



# Association between Menstrual Hygiene Management Practices and Lower Reproductive Tract Infections Among Women Aged 15–49 in Karachi: A Comparison of Sanitary Pads and Cloth Users

Aieman Haroon<sup>1</sup> Sameera Ali Rizvi<sup>2</sup>, Syeda Tabeena Ali<sup>2</sup>, Syed Azizur Rab<sup>1</sup>, Fawad Shamim<sup>1</sup>  
Nida Shoaib<sup>2</sup>

## Abstract

**Background:** This study aimed to assess the association between menstrual hygiene management (MHM) practices and symptoms of lower reproductive tract infections (LRTIs) among women aged 15–49 who use either sanitary pads or cloth, attending selected family health centers in Karachi.

**Methodology:** An analytical cross-sectional study was conducted from October 2022 to June 2023, involving 487 women aged 15–49. Data on sociodemographic, MHM practices, and LRTI symptoms were collected using a structured questionnaire. Nonrandom, purposive sampling was used to recruit participants from 12 family health centers in Karachi.

**Results:** The majority of participants (75.4%) were aged 25–49 years, with 51.0% using cloth and 49.0% using sanitary pads. Overall, 49.9% reported using appropriate MHM materials, including sanitary pads. Sanitary pad users were 0.644 times less likely to report LRTI symptoms (95% CI: 0.447–0.929;  $p = 0.018$ ). Additionally, those who changed pads or cloth after more than eight hours were 2.008 times more likely to develop LRTI symptoms (95% CI: 1.335–3.005). Other factors such as prolonged menstrual blood flow, frequency of material change, bathing practices, and use of underwear during menstruation were associated with LRTIs.

**Conclusion:** The study underscores that 49.9% of participants reported using appropriate MHM materials, with sanitary pad use being protective against LRTIs. The findings emphasize the role of hygiene practices, including material type, change frequency, bathing, and underwear use, in mitigating LRTIs among women of reproductive age.

**Keywords:** Menstrual hygiene; reproductive tract infections; menstruation; reproductive age; women's health; hygiene practices

**How to cite this article:** Haroon A, Rizvi SA, Ali ST, Rab SA, Shamim F, Shoaib N. Association between Menstrual Hygiene Management Practices and Lower Reproductive Tract Infections Among Women Aged 15–49 in Karachi: A Comparison of Sanitary Pads and Cloth Users. Pak J Public Health 2024 Dec. 28;14(4):250–5. Available from: <https://pjph.org/pjph/article/view/1437> DOI: <https://doi.org/10.32413/pjph.v14i4.1437>

<sup>1</sup> Greenstar Social Marketing Pakistan, (Guarantee) Limited Karachi, Pakistan.

<sup>2</sup> Department of Public Health, SZABIST University Karachi, Pakistan

## Correspondence:

Syeda Tabeena Ali  
[tabeena95@gmail.com](mailto:tabeena95@gmail.com)

**Submitted:** 04-06-2023

**Revised:** 05-09-2024

**Accepted:** 09-10-2024

**Published:** 28-12-2024

## Introduction

Menstrual Hygiene Management (MHM) practices differ by socio-cultural environment, level of education and financial status, and there is extensive variation in MHM practices among and within countries (1, 2). MHM is reflected by practices like the type of absorptive material used and the rate of change, related to body washing, the procedures of washing, drying and storage of reusable pads/cloths as well as further related factors, such as the site of menstruation associated changing and washing practices. These procedures can be inclined by Water, Sanitation and Hygiene (WASH) facilities at the domestic level, and the quality, and access to, these conveniences differ suggestively among and within countries (3). MHM practices could be unhygienic and difficult, mainly in

facilities-constrained locations, with underprivileged WASH access (4), and be related to severe reproductive tract infections BV, and vulvovaginal candidiasis (4) and with mental and social stress outcomes (5).

