Hygienic Sanitary Items Usage and Ovulatory Cycle Knowledge in India

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Research

Keywords: Menstrual Hygiene Management, Sanitary items Usage, Ovulatory Cycles, NFHS-4, India

Posted Date: June 9th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-33957/v1>

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Abstract

Background In India, most of the adolescent girls experience their first menstrual cycle with the lack of knowledge on menstruation, exacerbated by a plethora of taboos. Women undergoing menstruation experience discrimination, abuse, and neglect resulting from the myths and misconceptions built around menstruation. Such practices of discrimination and perpetuating myths might potentially lead to girls missing their schools and sometimes even dropping out after they start menstruating. NFHS-4 data shows that 26.8 percent of women in India are married before 18 years and 7.8 percent of the women in 15-19 years age group have already become a mother or are pregnant. One-third of the new births in India are born out of adolescent pregnancies. Considering these issues, this study examines how various socio-economic factors impact: (i) the usage of hygienic sanitary items by menstruating women during their periods, and (ii) their knowledge about the ovulatory cycle.

Methods We have used the most recent Demographic and Health Survey, popularly known as the National Family Health Survey Round 4 (NFHS-4), conducted in 2015-16 for this study, with a sample of 2,47,833 women in the age group of 15 to 24 years. Binary logistics regression was performed separately for addressing both the research questions, i.e., the impact of various socio-economic characteristics on the usage of hygienic sanitary items and women's knowledge of the ovulatory cycle.

Results We found that (a) women or their partners who are educated up to high school are more likely to use the hygienic sanitary items, and (b) married women or women who have access to television are more likely to know about the ovulatory cycles.

Conclusion These findings tell us the ground reality of menstrual health in India and urge policymakers to develop comprehensive puberty education programs for boys and girls and community-based programs to start a discussion between the community, adults, and other menstruators freely.

Plain English Summary

Menstruation (also referred to as periods) is a biological process women go through, signifying their reproductive capacity. In India, young girls experience their first periods as early as they age eight years in India, and most of them lack awareness on the process and hygiene aspects associated with it. This lack of knowledge is compounded by various myths and taboos (not allowed to bath or enter kitchen and temples, exclusions, etc.), primarily fed by their mothers or elderly females of their families, often leading to girls missing schools or dropping out. Further, with one-third of the new-borns in India coming from adolescent pregnancies, it becomes even more critical for women to understand the anatomy of the reproductive system (particularly the ovulatory cycle) and make informed decisions on planning pregnancies. The behaviors and practices shaped by various socio-economic factors are imposed upon young girls struggling to understand the process of menstruation and ovulatory cycles.

Thus, we attempted to understand women's knowledge levels (15–24 years) on menstruation and the ovulatory cycle and their potential relationships with the socio-economic factors, using a nationally

representative dataset NFHS-4. Our results indicate low awareness levels amongst women with lesser education, with less-educated partners, from impoverished backgrounds, and with lack of access to media platforms. We present the statistical analysis of knowledge levels on menstruation in India along with the potential factors causing it and draw attention towards proactively engaging with the population in addressing these concerns and target behavioural change in the society.

Introduction

Adolescence is a phase of life marked by physical, psychological, and behavioral changes when children experience puberty while transitioning from childhood to adulthood. Children in the age group of 10 to 19 are called adolescents. Approximately 18% of the world's population (1.2 billion) are adolescents [1]. Transition to adulthood also involves the development of the adolescents' reproductive organs and hence their capability to reproduce. Menstruation is one such process reflecting the change for females, which prepares their bodies for pregnancy.

The menstrual cycle is a physiological process of bleeding every 28 days (approximately) in women of ages from ten to fifty; however, the gap between two cycles may vary from 21 to 35 days. This 28-day period allows the ovaries to prepare the eggs for fertilization and release it by the end of it, if not fertilized. Meanwhile, the uterus also prepares for pregnancy by developing a lining on its inside wall. If the egg(s) does not fertilize during or by the end of that 28-day-period, the uterus starts shedding its lining in the form of bleeding through the vagina. This process of bleeding is called the menstrual period and typically lasts for 3-7 days [2]. By the end of the menstrual period, the body is ready again to prepare for the next cycle of pregnancy.

While menstruation is a natural biological process, women undergoing menstruation experience discrimination, abuse, and neglect resulting from the myths and misconceptions built around menstruation. Such practices have been observed across the world, but more so in low- and middle-income countries [3,4,5].

