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Cultural taboos and misinformation about menstrual health management in rural Bangladesh ☆

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ABSTRACT

Millions of women worldwide face challenges in managing menstruation, which negatively affects their health, education, labor force participation and productivity. Cultural taboos and social norms are believed to be at the core of this issue, perpetuating stigma and harmful health behaviors, and interfering with attempts to improve knowledge. Our study explores how deep-rooted cultural norms relate to, and potentially hinder, effective menstrual hygiene practices in rural Bangladesh. With an educational intervention, we disseminate crucial knowledge on menstrual hygiene practices. While the intervention succeeded in reshaping certain misconceptions and easing restrictions on hygienic drying of menstrual absorbents, it was less effective in changing deep-seated harmful practices related to their washing and maintenance. The findings suggest that information alone is insufficient to change entrenched norms, highlighting the need for more comprehensive strategies to improve menstrual health management.

1. Introduction

Managing menstruation with dignity and hygiene remains a pressing challenge worldwide: The World Bank estimates that over 500 million women lack access to adequate resources for menstrual hygiene management (World Bank, 2022). The inability to manage menstruation adequately can have wide-ranging impacts on menstruators' lives, including physical health issues such as urogenital tract infections (Das et al., 2015; Sumpter & Torondel, 2013), as well as adverse effects on mental well-being, with women often experiencing stress, anxiety and a sense of discomfort related to menstruation (Crichton et al., 2013). Moreover, challenges in managing menstrual health lead to reduced participation in education, as adolescent girls may miss school and face an increased risk of dropping out (Agarwal et al., 2024; Benshaul-Tolonen et al., 2021), and to increased work absenteeism among working women (Krenz & Strulik, 2021).

In low-income settings, the effectiveness of efforts to improve menstrual health management is often limited. Most efforts focus on providing knowledge or hygienic menstrual products but they do not address cultural norms. Yet, inadequate menstrual hygiene is often rooted in cultural beliefs and taboos. Menstruation, misconstrued as a curse or ailment (Khanna et al., 2005), is shrouded in stigma, and linked to disease and misfortune (Mohamed et al., 2018). Such misconceptions impose behavioral restrictions on menstruating women (Kumar & Srivastava, 2011). For instance, in Eastern South Asia, menstruators encounter numerous restrictions during their periods, such as being prohibited from entering kitchens, going outside, bathing, or even touching others (Mehjabeen et al., 2022; Toldy et al., 2024). Further, these misconceptions dictate that all menstrual practices should remain concealed (Mason et al., 2013; Thapa et al., 2019; Toldy et al., 2024). These cultural narratives perpetuate knowledge gaps about menstrual health and interfere with hygienic menstrual practices, including the adoption (Castro & Mang, 2024) and the proper maintenance (Dasgupta & Sarkar, 2008) of reusable products. Czura et al. (2024) show that providing information can enhance hygienic menstrual health management using traditional products, suggesting that hygienic practices are as effective as modern menstrual products in improving women's health. However, the cultural and social norms that sustain harmful menstrual practices and the dynamics between menstrual taboos, information dissemination, and their implications on women's well-being are not yet understood.

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In this paper, we study cultural beliefs and social norms surrounding menstruation and examine how they interact with the provision of information. Our data come from surveys with artisan workers in rural Bangladesh, a setting where limited awareness about menstruation and challenges in maintaining menstrual hygiene are prevalent, contributing to extensive negative consequences for women's health. (Bangladesh Bureau of Statistics, 2020). We document various aspects of menstrual health management: knowledge and practices, societal implications on women's physical and mental well-being, the reported impact of menstruation on behavior, and the societal taboos and social norms surrounding menstruation. To elicit social norms, we employ a state-of-the-art, monetarily incentivized experimental procedure (Krupka & Weber, 2013), building on the conceptual framework of Bicchieri (2005). Further, we implement an information intervention on menstrual health and hygiene among all artisan workers in our sample and observe how the aforementioned outcomes change, both in the short and in the long run. The one-hour information session delivered by an expert local NGO provided anatomical information on menstruation, highlighting the fact that it is a natural process. It also comprised practical guidance on hygienic menstrual practices with both disposable and re-usable products, emphasizing the importance of washing cloth with soap and water and drying it in sunlight to maintain its hygienic properties.

In our study sample, repurposed menstrual cloth is the most commonly used menstrual absorbent: 70% of our participants use cloth regularly.[1] However, only 9 percent follow the recommended cleaning and drying process. This can be explained by knowledge gaps and restrictive social norms. At baseline, around 25 percent of the women using menstrual cloth are unaware of the correct methods for cleaning and drying it. Restrictive social norms regarding the correct drying of menstrual cloth outdoors in the sunlight are in place: 67 percent of respondents report that their community views this practice as socially inappropriate. This restriction is particularly concerning in Bangladesh's humid climate, where drying cloth indoors or storing it without adequate drying increases moisture retention, fostering bacterial growth and infection risks (Torondel et al., 2018). To comply with the social norm, women may choose to store menstrual cloth without adequately drying them in the sun, thereby missing the opportunity to use the sun's disinfecting UV light–often the only effective method available for killing bacteria.

We find that the majority of women report a decline in physical and mental well-being during menstruation, particularly experiencing stress and shame. This highlights the heavy stigma associated with menstruation in the studied context, also evidenced by the reported fear of others noticing that they are menstruating due to stains or odor. Further, we find some support for mobility restrictions: During menstruation 50 percent of women restrict their market visits and 76 percent avoid interacting with individuals who feel unwell. We do not find restrictions for attending social gatherings or cooking for the family in this context.

Harmful social norms deteriorated directly after the information intervention: The correct drying of reusable cloth outside in the sunlight is rated 30 percent more socially appropriate after the information campaign compared to before. Impressively, this positive change persisted even two years after the intervention. However, a strong restrictive norm persist regarding the cleaning of menstrual absorbents both immediately after the intervention and two years later: Washing cloth in communal laundry facilities or water sources is considered highly socially inappropriate. Due to restrictive social views, individuals may avoid using available washing facilities, and in some cases, even their home environment, to clean their absorbents. Instead, they choose locations that offer privacy but may be unhygienic, such as the floors of public latrines. This enduring harmful social norm highlights the complexity of changing deeply ingrained social norms and practices and the limited effectiveness of information provision.

Our research contributes to three strands of literature. First, we contribute to the literature on menstrual health management. Prior studies predominantly focus on the financial barriers to hygienic menstrual health management, showing how improved access to menstrual material can positively impact schoolgirls' educational outcomes (Agarwal et al., 2024; Benshaul-Tolonen et al., 2021; Montgomery et al., 2012). For working women, Krenz and Strulik (2021) document reduced work absenteeism for women using disposable pads in Burkina Faso. Czura et al. (2024) relax both financial and informational constraints related to hygienic menstrual health management in a randomized-controlled trial among garment workers in Bangladesh. While alleviating these constraints does not affect labor outcomes, it yields important improvements in women's health: Reducing financial barriers leads to better health outcomes through the adoption of modern menstrual material, whereas reducing information gaps improves the hygienic use of traditional materials. Our study complements existing studies by documenting knowledge gaps in hygienic menstrual health management. Alongside Castro and Mang (2024) and Czura et al. (2019), our research further expands the scope by studying cultural beliefs, social norms and menstruation-related taboos.[2]

Second, we contribute to a growing literature on the importance of stigma and taboos for health behavior. Cultural beliefs and social norms have been identified as important factors in individual's health behavior (see Mollen et al. (2010) for an overview). For example, Templeton et al. (2016) show that individuals adapt their food preferences for healthy and unhealthy foods depending on their peers' preferences.[3] Moreover, stigma and fear of negative social repercussions have been reported to influence diverse preventive health behaviors, including the use of contraception (Håkansson et al., 2018) and face masks during a global pandemic (Kwon, 2022), and the decision for medical tests and treatments, such as testing for sexually transmitted diseases (Yang et al., 2023), preventative health check-ups (Ghosal et al., 2022), and seeking help for substance addiction or mental health issues (Shidhaye & Kermode, 2013). Most related to our study, Castro and Mang (2024) show that a discussion-based intervention can effectively destigmatize menstruation, increase demand for hygienic menstrual products, and alleviate restrictive social norms surrounding their purchase. Our contribution lies in directly measuring and quantifying social norms in the context of menstruation in a low-income setting, and empirically documenting their evolution in response to targeted information dissemination.