Infections, including Bacterial Vaginosis (BV), are prevalent due to inadequate MHM practices, with studies showing the impact on women's reproductive health (6–7). Lack of MHM practices leads to low-to-severe Lower RTIs, affecting 62.4% of women, with prevalent infections such as BV, Candida, and Trichomonas Vaginalis (8).

According to the World Bank, 48.5% of the population is women, with 49% in the reproductive age of 15–49 (8,9). Out of these, 42 million are school-age girls, but only 17% have access to sanitary napkins, and 66% use cloth during menstruation (10). Additionally, 79% of these girls lack access to

private facilities for menstrual management. The concept of puberty is traditionally passed down, and youth rely on the internet, friends, and family for information (11).

Nearly 60% of women in Pakistan use cloth during their menstrual cycle. Financial and sociocultural constraints worsen period poverty, highlighting the need for a multisectoral approach and MHM interventions (12). Pakistan's 12% tax on sanitary napkins makes them a luxury product. (13-14).

The usage of old clothes to deal with menstruation is a widely used practice reported by African and South Asian countries (15). The recycling of old cloth for several months was reported in South Asia countries (15). This presents a high risk of infections and other outcomes (15,16). A systematic review and meta-analysis of 138 articles on menstruation practices in India reported that usage of commercially prepared sanitary pads was infrequent among women found in rural areas (PP 32%, 95% CI: 25–38%, I<sup>2</sup>: 98.6%,  $n = 56$ ,  $p < 0.0001$ ) associated to urban (PP: 67%, 95% CI: 57–76%, I<sup>2</sup>: 99.3%,  $n = 38$ ) (17). of the limited studies that were conducted in Pakistan reported restricted usage of suitable MHM practices during menstruation.

To the best of our knowledge limited work has been done in Karachi on MHM, and the published work mainly emphasis on knowledge and practices. The MHM-associated lower reproductive tract infections and their interventions were overlooked by healthcare higher management and policymakers (18). MHM is the basic requirement of a women and need in every facility related to women (19). the inadequate data and understanding of MHM practices associated with lower reproductive tract infections assessments in Pakistan. The study aimed to determine the Association between MHM practices and lower reproductive tract infections among women aged 15-49, using either sanitary pads or cloth, at selected family health centers in Karachi. Identify the risk factors that are associated with Lower reproductive infections.

## Methodology

An analytical cross-sectional study was conducted from October 2022 to June 2023 in 12 Family Health Centers under Greenstar Social Marketing Network in Karachi. A non-probability purposive sampling technique was utilized to select single or married women of reproductive age (15-49 years) for this study. Women were selected based on the eligibility criteria that were related to the study objective and data were collected by using a structured questionnaire.

Women of reproductive age ranging 15-49 years, using cloth or sanitary pads during menstruation were included while menopausal, pre-menarche, pregnant, mentally compromised women, and those refusing informed consent were excluded from this study. The sample size was estimated using the OpenEpi sample size calculator by

taking the following statistics among sanitary pad users and cloth users (7), with the power of test 80% and 95% confidence level.

|                          |                               |                   |
|--------------------------|-------------------------------|-------------------|
| Bacterial vaginosis (BV) | Pad= 43.23%,<br>Cloth= 56.77% | 217 in each group |
|--------------------------|-------------------------------|-------------------|

Since the estimated sample size was highest for BV, 217 women of reproductive age were enrolled in each group. By inflating the sample size by 10%, approximately 239 women of reproductive age in each group were recruited. The estimated minimum sample size was 487. SPSS version 21 was used for data analysis. Qualitative variables are represented through frequencies and percentages. Chi-square test/Fisher exact test used for comparison. The odds ratio and 95% confidence interval were calculated. Significance considered at  $p \leq 0.05$ .

Verbal and written consent was obtained before data collection. Confidentiality is ensured with unique study identifiers. Participant privacy and integrity were maintained throughout. Participation was voluntary, with the right to refuse at any time. Data were recorded by the researcher, and stored securely, and formal approval was obtained from SZABIST University and Greenstar Social Marketing.