In India, most adolescent girls experience their first menstrual cycle with limited knowledge of the menstruation process. This experience is compounded by the myths and misconceptions associated with menstrual hygiene imposed by their families, like not taking a bath during the periods, not being allowed to enter the kitchen and temples, and discriminatory and sometimes even untouchable behaviors by family members, etc. [3,6,7,8]

Such practices of discrimination and perpetuating myths might potentially lead to girls missing their schools and sometimes even dropping out after they start menstruating [9]. Further, inadequate sanitation facilities in schools is another critical factor for lower school enrolment of adolescent girls across the world [10,11,12,13]. Sustainable Development Goal (SDG) 6.2 specifically states adequate and equitable sanitation for all including the sanitation facility and adequate treatment and disposal of human excreta and waste [14].

Access to sanitation facilities and menstrual hygiene awareness was found to be lacking amongst girls and women in most of the South Asian countries [13]. Studies have found that girls and women face various gynecological problems like Reproductive Tract Infections (RTIs), Bacterial Vaginosis (BV), Candida, and Trichomonas vaginalis (TV) due to lack of toilets and poor hygiene during menstruation [15,16,17]. Absence of menstrual hygiene component in the school curriculum could be one of the potential reasons for girls' low awareness levels; curriculums are primarily seen to be limited to the narrow description of the reproductive systems [18]. Additionally, girls are subjected to various social, emotional, and physical barriers at their homes (like no bath, social exclusion impacting their psychological well-being) with the onset of their menstruation cycle [3]. House and colleagues have also shown in their research that around 30 percent of female students in South Asian countries do not attend schools during their menstruation period. Research studies have consistently argued for focusing on proper provisioning of Water, Sanitation, and Hygiene facilities within schools, including the sanitary products for girls [10,19].

Adequate menstrual hygiene facilities include providing a clean private space for girls to change their clothes, soap, and water to clean and dustbins to dispose off their menstrual/sanitary waste [20]. Along with access to these facilities, adopting hygienic practices during menstruation is also critical, and is collectively referred to as Menstrual Hygiene Management (MHM). Women use different products, including cloth, locally prepared napkins, commercially sold sanitary napkins, tampons, etc. Hygienic methods of protection include using locally-prepared sanitary items, sanitary items (commercially-produced), and tampons, whereas cloth and other products (like fag) are regarded as unhygienic methods of protection [21]. Thus, effective MHM (i.e., maintaining hygienic practices during menstruation described above) is the key to a healthy lifestyle for girls and, therefore, needs to be adopted in their daily lives.

Past research has also depicted psychosocial consequences due to poor MHM [22], such as experiencing shame, social stigma, stress, etc. [23,24]. Women during menstruation also face various human rights violations, including their right to (a) human dignity, (b) adequate standard of living, (c) education, (d) work, and (e) non-discrimination and gender equality [25].

Thus, making girls aware of the menstruation process and associated menstrual hygiene practices are essential for educational purposes, it also has positive impacts on their personalities, well-being, and their surroundings. Improved awareness levels and understanding has been found to help them fight and overcome the barriers of shame, stigma, and stress, feel positive about their bodies, and eventually improve their motivation, confidence, and efficacy levels [26,24].

Ovulatory Cycle

The ovulatory cycle is the fertile time of the menstrual cycle with the highest chances of pregnancy [2]. NFHS-4 data shows that 26.8 percent of the women in India are married before the age of 18, and 7.9 percent of the women in the age group of 15-19 have already become a mother or are pregnant. One-third of the new births in India are from adolescent pregnancies [27]. Uttar Pradesh and Bihar together account

for 30% of the teenage population of India. A survey was conducted amongst 10,400 adolescents in Bihar, and it was found that 14.1 percent of unmarried boys and 6.3 percent of unmarried girls were sexually active [28]. Similarly, in Uttar Pradesh, a survey of 10,161 adolescents reported that 17.2 percent of boys and 6.2 percent of girls were sexually active [29]. Thus, it is essential for these women to know and understand the ovulatory cycles, which is often ignored or less emphasized.

Women possess limited knowledge about the physiology and hormones associated with the reproductive system. As a result, they might miscalculate the chances of an unplanned pregnancy. Understanding the functioning of their reproductive system, i.e., the anatomy of the body, ovulation, and menstrual cycle can potentially help women in mitigating their unplanned pregnancies [30]. Previous studies have suggested that girls who experience menarche (onset of menstruation) early, without adequate emotional support, are likely to engage in substance abuse and sexual relationship early in their life, thereby posing a higher risk for adolescent pregnancies [31,32]. Thus, this study's other critical component is to capture the understanding that women have about their ovulatory cycle.