Lastly, we extend the literature on the role of information provision in influencing health behavior. The impact of information campaigns on health outcomes has been mixed, as evidenced in hand washing promotion efforts. Some studies report a reduction in diseases like diarrhea (Haggerty et al., 1994), while others only find an improvement in knowledge without corresponding health improvements (Galiani et al., 2016). The nature of the information provided appears crucial. For instance, while abstinence-focused sexual behavior recommendations have been ineffective in preventing teen pregnancy, information on HIV risk has lead to substantial reductions (Dupas, 2011). In India, hand washing behavior was notably enhanced when messages incorporated emotional drivers such as nurture or disgust (Biran et al.,

[1] See Bangladesh Bureau of Statistics (2020) for a detailed description of menstrual materials used and comparisons between urban and rural populations in Bangladesh.

[2] Czura et al. (2019) is an earlier working paper version of Czura et al. (2024), in which they also report the effects of the information intervention on social norms with similar findings to ours.

[3] This influence mirrors the observed effects of peer behavior on various health-related behaviors, including unhealthy weight-control in adolescent girls (Eisenberg et al., 2005), physical activity and dietary habits in adult women (Ball et al., 2010), and hand-washing habits among university students (Dickie et al., 2018).

2014). In Pakistan, Bennett et al. (2018) find that information provision alone is ineffective when it contrasts with traditional beliefs and culture: Standard hygiene instructions did not change respondents' health behavior unless they were accompanied by a module that also addressed traditional health beliefs. Our study sheds new light on the complex interplay between cultural context and the receptivity to new health-related information.

In the next section we present detailed information about the background of the study. The study design and the sample are described in Section 3. Section 4 documents menstrual health management and its societal implications, and Section 5 analyzes the impact of the information campaign; Section 6 concludes.

2. Background on menstrual health and hygiene

Menstrual health: Knowledge and practices

In the last twenty years, descriptive studies across low- and middle-income countries have showcased the extent of inadequate menstrual practices. Several studies report that women rely on inadequate absorbent materials such as old cloths, tissue paper, cotton pieces, leaves or ash to manage their menstrual bleeding (International Institute for Population Sciences, 2020; Kuhlmann et al., 2017; McMahon et al., 2011; Singh et al., 2022; Eijk et al., 2016). Reusable menstrual cloth products are only hygienic if they are treated appropriately, i.e., they are washed with clean water and soap and dried outside in sunlight due to the disinfecting properties of the sun's UV light. But often reusable products are neither washed nor dried properly and are directly stored wet after washing, in concealed places such as cupboards or under the mattress. Commercially available disposable sanitary pads offer a good alternative and women report using them because they are seen as more comfortable and less likely to leak. But the rates of pad usage are rather low.[4] High prices, lack of knowledge and stigmatization of menstruation are suspected culprits for this low take-up (Averbach et al., 2009; Castro & Mang, 2024; Crofts & Fisher, 2012; Czura et al., 2024; Jewitt & Ryley, 2014).

In low- and middle-income countries, pervasive knowledge gaps and numerous myths, cultural restrictions, and psycho-social constructs exist around menstruation. Contrary to the assumption of public health experts that familial guidance bridges the gap, misinformation and myths about menstruation significantly impede young women's understanding of their own bodies: Many girls are unprepared for menarche, often concealing their first menstrual period out of fear of being punished for perceived sexual activity (Bangladesh Bureau of Statistics, 2020; Mason et al., 2013; Sommer & Sahin, 2013). This lack of preparedness stems largely from the discomfort and misinformation prevalent among adults, resulting in girls entering puberty with limited and inaccurate information (Chandra-Mouli & Patel, 2017). This educational vacuum extends to formal schooling environments. Health education programs for teenagers in low-income countries often do not address menstrual hygiene practices and disorders. Moreover, teachers and schools have an almost negligible role in providing information about menstruation (ICDDR, 2014; Khanna et al., 2005; Michael et al., 2020), leaving schoolboys completely uninformed and girls with only limited information about the physiological processes involved. This knowledge gap persists during adulthood. Although adult women have more experience, they do not necessarily have access to (more) information.

Cultural beliefs and taboos seem to be at the core of poor menstrual hygiene management through the perpetuation of misinformation and unhygienic customs (Crichton et al., 2013; McMahon et al., 2011). Common myths arise from the nature of menstruation, which is not seen as a natural process but perceived as a divine curse, a disease, or the result of a sin (Dasgupta & Sarkar, 2008; Khanna et al., 2005). The belief that menstrual blood is dirty, toxic, or impure is also widespread, including in India (Kumar & Srivastava, 2011), Nepal (Thapa et al., 2019), Fiji, Solomon Islands, and Papua New Guinea (Mohamed et al., 2018). It is believed that seeing menstrual blood can bring infertility, blindness (Garikipati & Boudot, 2017) and bad luck to men (Mohamed et al., 2018). Studies in various contexts have reported taboos and behavior restrictions during menstruation on bathing and participation in social activities, such as praying, cooking, entering kitchens, attending to guests, going to the market, and talking about menstruation. Women report not performing household work, and not attending school or social events, such as a marriage or a festive gathering. Further, cultural norms dictate that menstruation and all associated practices should remain completely hidden (Mason et al., 2013).

Menstrual practices in Bangladesh

In Bangladesh, the country of our study, misinformation and unhygienic practices are pervasive and the biological process of menstruation is closeted in a culture of shame. The *Bangladesh National Hygiene Survey* (Bangladesh Bureau of Statistics, 2020) offers a comprehensive but concerning overview of the current state of personal hygiene in Bangladesh. A significant portion of the population relies on traditional methods: The majority of adolescent girls (50 percent) and women (64 percent) report using old cloth for menstrual hygiene management. More troubling is the fact that menstrual cloth is often dried clandestinely, with 55 to 67 percent of adolescent girls and women hiding them when drying. Additionally, 40 percent of adolescent girls and 44 percent of women store their washed cloths in concealed locations. Other studies have shown that only 3 percent of schoolgirls wash their menstrual cloth with soap, dry them in the sunlight, and then store them with other cloth for repeated use (Alam et al., 2017). The topic is discussed only scarcely at home and in schools. Only 36 percent of the adolescent girls in the sample of the *Bangladesh National Hygiene Survey* had heard about menstruation before the onset of menarche, and only 3.5 percent learn about menstruation in school. This shows a massive information vacuum on menstruation in Bangladesh and unhygienic menstrual practices with severe repercussions on female well-being: 45 percent of adolescent girls and 36 percent of women face health problems directly linked to menstrual practices (Bangladesh Bureau of Statistics, 2020).

There has been a significant mobilization by humanitarian organizations in Bangladesh and the private sector around the lack of access to commercial products. For example, in the Bangladeshi garment industry there is an active discussion among various stakeholders about improving menstrual health for its large, mostly female workforce. Several NGOs have started initiatives to improve access to menstrual health management products in garment factories.[5] Efforts at the national level include programs such as the *Bangladesh National Hygiene Promotion Strategy* targeting menstrual health advancement, and the *National Health and Population Policies* seeking to improve women's health. However, little research has been carried out in Bangladesh to help guide these efforts, and the underlying cultural taboos are poorly understood.

[4] The International Institute for Population Sciences (2017) estimates that of the 336 million menstruating women in India, about 121 million women (roughly 36 percent) are using sanitary pads, locally or commercially produced. The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, 2014) estimates that in Bangladesh disposable pads are used by one quarter of adult women.

[5] The NGO Reemi has distributed between 2020 and 2025 more than 40.000 reusable menstrual underwear among garment factories (https://reemi.org/blogs/news/1-700-phone-interviews-later). The NGO SNV has a project which provides access to subsidized sanitary pads in 25 factories (SNV, 2016).

Theory of change: The role of information in menstrual practices and cultural taboos

A significant information vacuum, where society as a whole holds inaccurate beliefs about menstruation and menstrual health, is often based on cultural taboos surrounding menstruation and it can further fuel harmful social norms and stigma restricting menstrual practices. Our theory of change is based on the premise that information provision can improve menstrual knowledge and practices, and it can reduce cultural taboos. In the educational sessions, women are exposed to accurate information about menstruation and menstrual health. Women hear that menstruation is a natural process and they learn about its role for reproduction. Further, they learn about different menstrual practices and how to manage their menstruation hygienically. This includes the presentation of disposable sanitary pads as a hygienic menstrual material, but also the hygienic use of reusable pads and cloths by washing them with water and soap and drying them outside in the sunlight.

