carrying used pads to the facility for burning rubbish (Sinha and Singh, 2013; Garg et al., 2012). In the Ugandan school study, researchers estimated that 65 per cent of girls threw their pads inside the latrine pits, causing the latrines to fill quickly (Crofts and Fisher, 2012). The same study also described pads blocking suction hoses when latrines were emptied by trucks. Further, disposable pads do not biodegrade or burn easily. In addition to the challenges girls face disposing of pads, many commercial pads contain harsh chemicals including dioxins, a serious pollutant that builds up in the environment (WHO, 2014). Such

practical MHM issues, particularly in schools, require further exploration. How can we provide girls with affordable materials for MHM, yet have a low impact on the environment, and stop latrine pits filling too quickly? In addition, to reduce dropping, school latrines need structural improvements (Sommer, 2010); however, studies show that most rural schools in sub-Saharan Africa continue to lack or have poorly constructed sanitation facilities without doors or locks (Sibiya and Gumbo, 2013). Provision of adequate space, shelving, locks, and easily accessible water and soap must be a priority for the health and comfort of menstruating schoolgirls. Inclusion of peer 'champions' and/or sympathetic mentors in MHM programmes would support girls struggling with MHM in school, particularly younger, inexperienced girls who have just reached menarche. While our study was based in eastern Africa, and some MHM findings may be limited culturally, particularly on the use of menstrual cups, we believe our results on the inadequacies of latrine structures and girls' difficulty changing their menstrual items are applicable across a wider geography.

This study has a number of limitations. We recognize that any form of reporting is likely to incur some bias from girls; however we attempted to limit social desirability bias by using girls' private netbook-recorded responses rather than those obtained from face-to-face interviews with the nurses. We note girls rarely reported accidental drops when questioned by nurses, suggesting girls fear reprisal such as physical punishment or cup confiscation. Hygiene safety was a priority within the study; nurses screened girls nurses screened girls' health on a regular basis (twice a term), physically checked girls' cups with reminders on how to keep them clean, and a monitoring system was established to identify any clinical febrile events to screen for toxic shock syndrome. No clinical events were identified or recorded, including in all health facilities within the study catchment area; however, laboratory confirmation studies are pending analyses and may provide additional data on hygiene hazards.

School closures, holidays, elections, and strikes resulted in girls spending less time at school; hence the proportion of all drops that took place in school over the study duration under-estimates the frequency in school. While a higher proportion of drops during the study were among girls using traditional items, the frequency of reported drops in school was lower, suggesting possibly more 'menstrual time' spent in the home among these girls. We re-questioned a selection of girls at the end of the study to confirm again whether they had understood that 'dropping' described accidental drops, as a separate event to 'disposal', and this was verified at pilot and post-study; however, we caution that some study girls may have confused the two events. Analysis was based on 'per protocol' (what girls stated they actually used) instead of 'intent to treat', recognizing that girls would likely be slow to use menstrual cups regularly (Oster and Thornton, 2012), and that some girls in control schools ('usual practice') would have access to pads (Mason et al., 2013).

We acknowledge that schools with very low WASH scores were excluded from school study selection to minimize the risk of potential contamination of menstrual items. A study in western Kenya found that students at schools with latrines, but lacking handwashing water, had higher levels of *Escherichia coli* on their hands

(Greene, 2012). For this reason our study attempted to provide the 'best case scenario' of current WASH conditions by excluding schools with very high pupil/latrine ratios and no access to water; and by providing study schools (and individual girls) with soap monthly (Alexander et al., 2014). Due to these exclusions, it is possible that higher proportions of girls in primary schools outside our study have poorer access to water, no soap, and an insufficient number of latrines, leaving them to struggle with the challenges of changing (or choosing not to change) and subsequent dropping of menstrual items while at school.

Conclusion

Accidental dropping of menstrual items while changing occurs among adolescent schoolgirls. This could be due to poorly constructed or insufficient number of sanitation facilities, lack of privacy, and inadequate time for girls to change. Schools should strive to build structurally sound and menstruation-appropriate latrines in schools. Disposal of menstrual items is mainly directly into latrine pits. Alternative means of disposal, for example, use of special garbage bins with appropriate solid waste management services for collection and final disposal, should be tested. In addition, use of alternatives to disposable pads, such as menstrual cups or reusable pads should be further explored. Findings from this study are relevant for MHM and school WASH programme work, particularly in regions where schools have poor or limited sanitation facilities for girls.

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