This study builds upon the work done by Anand and his colleagues [33] and validates their findings using a more recent dataset NFHS-4 and expands the scope of research by including the understanding of women about the ovulatory cycle. Thus, this study aims to understand the impact of socio-economic factors on (a) women's use of hygienic sanitary items, including sanitary items, locally-prepared sanitary items, tampons, and (b) their knowledge about the ovulatory cycle. We have included multiple covariates to control for different socio-economic characteristics, as explained in the section below.

Methodology

Data

This study used the most recent publicly accessible Demographic and Health Survey, popularly known as the NFHS-4, conducted in 2015-16. This survey is administered by the Ministry of Health and Family Welfare, in coordination with the International Institute of Population Sciences, Mumbai. NFHS-4 data was collected from the erstwhile twenty-nine states and six union territories with 601,509 household interviews and includes data for 699,686 women and 112,122 men. We have considered young women in the age group of 15 to 24 for our analysis, i.e., 247,833 women is our sample for this study.

Dependent Variable

The following questions have been taken into consideration to identify dependent variables for this study using the NFHS-4 questionnaire. 1. "Women use different methods of protection during their menstrual period to prevent blood stains from becoming evident. What do you use for protection, if anything? Anything else?" There were six response options (1=Cloth, 2= Locally Prepared Napkins, 3= Sanitary Napkins, 4=Tampons, 5=Nothing, 6=Other). In the rest of the paper, women who use locally prepared napkins, sanitary napkins, and tampons are considered to be using hygienic sanitary items [21]. In contrast, those using cloth, other items, or nothing are considered as using unhygienic sanitary items. We

have converted this variable into a binary variable “sanitary items usage,” which is coded as “1” if the items used during menstruation are locally prepared napkins, sanitary napkins or tampons and coded as “0” if the items used are cloth, other items or nothing. 2. “From one menstrual period to the next, are there certain days when a woman is more likely to become pregnant if she has sexual relations?”. There were three response options (1= Yes, 2= No, 8= Don’t Know). If the respondent answers yes, then the next question is asked. “Is this time just before her period begins, during her period, right after her period has ended, or halfway between two periods?” There were six response options (1= During her period, 2= After the period ended, 3= Middle of the cycle, 4= Before period begins, 5= At any time, 6= Other, 8= Don’t know). This dependent variable is also converted into a binary variable “ovulatory cycle knowledge” and takes the value as “1” if the respondent answers “Middle of the cycle,” otherwise “0”.

Independent Variables

We have used multiple independent variables in this study including: Area of living (Urban, Rural), Caste (Scheduled Caste, Scheduled Tribe, Other Backward Classes, None of them, Don’t Know), Wealth (Poorest, Poorer, Middle, Richer, Richest), Religion (Hindu, Muslim, Christian, Sikh, and others), Frequency of reading the newspaper, listening to audio and watching television (Not at all, Less than once a week, At least once every week, Almost every day), Marital Status (Never in the union, Married, Widowed, Divorced, No longer living together/separated), Literacy (Cannot read at all, Able to read only parts of sentences, Able to read the whole sentence, no card with the required language, blind/visually impaired), Gender of the Household Head (Male, Female), Respondent’s education level (No education, primary, secondary, higher).

Data Analysis

Data analysis was performed in Stata Version 15.1. We started our preliminary investigation with the descriptive statistics, followed by finding correlation amongst the key study variables. Binary logistic regression was performed separately for addressing both the questions, i.e., socio-economic characteristics leading to better usage of hygienic sanitary items and the impact of that on women’s knowledge of the ovulatory cycle. The study also presents the odds ratio to show the precision of our estimates at a 95 percent confidence interval.

Descriptive Statistics of various socio-economic factors

Descriptive statistics for all the key variables used in the study are presented in Table 1. The study used data of 247,833 women in the age group of 15 to 24 who participated in the NFHS-4 survey. The average age of women at their first menstruation period is around 14 years. 56.8 percent of women used a local sanitary napkin during menstruation, whereas 2 percent of women used tampons. 2.5 percent of women use a combination of one of the three items. Thus, 56.3 percent of the sample used hygienic sanitary items to prevent bloodstains. Only 11 percent of women in the age group of 15 to 24 in our sample were aware of the ovulatory cycle.