We expect this information to correct inaccurate beliefs about menstruation and shift the perception of menstruation from being seen as impure and toxic to being recognized as a natural process. Further, we expect that women learn about hygienic menstrual practices. On an individual level, this can empower women to feel less ashamed about menstruation and to adopt healthier practices, such as properly drying menstrual cloth in sunlight.

Moreover, the information sessions are conducted with several women simultaneously. This not only equips women with practical knowledge, but it also serves to challenge and potentially shift entrenched social norms. As women internalize this new information and see other women exposed to the information doing the same, a gradual shift in the collective perception of what is considered appropriate behavior during menstruation can occur. This shift can lead to more widespread adoption of hygienic practices, reduced stigma, and improved well-being for the women involved.

In summary, we expect the intervention to work on two levels: (1) correcting individual knowledge gaps and (2) reshaping perceived social norms. These changes are expected to reinforce each other, leading to a sustainable improvement in menstrual health management practices and, ultimately, in well-being for women in these communities.

3. Study design

Our study is structured into two separate but interrelated parts. In the first part, we comprehensively document various aspects of menstrual health management among our sample of working women in Bangladesh. This includes an in-depth examination of their knowledge and practices, an analysis of the prevailing social norms and behavioral restrictions, as well as an exploration of the stigma and taboos associated with menstruation. The second part of the paper focuses on the evaluation of an information campaign. Here, we assess how the aforementioned outcomes changed after the information campaign, both in the immediate aftermath and over an extended period. This dual-phase approach enables us to not only understand the current state of menstrual health management but also to gauge the potential for positive change through targeted information interventions.

Data and sample

Our data come from surveys with 113 working women from the region of Maniganjk, a rural district situated 50 km west of the capital city of Dhaka in Bangladesh. All respondents work as artisans in embroidery centers of the social enterprise Aarong, which hand-produces ethnic wear and is part of the non-profit development agency BRAC. The artisans usually live near the artisan centers and belong to the same local community. They are, on average, 32 years old, predominantly Muslim (86 percent), and they have 10 years work experience as artisans for Aarong (Table 2, Column 1). We collaborated with Aarong to improve knowledge about menstrual health management for its all-female workforce and visited four different artisan centers to carry out information campaigns on menstrual health management in April 2019.

We elicited information on demographics, physical and mental well-being, menstrual health management knowledge and practices, behavior and restrictions during menstruation, and social norms surrounding menstruation directly before the information campaign in our *baseline* survey. Immediately after the information campaign, we conducted our *midline* survey, repeating the questions on knowledge and social norms. Approximately two years after the information campaign, we conducted an *endline* survey via telephone to assess knowledge, practices, and social norms surrounding menstruation. We reached 104 of the original 113 participants. All surveys were administered by a team of female enumerators.

This study adhered to all relevant ethical standards for research involving human subjects, particularly given the sensitive and personal nature of the questions related to menstrual health management. Prior to conducting the surveys and interventions, we obtained oral informed consent from all participants. Participants were fully informed about the purpose of the study, the nature of the questions they would be asked, and their voluntary participation. We emphasized that they were free to decline participation or withdraw from the study at any point without any negative consequences. Also, we pointed out that the data will be exclusively used for research purposes and saved confidentially.

Information provision on menstrual health management

The information sessions were delivered by personnel from an experienced non-profit organization in Bangladesh with 30 years of experience. The organization focuses on improving the socio-economic conditions of disadvantaged populations, particularly women and children through trainings and awareness campaigns. The organization has extensive experience in offering training on menstrual health in a culturally sensitive way and its effects on worker well-being and absenteeism have been evaluated in Czura et al. (2024). All respondents in our sample participated in the information session.

The one-hour sessions address several information constraints in menstrual health management. They provide both educational and practical guidance on managing menstruation within the specific cultural context of Bangladesh. An experienced female facilitator led the sessions, using laminated slides to clearly present key points and practical examples. The educational guidance provided in each session comprised an in-depth anatomical explanation of menstruation, explaining essential aspects of the menstrual cycle, its different phases, and the physiological changes women experience. Menstruation is portrayed as a natural process, aiming to dispel common misconceptions about menstruation. The practical guidance in each session covered practical aspects of menstrual health management, such as the correct methods for cleaning and drying reusable menstrual cloths, and the proper use of disposable menstrual products. Fig. 1 shows one of the slides used by the facilitator to explain hygienic menstrual management using disposable pads and reusable cloth. For disposable pads, hygiene practices and proper disposal were laid out. For reusable cloth, the importance of washing reusable cloths with soap and water and the critical need to dry them in direct sunlight to kill bacteria and prevent infections was stressed. The importance of these practices was repeatedly emphasized, given the health risks associated with improper hygiene, such as urogenital infections, particularly in the humid climate of Bangladesh.

The sessions addressed common menstrual symptoms and provided advice on managing pain and discomfort during menstruation. For instance, there was a section covering "safe methods for alleviating menstrual pain" that offered practical solutions for managing discomfort. An example included the recommendation of using warm water



Fig. 1. Slide from the session showing hygienic practices for menstrual absorbents.

applied to the lower abdomen, which can act as a natural anesthetic to help relieve menstrual pain. Last, the sessions covered cultural taboos surrounding menstruation and the restrictions these impose on women's lives. The experienced staff facilitated discussions on how to effectively communicate about menstruation, particularly with adolescent girls, covering topics such as attending school during menstruation and handling food while on their period.

Social norms surrounding menstruation

Prevailing cultural and social beliefs can be understood as social norms, defined as *"a rule of behavior such that individuals prefer to conform to it on condition that they believe that [...] most people in their reference network believe they ought to conform to it (normative expectation)"* (Bicchieri, 2005). Ongoing research in social sciences strives to set a detailed framework that delineates what is understood as social norms, cultural traditions, and personal preferences (Bicchieri, 2005, 2016; Tremewan & Vostroknutov, 2021).

In this paper, we follow the definition by Bicchieri (2005) and elicit normative expectations of Bangladeshi women on various issues surrounding menstruation: menstrual health management, mobility restrictions, and communication about menstruation. The normative expectations were elicited using an incentivized method based on Krupka and Weber (2013). Norms are obtained by using a matching coordination game: Participants are incentivized to match the valuation of others instead of revealing their own. Social norms are the emerging focal point in this coordination game about the social appropriateness of a given behavior. Throughout the paper, we refer to these normative expectations as *social norms*.

We elicit the social norms with vignettes describing different behaviors of a woman in Bangladesh who has her period. To illustrate the vignettes, we showed pictures of a Bangladeshi woman, called Romana. For example, in one picture Romana was shopping for groceries and the vignette described her as having her monthly period and going to the market to buy food. The participants rated the social appropriateness of the described behavior on the four-point Likert-scale: 1 'very socially inappropriate', 2 'socially inappropriate', 3 'socially appropriate', and 4 'very socially appropriate'. The respondents received answer cards that illustrated the different answer options using different emojis to symbolize the various levels of social appropriateness. To place their rating, the respondent selected one of the answer cards and enumerators recorded the answers. After a practice round based on a vignette on the social appropriateness of a Bangladeshi woman going to the mosque without wearing a head scarf — a behavior unrelated to menstruation, each respondent rated various vignettes on their social appropriateness. All answers are monetarily incentivized: Workers receive a bonus payment if their answer for a given behavior matches the modal answer among other respondents in the same artisan working center. To determine the bonus payments, one vignette was randomly chosen by the enumerator for the bonus calculation.

In our analysis, we categorize social norms into distinct sets: The first set pertains to menstrual cloth, encompassing norms around its use, drying, and washing. The second set relates to disposable pads, including norms regarding their use and purchase in the market. We also examine norms related to nutrition, focusing on purchasing and cooking food for different family members during menstruation. Next, we explore norms on mobility during menstruation, such as going to work or school. Finally, we elicit norms related to communication about menstruation and those associated with religious beliefs.

4. Menstrual health management: Knowledge, practices and social norms

In this section we give a detailed description of menstrual health management knowledge and practices, and their connections to female well-being, stigma and social norms at baseline.