Approximately three-fourth of our sample was Hindu (73.6 percent), 15.4 percent were Muslims, 6.8 percent were Christians, 1.9 percent Sikh, and the remaining 2.3 percent were from other religions (Buddhist, Jain, Jewish, Parsi, or none). Approximately two-fifth of our sample (41.6 percent) belonged to other backward classes, 19.5 percent to the scheduled caste, 18.6 percent to scheduled tribe, 19.7 percent belonged to none of them, and 0.5 percent of the sample participants didn't know their caste. 72 percent of our sample lives in rural areas, whereas 28 percent live in urban areas. 41 percent of our sample came from a poor economic background, 21 percent from middle-class families, whereas 38 percent came from wealthy families. 14 percent of our sample participants cannot read at all, 4 percent were able to read-only parts of sentences, and 83 percent were able to read the whole sentence.

<Insert Table 1 here>

Pearson product-moment correlation was calculated for all the critical variables in the study. The correlation coefficients between all dependent and independent variables generally ranged in the expected direction. Women from middle and more affluent families are highly correlated with the usage of hygienic sanitary items. In other words, women from wealthy families were more likely to use hygienic sanitary items. There was a low but positive correlation between women using hygienic methods of protection and women who understood the ovulatory cycle ($r=0.05$).

Results

The odds ratio for using hygienic methods of menstrual protection

The results of the binary logistic regression model are shown in Table 2. Most of the independent variables fit in the final model and were statistically significant. The odds ratio for women and their partners for educational levels is very high, showing that it is the most influential factor in the usage of hygienic sanitary items. Women who are educated up to high school are five times more likely to use hygienic sanitary items than women who are not ($OR=4.614$). Similarly, women whose partners are educated up to high school are two times more likely to use the hygienic sanitary items ($OR=1.906$).

Hindu women are less likely to use hygienic sanitary items than women from all other religions. There are multiple myths and taboos associated with the menstruation in the Hindu religion [35], thereby socially excluding the women [36] and further restrict them from taking a bath and using any hygienic sanitary items. The usage of hygienic sanitary items increases with an increase in the wealth of the families. Women from the more impoverished families are six times more likely to use the hygienic sanitary items as compared to the women coming from the more impoverished households ($OR=6.226$). Similarly, women from the scheduled tribe or other backward classes are 0.806 and 0.888 times less likely to use hygienic sanitary items, respectively, than women from a scheduled caste.

Another critical factor affecting the usage of hygienic sanitary items was access to different media platforms, including newspapers, radio, and television. Women who read newspapers or magazines every day are two times more likely to use a hygienic sanitary item than women who do not read newspapers or

magazines (OR=1.819). Women who listen to the radio or watch television every day are one and a half times (OR=1.519), and two items (OR=1.743) more likely to use hygienic sanitary items as compared to the women who do not listen to the radio or do not watch television at all, respectively. Women living in rural areas are 0.77 times less likely to use the hygienic sanitary items than their urban counterparts.

<Insert Table 2 here>

The odds ratio for ovulatory cycle knowledge

The results of the binary logistic regression model for ovulatory cycle knowledge are also shown in Table 2. The odds ratio for having ovulatory knowledge is high for Sikh and married women. Women who are married are two and a half times more likely to know about the ovulatory cycle (OR=2.538). Sikh women are seven times more likely to know about ovulation cycles than Hindu women (OR=6.901).

Approximately 95% of the Sikh women in our sample belong to the middle or upper category. Knowledge of the ovulatory cycle increases with the increase in the wealth of the families. Women from the most affluent families are one and half times more likely to know about the ovulatory cycles as compared to the women coming from impoverished families (OR=1.508). Women from scheduled caste are 0.864 times less likely to have better ovulatory cycle knowledge as compared to other backward classes. There is a dearth of literature on this topic, and further research needs to be conducted to find the socio-economic factors which provide theoretical justification for this relation.

The findings of our study show that education plays a crucial role in the understanding of the ovulatory cycle. Women who have completed high school are one and half times more likely to know about the ovulatory cycle than women who have no education at all (OR=1.412).

Further, similar to the impact on the usage of hygienic sanitary items, access to media platforms (only television in this case) was found to have a positive impact on women's ovulatory cycle knowledge. Women who watch television every day are one and a half times (OR=1.345) more likely to know about the ovulatory cycle as compared to women who do not watch television at all. However, we did not find any impact on women who read the newspaper or listen to the radio every day as compared to those who do not.