Menstrual health management: Knowledge and practices

At baseline, knowledge about menstruation and hygienic menstrual practices is limited among the participants (see Table 1). While nearly all women recognize menstruation as a natural process rather than a curse, a significant proportion (27 percent) erroneously believes it to be an illness. A striking 97 percent of respondents hold the misconception that menstruation is a process of eliminating toxic blood from the body. Regarding menstrual hygiene, nearly all women (97 percent) are aware of the necessity to wash reusable cloth with soap, but approximately a quarter of them lacks knowledge about proper drying techniques. Specifically, they are unaware that menstrual cloth should not be stored without adequate drying and that it should be hung outside in the sun for effective drying. Participants predominantly use reusable cloth (70 percent) for managing their menstruation. Additionally, 46 percent report using disposable pads frequently.[6] These percentages refer to methods used frequently, not exclusively, as some women use more than one method during menstruation. The reported practices associated with reusable cloth reveal a lack of adherence to

[6] There is a significant correlation between menstrual management choices and demographic factors. The use of menstrual cloth is positively correlated with age (Pearson's correlation coefficient: 0.26, p-value: 0.00) and inversely correlated with educational attainment (Pearson's correlation coefficient: −0.27, p-value: 0.00). Conversely, pad usage is negatively correlated with age (Pearson's correlation coefficient: −0.36, p-value: 0.00) and positively with years of education (Pearson's correlation coefficient: 0.26, p-value: 0.00).

Table 1
Summary statistics.

	(1) Baseline	(2) Endline	(3) Difference
Knowledge and practices			
Menstruation is a ... (% agreeing with statement)			
Curse	1.77	2.88	1.11
	(13.24)	(16.82)	(2.07)
Illness	27.43	5.68	−21.75***
	(44.82)	(23.28)	(4.89)
Natural process	97.32	99.04	1.72
	(16.22)	(9.81)	(1.81)
Toxic	97.35	97.12	−0.23
	(16.15)	(16.82)	(2.24)
Menstrual cloth ...(% agreeing with statement)			
Must be washed with soap	96.46	100.00	3.54**
	(18.56)	(0.00)	(1.75)
Should not be stored without drying	75.22	100.00	24.77***
	(43.37)	(0.00)	(4.08)
Must be hung in the sun to dry	75.89	94.23	18.34***
	(42.97)	(23.43)	(4.67)
Practices (in %)			
Cloth use	69.64	34.62	−35.03***
	(46.19)	(47.80)	(6.40)
Pad use	45.54	64.42	18.89***
	(50.02)	(48.11)	(6.68)
Wash - no see	0.88	0.84	−0.05
	(0.32)	(0.37)	(−0.05)
Wash - public		0.06	
		(0.23)	
Wash- private		0.88	
		(0.32)	
Dry outside	0.08	0.68	0.60***
	(0.28)	(0.46)	(2.70)
Mental well-being			
Increased level of stress	46.85	17.30	−30.47***
	(50.01)	(38.01)	(6.01)
Increased feeling shame	51.82	20.19	−32.48***
	(50.08)	(40.33)	(6.17)
Concerned about noticeable stains	62.16	30.76	−32.06***
	(48.61)	(46.40)	(6.44)
Concerned about noticeable odor	56.36	7.69	−49.45***
	(49.71)	(26.77)	(5.38)
Increased difficulty of reaching work tasks	67.57	49.03	−19.10***
	(46.92)	(50.23)	(6.60)
Mobility restrictions			
Avoid going to the market (in %)	0.50	0.41	−0.08
	(0.50)	(0.49)	(0.06)
Go to social gatherings (in %)	0.82	0.67	−0.15***
	(0.38)	(0.47)	(0.05)
Walk long distances (in %)	0.46	0.48	0.03
	(0.50)	(0.50)	(0.06)
Cook for the family (in %)	0.96	0.98	0.02
	(0.19)	(0.14)	(0.02)
Avoid ill people (in %)	0.76	0.36	−0.41***
	(0.43)	(0.48)	(0.06)
Work absence	0.23	0.15	−0.08*
	(0.42)	(0.36)	(0.05)
Observations	113	104	

Notes. Means and standard deviations (in parentheses) at baseline in Column 1 and endline in Column 2. Column 3 reports the difference as the coefficient of a simple regression of a coefficient for baseline vs. endline on the respective outcome variable with robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

hygienic standards; specifically, the cloth is often neither washed nor dried appropriately. Despite the vast majority of women (88 percent) stating that they wash their reusable menstrual cloth without being seen by anyone, informal discussions with respondents revealed that they most often wash their reusable cloth on the floor of toilets. This choice reflects a prioritization of privacy over hygiene, as this location typically lacks clean water and soap but offers privacy. Moreover, only 9 percent of the respondents report drying their washed reusable cloth outside in sunlight despite 77 percent acknowledge the importance of sun drying (Table 1, Column 1). This discrepancy between knowledge and practice suggests that factors other than awareness significantly influence menstrual hygiene behaviors.

Well-being and behavioral implications

Limited knowledge and hygienic menstrual practices are closely associated with reduced physical and mental well-being. Approximately 75 percent report feeling fatigued and suffering from acute pain during their menstruation, with only 20 percent using pain killers (see Table 1). Additionally, nearly half of the women (48 percent) experience heavy bleeding, while 60 percent report stains on their clothes from leaking menstrual blood, and 49 percent report a strong menstrual odor. These findings indicate that many respondents may not be using sufficiently effective absorbent materials.

Inadequate absorbent material can be a source of stress or shame, in particular in environments where menstruating women are stigmatized. Our data reveal considerable self-reported negative effects on mental well-being during menstruation. Half of our sample reports increased feelings of stress (47 percent) and shame (52 percent), with concerns about others noticing that they are menstruating, both due to stains on their clothes (62 percent) and menstrual odor (56 percent). Furthermore, two thirds report difficulty in fulfilling their work tasks during this time, underscoring the psychological burden and diminished well-being that many experience during menstruation.

Women are also restricted in their daily activities. Around half of the respondents avoid going to the market, 76 percent avoid visiting ill people, and 18 percent do not go to social gatherings while menstruating. In contrast to other studies, in our sample there is no restriction imposed when it comes to entering the kitchen or even touching food: 96 percent of the respondents report cooking for the family during their menstruation. Twenty-three percent have missed a day at work because of menstruation.

In Table 2, we investigate the interrelations between demographics and well-being, on the one hand, and menstrual health practices and behavioral restrictions, on the other hand. Columns 2, 3, and 4 show that women using pads, i.e. modern, hygienic menstrual material, are younger, higher educated and less-likely to be married (though still predominantly so). They are also less likely to report menstrual blood leaking through their absorbent material. We do not find any difference with respect to physical and mental well-being when menstruating, suggesting that the choice of menstrual material is not directly influencing this. In line with Czura et al. (2024), we conjecture that hygienic menstrual health management, either through modern hygienic material, such as pads, or the hygienic treatment of traditional material, i.e., washing and drying reusable cloth properly, is crucial for female well-being, and not the choice of material itself.

We find that the most common behavioral restriction, not going to the market when menstruating, is concentrated among women who face lower mental well-being during their menstruation: Women who experience increased stress and shame during their menstruation, and who are more concerned about others noticing their menstruation by stains or odor are substantially more likely (15 to 27 percentage points) to restrict their behavior and avoid going to the market place when they are menstruating (Table 2, Column 7).

Taboos and stigma in communication about menstruation

We now shed more light on the potential secrecy and taboos surrounding menstruation by examining communication patterns around menstruation. Women are asked what reason they would give if they need to miss a day of work due to their menstruation when communicating with (i) their supervisor (supervisors are also female in our sample), (ii) their coworkers, or (iii) their family at home. Respondents stated their level of agreement to giving the real underlying reason,

Table 2
Behavioral implications — Using disposable pads & Going to the market during menstruation.

Baseline	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Using disposable pads			Going to market during menstruation		
		No	Yes	Difference	No	Yes	Difference
Age	32.23	34.68	28.94	−0.06***	32.33	32.12	−0.21
	(8.16)	(7.54)	(7.20)	(0.01)	(8.06)	(8.37)	(1.10)
Non-muslim (in %)	14.41	18.64	9.80	−0.09*	18.52	10.53	−7.99*
	(35.20)	(39.11)	(29.88)	(0.05)	(39.21)	(30.96)	(4.74)
Married (in %)	95.50	98.31	92.16	−0.06**	94.44	96.49	2.05
	(20.79)	(12.96)	(27.02)	(0.03)	(23.12)	(18.56)	(2.81)
Education (years)	6.36	5.49	7.49	0.02***	5.70	6.98	1.28**
	(3.97)	(3.70)	(3.96)	(0.01)	(3.98)	(3.90)	(0.53)
Work experience (years)	10.53	11.51	9.06	−0.02**	10.40	10.66	0.26
	(7.57)	(7.92)	(6.59)	(0.01)	(7.62)	(7.63)	(1.02)
Commute to work (min)	11.57	11.71	11.53	−0.00	13.26	9.96	−3.29**
	(11.22)	(11.31)	(11.23)	(0.02)	(12.78)	(9.40)	(1.51)
Ever absent due to menstruation (in %)	23.36	21.43	26.00	0.05	25.00	21.82	−3.18
	(42.41)	(41.22)	(44.08)	(0.06)	(43.72)	(41.68)	(5.82)
Physical well-being (in %)							
Increased tiredness	77.48	76.27	78.43	0.02	77.78	77.19	−0.58
	(41.87)	(42.72)	(41.33)	(0.06)	(41.96)	(42.33)	(5.63)
Suffer from acute pain	72.97	71.19	76.47	0.05	68.52	77.19	8.67
	(44.51)	(45.48)	(42.63)	(0.06)	(46.88)	(42.33)	(5.98)
Use painkillers	19.52	16.38	23.53	0.07	16.67	22.22	5.56
	(33.40)	(29.80)	(37.11)	(0.05)	(32.86)	(34.12)	(4.47)
Very abundant bleeding	46.97	44.63	50.00	0.05	49.69	44.44	−5.24
	(37.23)	(38.79)	(35.61)	(0.05)	(36.76)	(37.97)	(5.02)
Full of energy	55.26	55.93	54.25	−0.02	50.62	59.65	9.03*
	(36.01)	(32.29)	(40.33)	(0.05)	(37.05)	(34.92)	(4.82)
Leaks on clothes	59.46	64.41	52.94	−0.11*	62.96	56.14	−6.82
	(49.21)	(48.08)	(50.16)	(0.07)	(48.74)	(50.06)	(6.60)
Strong menstrual odor	49.25	51.41	46.41	−0.05	50.00	48.54	−1.46
	(35.27)	(33.94)	(36.98)	(0.05)	(35.32)	(35.67)	(4.74)
Mental well-being (in %)							
Increased level of stress	46.85	42.37	50.98	0.09	59.26	35.09	−24.17***
	(50.01)	(49.63)	(50.24)	(0.07)	(49.60)	(48.15)	(6.54)
Increased feeling shame	51.82	50.85	52.00	0.01	66.04	38.60	−27.44***
	(50.08)	(50.21)	(50.21)	(0.07)	(47.81)	(49.11)	(6.51)
Concern noticeable stains	62.16	62.71	60.78	−0.02	75.93	49.12	−26.80***
	(48.61)	(48.56)	(49.06)	(0.07)	(43.15)	(50.44)	(6.26)
Concern noticeable odor	56.36	56.90	54.90	−0.02	64.15	49.12	−15.03**
	(49.71)	(49.74)	(50.00)	(0.07)	(48.41)	(50.44)	(6.63)
Increased feeling irritated	57.88	52.87	62.75	0.10*	64.15	52.05	−12.10**
	(40.21)	(40.78)	(39.05)	(0.05)	(36.31)	(43.19)	(5.34)
Increased difficulty of reaching work tasks	67.57	62.71	72.55	0.10	74.07	61.40	−12.67**
	(46.92)	(48.56)	(44.85)	(0.06)	(44.23)	(49.11)	(6.24)
Observations	113	59	51		54	57	

Notes. Means and standard deviations (in parentheses) are reported for the full sample (column (1)), and separated by whether the respondent uses disposable pads (Columns 2–3) and whether the respondent continues to go to the market during menstruation (Columns 5–6). Physical and mental well-being measures equal 1 for "(completely) agree" and 0 for "(completely) disagree". Columns 4 and 7 report the difference between the two sub-samples based on a simple regression with robust standard errors (in parentheses). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

namely, menstruation, or to indicate with a euphemism or a term that would hide that menstruation is the reason (such as the term *shorir karap* that in Bangladesh is commonly used to refer to one's period and it is also used to state a general feeling of uneasiness which allows a woman to hide the true reason for missing a day at work).

Fig. 2 displays the distribution of answers. There are some indications for a taboo leading women to hide the real reason for not attending work, both at home and at work. The left side of Fig. 2 shows that the respondents would choose nearly unanimously not to inform their female supervisor about menstruation being the true reason for missing work and would rather indicate that they are feeling unwell. When it comes to their coworkers, we observe that respondents combine reporting the real reason and using also the vague term. Lastly, looking at the domestic environment, we can also observe a stronger taboo in place, since the respondents prefer to indicate that they are feeling unwell rather than stating that they are menstruating. We conclude that the taboo is not apparent in horizontal communication among individuals of the same hierarchical status, represented in our sample by the coworkers, but is more apparent in vertical communication among different hierarchical statuses: in the communication between workers and supervisors or between wife and husband, daughter and mother or step-mother. Secrecy and taboos around menstruation seem to be particularly present in communication across different hierarchical levels and may pose constraints to information transmission across these levels.

Social norms

Based on our incentivized norm elicitation, Table 3 sets out the mean and the distribution of the social norms stating the percentage share of respondents choosing each answer option. At baseline (Panel A), the respondents perceive that it is considered very socially inappropriate to pray during menstruation (93 percent) and to dry menstrual cloth outside (67 percent). The norm against correctly drying menstrual cloth is especially concerning, as this unhygienic practice increases the risk of infection (Torondel et al., 2018). For the remaining norms, the focal point is on the highest social appropriateness rating: Respondents report that it is considered very socially appropriate to engage in daily

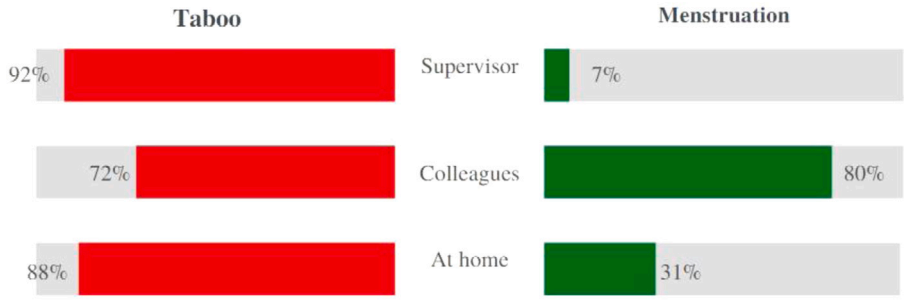


Fig. 2. Communication regarding absence at work.
Notes: Self-reported level of agreement (in percent) to the communication strategies for needing to miss a day of work due to menstruation towards a) the supervisor, b) the coworker, and c) at home. The left-hand side of the panel reports the percentage of women who use an euphemism or report that they are feeling unwell when they need to miss work due to menstruation. The right-hand side reports the percentage of women who would disclose the real reason, i.e., their menstruation. The questions are not exclusive and women could agree to different communication strategies.

Table 3
Social norms.