Women in rural areas are more likely to know about the ovulatory cycle than women in urban areas (OR=1.118). Women in the age group of 20-24 are more likely to know about the ovulatory cycle than women in the age group of 15-19 (OR=1.258). With age, women develop a better understanding of their bodies and their associated processes and, thus, tend to have more knowledge of the ovulatory cycle.

Discussion

In India, most adolescent girls experience their first menstrual period with limited/incomplete knowledge of the process, compounded by various myths and misconceptions associated with menstrual hygiene. Around 60 percent of women suffer from common RTIs due to the usage of unhygienic sanitary items

and access to inadequate sanitation facilities [3]. Also, India is home to the highest number of adolescents in the world [1]. One-third of the new-borns are from adolescent pregnancies [27]. Therefore, it is crucial to understand how many women use hygienic sanitary items and what they know about the ovulatory cycle. Our results show that the average age of first menstrual period in India is 13.96 years, starting as early as eight years old. In contrast, only 11% of women know about ovulatory cycle knowledge.

Through *Swachh Bharat Abhiyan* (Clean Indian Mission), the emphasis has been laid on the construction of toilets in schools as well as at homes to provide better sanitation facilities. However, merely ensuring the availability of toilets is not sufficient for better MHM. Regular use of these toilets and its proper maintenance, including cleanliness and supply of water, along with the availability and adequate knowledge on usage of hygienic sanitary items, are other factors contributing to proper MHM. NFHS-4 data shows that approximately 56 percent of the women in the age group of 15-24 use hygienic sanitary items, including locally prepared sanitary napkins, sanitary napkins, and tampons. Our analysis depicts that the proportion of women using hygienic sanitary pads has increased over time, with 56% recorded as per NFHS-4 data (2015-16), approximately one and a half to four times more as compared to the 33% [33] based on District Level Household and Facility Survey-3 data (2007-08) dataset, 27% from [37] based on data collected in 2005, and 13% from [38] based on data of 190 adolescent girls.

One of the potential reasons for this increased usage of hygienic sanitary items reported from NFHS-4 (2015-16) is the awareness campaigns started by the Indian Government, like *Swachh Bharat*, *Swachh Vidyalaya* in 2014 (Clean India, Clean School), MHM Scheme under National Health Mission [39]. But such campaigns are limited to schools, and hence, one may see a difference in the hygienic sanitary item usage between the schooled and non-schooled women. Our analysis speaks directly to this gap, where women who have completed high school education were found five times more likely to use hygienic sanitary items as compared to the women who have not.

Educational background of the partners

In addition to women's educational levels, their partner's educational background also plays a critical role in the adoption of hygienic menstrual practices by these women. According to NFHS-4 data, around 27 percent of the women in India get married before the age of 18, and 7 percent get married before the age of 15. Our analysis suggests that women whose husbands/ partners have completed high school education are likely to choose a hygienic product for menstruation. Going to school gives them a preliminary knowledge about the biological process of both men and women, and the potential infections that may happen using old clothes or rags. However, [4] reported that when men felt like they were not given enough information to understand menstruation completely.

Men with formal schooling lead to better-paying jobs and maintain a decent standard of living [40]. They are also more sensitized about female anatomy due to primary school education with improved access to menstruation and other biological processes through media platforms. Thus, they are expected to make informed decisions in purchasing hygienic sanitary products for the women in their families. Having girls

and their potential partners with minimum high school education has contributed to preventing early marriages [41] and in bringing hygiene as an essential factor in their menstrual product choices and practices.

Thus, emphasizing girls' education is observed to have a positive impact on multiple fronts. The Indian Government started the *Beti Bachao Beti Pado Abhiyaan* [save the girl child, educate girl child program] in 2014-15 in an attempt to focus on girl's education from early on. One of the significant advocacies of this program was to prevent early girl child marriage and emphasize the importance of completing school education and further pursuing higher education [42]. Even after the implementation of such schemes, around 30 percent of the girls drop out by class IX and 57 percent drop out by class XI [43]. Similar trends can be seen across the country. The number of girls dropping out has increased three-fold from 2016-17 to 2018-19 in Madhya Pradesh [44]. With the onset of the menstruation, girls coming from poorer family backgrounds drop out since they do not have enough resources to buy sanitary pads, making affordability of sanitary pads as one of the critical concerns for policymakers.