Panel	*A: Before Information - Baseline*						*B: After Information - Midline*							*C: After Information - Endline*						
			% of Respondents						% of Respondents				*K-S*			% of Respondents				*K-S*
	Mean	SD	– –	–	+	++	Mean	SD	– –	–	+	++	test	Mean	SD	– –	–	+	++	test
Menstrual cloth																				
Use	0.77	0.32	9	8	26	**57**	0.81	0.29	6	8	26	**61**	1.00	0.56	0.31	11	32	**36**	21	0.00***
Drying	0.23	0.37	**67**	10	10	14	0.83	0.33	10	6	9	**75**	0.00***	0.67	0.34	14	17	26	**43**	0.00***
Wash - non-private							0.50	0.47	**44**	4	12	40		0.29	0.34	**46**	34	6	14	
Wash - village facilities														0.29	0.32	**42**	38	9	11	
Disposable pads																				
Use	0.88	0.26	5	2	16	**77**	0.98	0.07	0	0	5	**95**	0.05***	0.99	0.07	0	0	5	**95**	0.05***
Purchase - herself	0.76	0.34	13	4	28	**56**	0.97	0.09	0	0	8	**92**	0.00***	0.88	0.23	5	11	23	**62**	0.08
Purchase - husband							0.94	0.17	2	0	13	**85**		0.87	0.21	1	5	24	**70**	
Purchase - female clerk							0.98	0.08	0	1	3	**96**								
Nutrition																				
Purchase - market	0.74	0.33	11	7	31	**51**	0.96	0.14	1	0	10	**89**	0.00***	0.66	0.32	9	21	**37**	33	0.24
Cook - family	0.86	0.28	6	5	15	**74**	0.97	0.13	1	0	7	**92**	0.05**	0.97	0.11	1	1	7	**92**	0.07
Cook - relative							0.97	0.09	0	0	8	**92**								
Cook - newborn							0.97	0.10	0	0	9	**91**								
Cook - other food							0.97	0.10	0	1	7	**92**								
Mobility																				
Attend - work	0.89	0.26	5	6	6	**83**	0.96	0.19	4	0	0	**96**	0.36	0.95	0.15	1	2	9	**88**	0.71
Attend - school							1.00	0.03	0	0	1	**99**		0.78	0.34	6	12	22	**60**	
Communication																				
Mother	0.95	0.17	2	1	9	**88**	0.99	0.10	1	0	1	**98**	0.67	0.99	0.07	0	0	5	**95**	0.95
Husband	0.95	0.19	3	1	6	**90**	0.99	0.06	0	0	3	**97**	0.95	0.95	0.16	2	3	13	**82**	1.00
Religion																				
Praying	0.05	0.21	**93**	2	2	4	0.01	0.05	**98**	2	0	0	1.00	0.04	0.11	**88**	12	0	0	1.00
Participate in Ramadan							0.01	0.05	**98**	2	0	0								

Notes: This table presents normalized means (range: 0–1) and standard deviations of the normative expectation ratings, as well as the share of respondents for each answer possibility of the 4-point Likert scale: (––) very socially inappropriate, (–) rather socially inappropriate, (+) rather socially appropriate, (++) very socially appropriate. Responses are reported for three phases: before the information intervention (baseline), directly after the information intervention (midline), and two years after the information intervention (endline). The *p*-value for the Kolmogorov–Smirnov test, assessing distribution equality across different elicitation times (Panel B and C) against the baseline (Panel A), is shown in the final columns of the respective panel. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

activities such as cooking (74 percent), visiting the market (51 percent), and working (83 percent) during menstruation. Regarding menstrual hygiene products, a substantial portion of the respondents perceives using cloth (57 percent) and pads (77 percent) as socially acceptable, along with purchasing pads (56 percent). Notably, open communication about menstruation with close family members is also perceived as highly appropriate, with 88 percent and 90 percent of respondents considering it very socially acceptable to discuss menstruation with their mothers and husbands, respectively. This stands in contrast with own reported behavior described above. A potential explanation for this divergence is our reference group when eliciting social norms: The coordination game to match second order beliefs is based on the ratings of other female artisan workers. For observed behavior, however, the reference group for judging socially appropriate behavior is much broader: the local community or society in general.

5. Effects of information provision on menstrual health management

The aim of the information campaign on menstrual health management is to enhance knowledge about menstrual health management, potentially improving female well-being, and addressing behavioral restrictions. To assess how the outcomes associated with the information campaign changed over time, we collected data on menstrual practices and knowledge, behavioral restrictions, and social norms directly after the intervention (midline) and two and a half years later (endline).

Empirical strategy

We compare outcomes directly linked to the information intervention, that is menstrual health management knowledge and social norms, before and after the information intervention. We identify differences

in means using simple t-tests. For our elicitation of social norms, we additionally test for differences in the distribution using a Kolmogorov–Smirnov test. Additionally, we test for shifts in the mean of the social norms using two regression estimation methods: First we estimate the effect of the intervention using a stacked ordinary least squares regression. This method is chosen as it allows an economically meaningful interpretation of the results. We include binary elicitation round indicators to measure the changes in the outcome variable over time and we include individual fixed effects to control for unobserved heterogeneity. Second, we present results from an ordered logistic regression in order to verify that the results are robust to using an estimation method that considers the ordinal nature of our discrete dependent variable (see Appendix). The specifications have the following (standard) form:

$$y_{it} = \alpha + \beta_1 midline_{it} + \beta_2 endline_{it} + \delta_i + \epsilon_{it} \quad (1)$$

where y_{it} is the outcome variable for respondent i at time $t, t \in (0 = baseline, 1 = midline, 2 = endline)$, *midline* and *endline* are binary variables equal to one if the social norm was elicited this survey round after the information session, and zero if not; δ_i are individual fixed effects; ϵ_{it} refers to robust standard errors.

While our study design lacks a control group for causal inference, we plausibly identify causal effects for the outcomes directly linked to the information campaign: First, the midline data was collected directly after the information campaign, so only the information campaign could plausibly effect knowledge and societal expectations at midline. For the endline data, any observed changes could be driven by general developments over time, such as policy changes, broader awareness campaigns on menstrual health and hygiene, or increased personal experience with menstrual health practices. To validate whether we can ascribe these effects to our information intervention, we compare our findings to Castro and Mang (2024). Their study is closely related to ours: the context and setting are similar (stigma in menstrual health and hygiene among working women in Bangladesh), it is conducted in a similar time period (2021 vs. 2019 to 2021 in our study), and they use similar metrics and methods to elicit social norms.[7] Castro and Mang (2024) report baseline metrics in 2021 that are much closer to our 2019 baseline metrics and markedly different from our 2021 endline measures. We conjecture that general developments over time, as could be caused by national policy changes or advertising campaigns, are unlikely driving our findings. While we alert the reader to the limitations of our study design, the comparison to the baseline date of Castro and Mang (2024) gives more confidence in a plausible causal interpretation of our results.

5.1. Menstrual health management knowledge

Menstrual health management is directly addressed in the information session: The increased risks of infections that arise from not properly treating menstrual cloth are explained together with instructions for proper washing and drying. Information on how to use and dispose of disposable pads is also provided. Table 4 presents the changes observed in knowledge after the information intervention. There are improvements in knowledge after the information session. Significant differences are observed on the aggregated index (Table 4, Column 1), both at midline and at endline. These differences seem to be related to improvements in knowledge on the misconception that menstruation is an illness (19 percentage points, corresponding to 26 percent evaluated at baseline mean) and that menstrual blood is toxic (31 percentage points, corresponding to 1.033 percent evaluated at baseline mean).

Table 4
Knowledge on menstruation.

	(1) Index	(2) Cause	(3) Curse	(4) Illness	(5) Natural	(6) Toxic
Midline	0.10***	0.05	−0.03	0.19***	0.02	0.31***
	(0.02)	(0.06)	(0.03)	(0.05)	(0.02)	(0.05)
Endline	0.04**	0.03	−0.01	0.22***	0.02	0.00
	(0.02)	(0.06)	(0.02)	(0.05)	(0.02)	(0.02)
Mean of dep. var.	0.59	0.24	0.98	0.73	0.97	0.03
Observations	104	104	104	104	104	104
R-squared	0.11	0.00	0.01	0.07	0.00	0.17

Notes: OLS estimation on knowledge on menstruation over survey rounds. Dependent variables are binary variables equal to one if the question has been answered correctly, and zero otherwise. Questions test knowledge on whether menstruation is (2) a body function that happens for no reason, (3) a curse, (4) an illness, (5) a normal and natural process for all women worldwide or, (6) a process for the elimination of toxic or bad blood from the body. The index reported in Column 1 is the average of the knowledge questions reported in Columns 2 to 6. Mean share of correctly answered questions is reported for all knowledge questions at baseline before the information intervention. The coefficients measure changes right after the session (*Midline*) and after two years (*Endline*) compared to baseline. Participant fixed effects included in all regressions. The adjusted p-values for multiple hypothesis testing using the Family-Wise Error Rate method of List et al. (2023) are 0.000 for the coefficient *Midline* and 0.027 for *Endline* for the index in Column 1. Robust standard errors are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

On the latter, the knowledge gap remains large: 66 percent of the respondents still believe that menstruation is composed of toxic blood after the information session. The improvements in knowledge are maintained only for the misconception that menstruation is an illness at endline two years after the intervention. For the belief that menstrual blood is toxic, all knowledge gains evaporated after two years and nearly all participants believe that menstrual blood is toxic.

5.2. Social norms

We first examine the distribution of levels of social appropriateness to assess how social norms changed after the information campaign. Table 3, Panel, A sets out the social norms before (left side) the information intervention, these are our baseline metrics. Panel B (middle) shows the norms right after the information session at midline. Lastly, Panel C (right side) provides the results elicited two years after the intervention at endline. We analyze shifts in focal points and in the overall distribution compared to baseline using a Kolmogorov–Smirnov test.[8] Second, we also analyze shifts in the social appropriateness ratings in regression analyses. For this, we consider a reduced set of social norms as outcome variables: (i) related to menstrual health practices: cloth use, pad use, purchase pads, dry cloth outside, and (ii) related to behavior: daily activities, nutrition, and communication.

Norms on menstrual health practices

We see that there are no differences in the focal points before and after the information intervention except for drying cloth in the sunlight. Here we do see that the focal point shifted from ‘very socially inappropriate’ to ‘very socially appropriate’ behavior (Table 3). When looking at the long-term effect, two years after the intervention, the focal point remains at ‘very socially appropriate’, indicating the persistence of this change. This is also reflected in a sizable increase of the social appropriateness ratings of drying cloth outside in the sunlight by 60 and 41 percentage points at midline and endline, respectively (see Table 5, Column 3).

[7] While we study an information campaign on menstrual health and hygiene, they study a soft-touch facilitated group discussion. Another difference is that their sample consists of more educated garment workers in a peri-urban setting in the vicinity of the district of Maniganjk compared to our artisan workers in a rural setting.

[8] Not every social norm could be elicited at all points in time to avoid fatigue of participants and due to time constraints (see Table 3). For all analyses comparing shifts in the distribution or ratings, we focus on the social norms for which measures are available at all three data collection points.

Table 5
Social norms — Menstrual health management.

	(1) Index	(2) Menstrual cloth	(3)	(4) Disposable pads	(5)
		Use	Drying	Use	Purchase
Midline	0.24***	0.05	0.60***	0.11***	0.20***
	(0.02)	(0.04)	(0.05)	(0.03)	(0.03)
Endline	0.10***	−0.22***	0.41***	0.11***	0.11***
	(0.02)	(0.04)	(0.05)	(0.03)	(0.04)
Mean of dep. var	0.66	0.77	0.23	0.87	0.75
Observations	104	104	104	104	104

Notes: OLS estimation on menstrual health management practices over survey rounds. Dependent variables are measures of social norms based on the 4-point Likert scale (very socially inappropriate, socially inappropriate, socially appropriate, and very socially appropriate) normalized to a range between 0 and 1. The index reported in Column 1 is the average of the elicited social norms. Mean ratings are reported at baseline before the information intervention. The coefficients measure changes right after the session (*Midline*) and after two years (*Endline*) compared to baseline. Participant fixed effects included in all regressions. The adjusted p-values for multiple hypothesis testing using the Family-Wise Error Rate method of List et al. (2023) are 0.000 for the coefficient *Midline* and 0.000 for *Endline* for the index in Column 1. Robust standard errors are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 6
Social norms — Mobility limitations and communication.

	(1) Index	(2) Praying	(3) Attend	(4) Nutrition	(5)	(6) Communication	(7)
			Work	Meal	Market	Mother	Husband
Midline	0.07***	−0.05**	0.06**	0.11***	0.20***	0.04**	0.04**
	(0.01)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
Endline	0.02	−0.01	0.07**	0.12***	−0.11***	0.05**	0.00
	(0.01)	(0.02)	(0.03)	(0.03)	(0.04)	(0.02)	(0.02)
Mean dep. var	0.74	0.05	0.89	0.86	0.74	0.94	0.95
Observations	104	104	104	104	104	104	104

Notes: OLS estimation on mobility limitations and communication during menstruation over survey rounds. Dependent variables are measures of social norms based on the 4-point Likert scale (very socially inappropriate, socially inappropriate, socially appropriate, and very socially appropriate) normalized to a range between 0 and 1. The index reported in Column 1 is the average of the elicited social norms. Mean ratings are reported at baseline before the information intervention. The coefficients measure changes right after the session (*Midline*) and after two years (*Endline*) compared to baseline. Participant fixed effects included in all regressions. The adjusted p-values for multiple hypothesis testing using the Family-Wise Error Rate method of List et al. (2023) are 0.000 for the coefficient *Midline* and 0.158 for *Endline* for the index in Column 1. Robust standard errors are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Using menstrual cloth itself has become persistently less socially appropriate over time: Both the distribution of the norms at endline has become significantly more dispersed (see Table 3) and the social appropriateness rating has declined (see Table 5, Column 2). We see the opposite development for using and purchasing disposable pads: The distribution of the ratings becomes significantly more concentrated (Table 3) and the mean rating has increased (Table 5, Columns 4 and 5).

Norms on daily activities, nutrition, and communication

We observe a shift in focal points for purchasing at the market during one's period from 'very socially appropriate' before the information intervention to 'socially appropriate' two years after the intervention. While we do not observe other, persistent changes in focal points or the distribution of the social appropriateness rating (Table 3), we mainly see improvements in the average ratings in our regression analyses (Table 6).

We observe an overall positive shift in social norms after the information intervention (11 percent evaluated at the sample mean) for mobility restrictions and communication (Table 6, Column 1), but effects at endline are more modest. The information sessions did not address behavior restrictions associated with menstruation, and all of them involved to some extent a third party, such as the family or the market vendor who have not received the information. It is therefore not surprising that we only observe changes in the mean rating but not in the distribution or overall social norm, the focal point of the distribution.

For communication patterns (Table 6, Columns 7 and 8), we see significant but modest changes, mainly because the level of observed frequency and social acceptability was already high at the baseline. The information session leads to an increased level of social acceptability of 4 to 5 percent, evaluated at the baseline sample mean. The mean expectations for talking to one's mother and husband were shifted: After the information session it is seen as more socially appropriate to discuss menstruation, but only effects for communicating with the mother prevail at endline.

Discussion: Social norms vs. Knowledge

Our study's design precludes a causal analysis of the effects of information provision on menstrual health management knowledge, practices, and social norms. However, when examining knowledge acquired immediately before and after the information sessions, it seems reasonable to ascribe observed changes directly to the information campaign. The case of social norms, which are derived from incentivized assessments of others' beliefs, presents a more complex scenario. Here, it is challenging to ascertain whether shifts in beliefs about the social appropriateness of certain behaviors are due to altered perceptions and second order beliefs or simply reflect an adjustment based on new information acquired by the respondents and their peers. If the positive effect of the information intervention were just an information update, we would expect to see two changes: (i) an improvement in their knowledge after the information session, and (ii) a change in social norms only regarding matters directly addressed in the information session, while those regarding other matters not directly addressed in the information session remain unaltered.

As discussed above, there are only modest persistent increases in knowledge after the information session, as they deteriorate over time. Despite an improvement directly after the information campaign, knowledge gaps for the misconception that menstrual blood is toxic remain substantial directly after the information campaign and increase even further at endline.

We see sizable changes in social norms for menstrual practices and mobility restrictions and communications. While the information campaigns directly addressed menstrual practices, mobility restrictions and communications are not covered in the information session. Castro and Mang (2024) and Czura et al. (2019) find similar changes in social norms: Czura et al. (2019) offer the same information intervention in their randomized controlled trial and they find similar, persisting changes in social norms on drying reusable cloth outside in the sun as we do. Castro and Mang (2024) study how offering discussion sessions on menstruation among garment workers helps to break the silence on taboos around menstruation and leads to similar changes in social norms surrounding menstruation. We conjecture that the changes in social norms go beyond a pure facilitation of the matching of second order beliefs by the information provision.

5.3. Menstrual practices, mobility restrictions, and communication

Two years after the information session women report improved menstrual practices. The share of women who use disposable pads increased from 46 percent at baseline to 64 percent at endline, while the use of reusable cloth decreased from 70 to 35 percent (Table 1). Table 7 displays that women started to treat their menstrual cloth more hygienically by washing it with warm water and soap and drying it outside in the sunlight after the information session. They also

Table 7
Self-reported behavior two years after the information session.