Affordability and income levels

Affordability is another factor contributing to limited usage, compounded by availability, lack of awareness, and safe disposal facilities [45]. As quoted by Garg and his colleagues, the average expenditure for rural women during the one menstrual period is Rs 48 for sanitary pads, which is considered expensive as per the Indian Standards. This makes sanitary pads affordable only for women from middle-to-high income households (See figure 1). Efforts need to be put in easing out the affordability pressure on women, mainly from rural and low-income backgrounds. With the support of Self-Help Group (SHGs), the Government can engage in local production and sanitary pads at a much lower cost. The Government has already tied up with multiple SHGs, but the model doesn't work quite well. They need to identify the loopholes and come up with a solid plan to make these plan work.

As discussed above, household income levels do play a critical role in allowing women to purchase and use hygienic sanitary items. Still, there can be challenges other than just affordability that prevents poor women from using them. We found that women from high-income households are six times more likely to use hygienic sanitary items than poorer women. This finding is quite intuitive and also consistent with the previous studies [46]. Factors like cultural barriers, shame, and social stigma associated with the purchase of menstrual products have been cited in the literature, contributing to low usage amongst women from rural and impoverished backgrounds [3]. For instance, women may not be able to step out to purchase the sanitary pads from a male shopkeeper, or might hesitate to ask their husbands/male members in the house to purchase it for them, due to shame and social stigma attached to sanitary pads. Males, on the other hand, might not feel comfortable in buying sanitary pads, again due to shame and feelings of embarrassment [47]. In most of the cases, there is no discussion of MHM between husband and wife [48].

Traditionally, females in rural areas have been known to use clothes and old rags (considered unhygienic) during menstruation to prevent bloodstains [46]. These women have been found to insist other women

and girls in their families from a young age to follow the same practice [49]. Using an old cloth piece, rag, or other unhygienic methods for blood absorption can be unsafe and risky, potentially leading to RTIs [33]. Thus, efforts need to be made on multiple fronts simultaneously, ranging from affordability and easy accessibility to breaking the cultural barriers, for ensuring effective MHM practices for women living in poor and remote communities.

Access to Media

Media has been found to become a critical factor in uplifting the hygienic sanitary item usage for women [57,58]. Traditional media platforms (like newspapers, magazines, television, radio) help understand which products are hygienic and why there is a need to use hygienic sanitary items. NFHS-4 data shows that approximately 60 percent of women (educated as well as uneducated) watch television every day. Our study suggests that women who listen to the radio or watch television every day are one and a half times and two times more likely to use hygienic sanitary items, respectively. Our results build on the evidence pointed out by Nemade, Anjenaya & Gujar R [57] and Arora et al [58] on the impact of access to traditional media in improving the usage of hygienic sanitary items.

The knowledge gained through media is not limited to improving awareness of hygienic menstrual practices, but it also helps disseminate knowledge of the ovulatory cycle among people. We found that women who watch television every day are one and a half times (OR=1.345) more likely to know about the ovulatory cycle as compared to women who do not watch television at all. We need more research to understand how and in what ways does access to media contributes to enhanced knowledge of the population on ovulatory cycles so that the awareness messages and ad campaigns can be strategically designed to address this need. This will help reduce the social stigma associated with these issues and bring conversations on such critical aspects to the forefront. This will also potentially help students engage in more meaningful and informative conversations within schools and at home.

Taking about media, Movies also play a critical role in shaping the community's perspectives and, in some way, also addressing the social issues of a country. Movies and documentaries like *Padman* and *The Period*, have helped in reducing the stigma around menstruation and bring the discussions on menstruation to the mainstream. Such films prove remarkably empowering for women, as it helps them gain confidence in talking about such issues and feel comfortable with their bodies [56].

In this digital age, traditional media is now overloaded with so many additional online platforms for news, connecting with people, doing fun activities together, like Facebook, Instagram, and recently Tiktok, which are also being used by many women. Such platforms can be used as the engaging spaces for targeting specific messages and advertisements for a wide variety of population groups. Messages can be designed, bringing together various concerns raised above and help promote effective MHM.

Developing strong MHM programs

Previous studies have shown that mothers were the most frequent source of information for awareness about menarche and building girls' knowledge and perception about menstruation [46]. In many families, mothers themselves have limited knowledge and experience in explaining menstruation and how to deal with the problems linked with it, in their daily life, in the school and the local community. In some communities, it is seen as taboo, where mothers do not consider it appropriate to discuss menstruation with their daughters who have not yet experienced menarche [50]. Mothers tend to pass on minimal information to their daughters (perhaps not always at the right time) and compound them with several preconceived notions, myths, and other taboos associated with menstruation [51]. Educating these women has to be the first step before moving on to seeking men's support. Further, involving men and various civil society organizations working towards improving male engagement in MHM activities can potentially help in addressing these myths and taboos. However, male attitudes are one of the significant factors contributing to these myths around menstruation [4,52,53]. The inclusion of both the parents in MHM programs has been found helpful in improving parenting skills as well as enhancing communication around sexual and reproductive health issues within the family [54].

Phillips-Howard and his colleagues [55] stressed the need and importance of engaging all the family members in understanding the physiological processes and changes that women in their family experience. They need to be sensitized on the challenges women face physically and socially to start contributing their bit in busting the myths and taboos associated with menstruation. Previous studies have also suggested that boys in the school understand menstruation superficially in their biology lessons; however, they lack knowledge of the biological processes and social issues surrounding menstruation [4]. The course curriculum needs to be more detailed and comprehensive and include various physiological processes of human bodies. Equal focus should also be laid on sensitizing these boys on the social and cultural barriers these girls and women face while undergoing these processes, so that they can provide support and break societal norms. Young boys and men can eventually become advocates of the MHM agenda, supporting women not only in their families but also in their communities. Overall, there is a strong need to build comprehensive adolescent programs that include menstruation, MHM, pregnancy, and mechanisms through which each individual (boy or girl) can contribute to this.

Limitations

The literature on menstruation is very sparse and limited to covering various aspects of menstruation in detail. It is a relatively new and growing area of interest for researchers, now also gathering attention from multiple disciplines. Our analysis is limited to the quantitative assessment of the relationship between socio-economic factors and women's knowledge levels on menstruation and the ovulatory cycle, since our study uses a nationally representative NFHS dataset. Secondly, our study sample is restricted to the age group of 15 to 24 years, because the sanitary item usage in NFHS-4 is limited to this age group. Lastly, the NFHS-4 survey did not ask the information on the menstrual cups. Thus, our final results might under-represent the population (even from the age group of 15–24) using hygienic sanitary items by a few percentage points. Despite these limitations, the study provides a factual reality of menstrual health

in India. Connecting the dots from the limited literature available and findings from our analysis do convey a strong message for the need to have comprehensive adolescent programs for improving menstrual health in India.

Conclusion

One of the most neglected areas in sexual and reproductive health is menstruation and its associated hygiene practices. Women in India have been living with numerous myths and taboos around menstruation, which they continue to pass on to their next generations. According to NFHS-4 data, approximately 20 percent of India's female population is in the age group of 15 to 24. Thus, it is imperative that women must get accurate and sustained knowledge to manage their menstrual cycles with proper hygiene. Another neglected issue within menstruation is the understanding of the ovulatory cycle, which can potentially prevent unplanned and adolescent pregnancies. This study provides a factual reality-based look on the menstruation health situation in India. The knowledge levels and usage of hygienic sanitary products were found to be poor, particularly amongst women, who are less educated, have less educated partners or husbands, belong to impoverished rural households, and lack access to media sources (traditional or modern). Further, merely 11% of the women in our sample were aware of the ovulatory cycles. These poor awareness levels are exacerbated by the myths and misconceptions that prevail within the society around menstruation, thereby making it a horrifying experience for many young girls in India.

While India is slowly gaining momentum in spreading awareness around menstruation through government schemes and programs and various initiatives of the civil society organizations, some targeted at the school level while others at the household level, there is still a long way to go. Menstruation is primarily seen as a gender issue. With gender disparities aggravated by the power imbalances within the households and the society, we strongly need to engage with boys and men in promoting MHM for their female family members and help in bursting the myths and taboos around menstruation. For school-based programs, the approach needs to go beyond just providing mid-day meals, clean toilets, and sanitary pads; and include revised curriculum, sensitization workshops, etc. that encourage open dialogues within the families and communities, and focus on behavioural change at a broader level.

Abbreviations

BV
Bacterial Vaginosis
MHM
Menstrual Hygiene Management
NFHS-4
National Family Health Survey Round 4
RTI

Reproductive Tract Infections
SDG
Sustainable Development Goals
SHG
Self Help Groups
TV
Trichomonas vaginalis

Declarations

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Both the authors have reviewed and approved the manuscript for publication.

Authors' contributions

KB conceived the study idea and did the data analysis, and drafted the manuscript. DS contributed in the editing and critical revision of the manuscript. Both the authors approve the final version of the manuscript.

Funding

There was no funding required for this project.

Availability of data and materials

The datasets analysed for the current study are available in the Demographic Health Survey (DHS) repository, <https://www.dhsprogram.com/data/available-datasets.cfm>, and is available upon request.