In the last 1.5 years:	Percentage
Started to wash menstrual cloth with soap and warm water	89.42
	(30.90)
Started to wash menstrual cloth in the pond or village facilities for washing	3.84
	(19.32)
Started to dry cloth menstrual cloth outside or under sunlight	67.30
	(47.13)
Started to feel less ashamed about having your period	88.46
	(32.21)
Talked about menstruation more with others	92.30
	(26.77)
How helpful was the info session in the following...	
Understanding how the menstrual cycle works	86.07
	(34.87)
Recognizing menstruation as a natural phenomenon	81.60
	(39.42)
Improving your menstrual hygiene	85.72
	(35.88)
Making it easier to exchange information about menstruation	85.00
	(34.05)
Observations	104

Notes. Means and standard deviations (in parentheses). This table summarizes responses to questions evaluating the perceived usefulness of the information session. All responses are quantified in percentages, representing the proportion of respondents who reported the information campaign to be "very helpful" for the statement, instead of "somewhat helpful". No respondent replied that the information campaign was "not helpful".

overwhelmingly reported feeling less ashamed about their period (88 percent) and to talk more about menstruation with others (92 percent). All of these self-reported changes are directly visible in descriptive statistics at baseline and endline (Table 1, Column 3).

At endline, over two years after the information session, 96 percent of the women remembered taking part in this information session and they found it very helpful to understand how the menstrual cycle works (87 percent), to recognize menstruation as a natural phenomenon (83 percent), to exchange information about menstruation (88 percent) and to improve menstrual hygiene (83 percent). The changes in menstrual practices are accompanied by large improvements in mental well-being over time. During menstruation, women report to feel less stressed, less ashamed, less concerned about noticeable stains and odor, and less difficulty of reaching work targets (Table 1, Column 3).

5.4. Restrictions on effectiveness of information provision

Our baseline survey focuses on washing menstrual cloth in private, and we observe a persistently high share of women following this practice (88 percent at baseline and 64 percent at endline). At endline, we elicited details on different possibilities to wash menstrual cloth as qualitative interviews cast doubt on hygienic standards in private facilities. We observe a wide dispersion for social norms regarding washing menstrual cloth in a public facility (or publicly): 40 percent consider this behavior to be very socially appropriate, and 44 percent perceive it to be very socially inappropriate. The strong dispersion suggests that the information session, in which this behavior was directly addressed and the importance of washing menstrual cloth with clean water and soap was stressed, may not be sufficient to overcome restrictive norms on menstrual hygiene practices. At endline, the social norms are more restrictive. Only 20 percent of the respondents think that it is socially appropriate or very appropriate to use non-private or village facilities to wash their menstrual cloth. Using the village laundry facilities, or a nearby water body to wash the menstrual cloth is perceived as very socially inappropriate by 42 percent of the participants and as socially inappropriate by 38 percent. The social norms are also reflected in reported own behavior: Only 6 percent report washing their menstrual cloth at public water sources (Table 1, Column 2).

In particular in light of the living standards, where households only have access to communal water sources such as washing facilities in the village, large ponds, or rivers to launder their clothes, normative restrictions on washing menstrual cloth in public facilities may lead to unhygienic menstrual health management. Women seem to wash their menstrual cloth in places that provide privacy but that are unhygienic and do not facilitate effective washing, such as on the floor of toilets, as reported qualitative interviews by respondents in our sample and in Das et al. (2015) for a sample in India.[9] Although information leads to shifts in expectations related to menstrual hygiene (such as drying menstrual cloth) as our results show, deeply-rooted taboos, like the taboo of seeing menstrual blood, do not seem to be affected by information provision. When the menstrual cloth is hung outside to dry, it has already been cleaned so the taboo or secrecy that affects menstruation has a lower intensity than when washing menstrual cloth. We interpret this finding as further support for the important role of taboos and cultural norms: Some practices are not affected by available information and improving knowledge alone might not change unhygienic behavior, if they are connected to deeply-rooted taboos. This is particularly relevant for WASH policy efforts when trying to improve hygiene in such settings. Public improved facilities might not suffice to improve menstrual hygiene.

6. Conclusion

In this paper, we comprehensively document various facets of menstrual health management among a sample of working women in Bangladesh, encompassing their knowledge, practices, and the social norms, behavioral restrictions, and stigma associated with menstruation. Additionally, we evaluate how these outcomes evolve after information sessions, both in the short- and in the long-run.

Our findings reveal substantial psychological distress related to menstruation within this population. The majority of our respondents report feelings of shame and fear of others noticing that they are menstruating. Notably, these emotions are closely linked to self-imposed behavioral restrictions, such as avoiding market visits during menstruation, further exacerbating their reduced mental well-being. The

[9] Das et al. (2015) report that the 69 percent of the women in their study in Odisha, India, wash their menstrual cloth in the toilet and not at the public washing facility, the pond or at a tub well or yard.

information interventions positively influence restrictive norms and behaviors. The most notable change, possibly indicating a shift in social norms, is observed in the practice of drying menstrual cloth in the sunlight, a key element for maintaining hygiene.

Our conclusion is twofold: Firstly, targeted information campaigns can bridge knowledge gaps and influence women's behavior and social norms. However, effectuating a comprehensive change in entrenched social norms remains a complex challenge. Future research should aim to experimentally delineate the extent and mechanisms through which information can modify harmful social norms. Secondly, even after the information provision, taboos and stigmatization around menstruation continue to impose constraints on proper menstrual hygiene practices, such as the washing of menstrual cloth in non-private sources. This persistence suggests that taboos and stigma can significantly hinder the uptake of provided information, which is also observed by Czura et al. (2024), who find partial improvements in menstrual practices for drying, but not washing of menstrual cloth. More generally, this observation aligns with findings from Pakistan, where standard hygiene instructions are found to be ineffective unless they are coupled with education about germ theory, replacing traditional medical beliefs with modern understanding (Bennett et al., 2018). Our study extends this insight, proposing that not just traditional health beliefs, but any form of taboo or stigma, may diminish the effectiveness of informational interventions. This underscores the need for multifaceted approaches that address both informational deficits and cultural barriers to foster meaningful behavioral change.

CRediT authorship contribution statement

Silvia Castro: Writing – review & editing, Writing – original draft, Project administration, Investigation, Funding acquisition, Formal analysis, Data curation. **Kristina Czura:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The author declares that she has no relevant or material financial interest that relate to the research described in this paper.

Appendix. Robustness check: Ordered logistic regression

See Tables A.1 and A.2

Table A.1
Social norms — Menstrual health management.

	(1)	(2)	(3)	(4)	(5)
	Index	Menstrual cloth		Disposable pads	
		Use	Drying	Use	Purchase
Midline	2.72***	0.22	2.93***	1.87***	2.21***
	(0.29)	(0.27)	(0.32)	(0.50)	(0.38)
Endline	1.16***	−1.37***	2.13***	1.65***	0.74***
	(0.25)	(0.27)	(0.29)	(0.47)	(0.28)
Mean of dep. var	0.66	0.77	0.23	0.87	0.75
Observations	104	104	104	104	104

Notes: Ordered Logistic estimation on menstrual health management practices over survey rounds. Dependent variables are measures of social norms based on the 4-point Likert scale (very socially inappropriate, socially inappropriate, socially appropriate, and very socially appropriate) normalized to a range between 0 and 1. The index reported in Column 1 is the average of the elicited social norms. Mean ratings are reported at baseline before the information intervention. The coefficients measure changes right after the session (*Midline*) and after two years (*Endline*) compared to baseline. Participant fixed effects included in all regressions. Robust standard errors are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A.2
Social norms — Mobility limitations and communication.

	(1)	(2)	(3)	(4)	(5)	(7)	(8)
	Index	Praying	Attend	Nutrition		Communication	
			Work	Cook	Purchase	Mother	Husband
Midline	1.91***	−1.41*	1.60***	1.36***	2.11***	1.99**	1.33**
	(0.28)	(0.79)	(0.59)	(0.40)	(0.35)	(0.78)	(0.66)
Endline	0.05	0.71	0.54	1.46***	−0.62**	1.29**	−0.16
	(0.25)	(0.47)	(0.39)	(0.42)	(0.26)	(0.58)	(0.44)
Mean dep. Var	0.75	0.05	0.89	0.86	0.74	0.94	0.95

Notes: Ordered Logistic regressions on mobility limitations and communication during menstruation over survey rounds. Dependent variables are measures of social norms based on the 4-point Likert scale (very socially inappropriate, socially inappropriate, socially appropriate, and very socially appropriate) normalized to a range between 0 and 1. The index reported in Column 1 is the average of the elicited social norms. Mean ratings are reported at baseline before the information intervention. The coefficients measure changes right after the session (*Midline*) and after two years (*Endline*) compared to baseline. Participant fixed effects included in all regressions. Robust standard errors are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Data availability

Data will be made available on request.

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