Ethics approval and consent to participate

We would like to thank Demographic and Health Survey team for providing us access to the data and consent to publish the manuscript.

Acknowledgements

Authors would like to thank Prof Devasmita Chakraverty, Assistant Professor, Indian Institute of Management Ahmedabad; Prof Pritha Dev, Assistant Professor, Indian Institute of Management, Ahmedabad; Kavya Menon, founder of Sustainable Menstruation, Tamil Nadu; Akansh Khandelwal, PhD Scholar, Indian Institute of Management, Indore for their review comments on the paper.

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Tables

Table 1: Descriptive Statistics for the key variables

Background Characteristics	Number	Percentage
Hygienic Sanitary Items Usage	139494	56.3%
Ovulatory Cycle Knowledge	28753	11.6%
Place of residence		
Urban	68459	27.6%
Rural	179374	72.4%
Religion		
Hindu	182356	73.6%
Muslim	38212	15.4%
Christian	16784	6.8%
Sikh	4710	1.9%
Others	5764	2.3%
Caste		
Scheduled Caste	46311	19.5%
Scheduled Tribe	44230	18.6%
OBC	99215	41.7%
None of them	46808	19.7%
Don't Know	1083	0.5%
Education Level of Respondent		
No Education	26627	10.7%
Primary	22233	9.0%
Secondary	163957	66.2%
Higher	35016	14.1%
Partner's Education Level		
No Education	2005	12.2%
Primary	2115	12.9%
Secondary	9995	60.8%
Higher	2261	13.7%
Don't Know	76	0.5%
Wealth Index		

Poorest	48015	19.4%
Poorer	56529	22.8%
Middle	54350	21.9%
Richer	48054	19.4%
Richest	40885	16.5%
Frequency of reading newspaper		
Not at all	125770	50.7%
Less than once a week	49887	20.1%
At least once a week	40574	16.4%
Almost everyday	31602	12.8%
Frequency of listening to radio		
Not at all	203436	82.1%
Less than once a week	16998	6.9%
At least once a week	16717	6.7%
Almost everyday	10692	4.3%
Frequency of watching television		
Not at all	55089	22.2%
Less than once a week	19350	7.8%
At least once a week	28848	11.6%
Almost everyday	144546	58.3%
Marital Status		
Never in union	152116	61.4%
Married	94034	37.9%
Widowed	417	0.2%
Divorced	491	0.2%
No longer living together	775	0.3%

Table 2: Odds ratio for the usage of hygienic methods for menstrual protection and ovulatory cycle knowledge

Age Group	Background Characteristics	Ovulatory Cycle Knowledge	
		Sanitary Items Usage	
		Odds Ratio	
	15-19		
	20-24	0.870**	1.258***
	Place of residence		
	Urban		
	Rural	0.767***	1.180**
	Religion		
	Hindu		
	Muslim	1.239***	1.204**
	Christian	2.593***	0.993
	Sikh	2.203***	6.901***
	Others	1.972***	1.034
	Caste		
	Scheduled Caste		
	Scheduled Tribe	0.806**	0.956
	OBC	0.888*	0.864*
None of them	1.073	1.041	
Don't Know	1.143	0.993	
Education Level of Respondent			
No Education			
Primary	1.464***	1.159.	
Secondary	2.231***	1.207*	
Higher	4.614***	1.412**	
Partner's Education Level			
No Education			
Primary	1.051	1.019	
Secondary	1.347***	1.104	

Higher	1.906***	1.090
Don't Know	1.329	0.352*
Wealth Index		
Poorest		
Poorer	1.589***	1.155.
Middle	2.723***	1.254**
Richer	3.701***	1.365**
Richest	6.226***	1.508***
Frequency of reading newspaper		
Not at all		
Less than once a week	1.279***	1.048
At least once a week	1.620***	1.044
Almost everyday	1.819***	1.075
Frequency of listening to radio		
Not at all		
Less than once a week	0.945	0.956
At least once a week	1.029	0.835.
Almost everyday	1.519***	1.066
Frequency of watching television		
Not at all		
Less than once a week	1.272**	1.245*
At least once a week	1.358***	1.244**
Almost everyday	1.743***	1.345***
Marital Status		
Married		
Living with Partner	1.255.	2.538***
Widowed	0.715	0.879
Divorced	0.685	2.364*
No longer living together	0.734	2.300*
Constant	.107***	0.032***

Figures

Figure 1

Hygienic Sanitary Item Usage across different wealth sections

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