## Results

Table 1 summarizes the socioeconomic and demographic characteristics distribution of women of reproductive age. These women were divided into two equal groups based on the sanitary product they used. The data were collected across six districts of Karachi

The age of women in our study ranged from 15-49 years the majority of the women (75.4%) were between the ages of 25-49 years, of which 51.0% were cloth users, and 49.0% used sanitary pads. With regards to marital status, 89.5% of women were married, and 10.5% were single. 91.8% of married women were sanitary pad users, whereas 87.3% used cloth. Amongst single respondents, 12.7% were cloth users. Regarding their education, 37.2% of respondents had done matriculation, of which 39.1% were sanitary pad users and 35.2% used cloth. 12.1% of women had no education, of which 17.6% and 6.6% used cloth and sanitary pads, respectively. Only 7.8% of women had acquired higher education, of which 10.7% preferred sanitary pads, and 4.9% used cloth. According to Ethnicity, 75.2% of women were Urdu speaking, of which 78.2% were sanitary pad users. The second largest ethnic community was Punjabi (6.6%) of which 9% were cloth users. In the Pathan community, 9% of women used cloth.

Regarding income and occupation of father/husband, (92%) earned less than  $\leq 50000$  PKR, where 51.8% of respondents were cloth users and 48.2% used sanitary pads. respectively. 49.7% of bread earners were blue-collar of which 63.6% responded used cloth. 46.8% of

white-collar breadwinners had 50.3%, whereas 63.3% of women were sanitary pad users.

Regarding the practices and perceptions of women, of the total women, 48.2% purchased sanitary products in the monthly grocery, of which 58% of women used sanitary pads while 38.5% also used cloth. Around 21.4% of women exclusively used cloth. The majority of 54.4% of women required less than three sanitary products with 55.7% of women using cloth, and 53.1% using sanitary pads. Regarding the frequency of changing sanitary products, 66.9% of women reported changing products in over 8-hour intervals, of which 68% used cloth and 65.8% used sanitary pads. In the >8-hour change group, 34.2% used sanitary pads and 32% used cloth. Of the 487 respondents, 72.3% of women did not wear underwear. Of these, 75% of women used cloth, and 69.5% were sanitary pad users. Approximately, 59.5% of women did not bath during periods, of which 54.7% used sanitary pads and 64.3% used cloth.

**Table 1: Demographic profile and menstrual hygiene practices of respondents (women of reproductive age (15-49)) coming in selected Family Health Centers in Karachi (n=487)**

| Categories                              | Total<br>N = 487 | Sanitary<br>Pad Users | Cloth<br>Users |
|-----------------------------------------|------------------|-----------------------|----------------|
|                                         | 487              | 243<br>(49.9%)        | 244<br>(50.1%) |
| <b>Age in years</b>                     |                  |                       |                |
| 15-24 years                             | 120<br>(24.6%)   | 63<br>(25.93%)        | 57<br>(47.5%)  |
| 25-49 years                             | 367<br>(75.4%)   | 180<br>(74.07%)       | 187<br>(51.0%) |
| <b>Marital status</b>                   |                  |                       |                |
| Married                                 | 436<br>(89.5%)   | 223<br>(91.8%)        | 213<br>(87.3%) |
| Single                                  | 51<br>(10.5%)    | 20<br>(8.2%)          | 31<br>(12.7%)  |
| <b>Fathers/Husband's monthly income</b> |                  |                       |                |
| ≤50,000                                 | 448<br>(92%)     | 216<br>(88.89%)       | 232<br>(51.8%) |
| >50,000*                                | 39<br>(8.0%)     | 27<br>(11.11%)        | 12<br>(30.8%)  |
| <b>Fathers/Husband's occupation</b>     |                  |                       |                |
| Blue collar                             | 242<br>(49.7%)   | 88<br>(36.4%)         | 154<br>(63.6%) |
| White collar                            | 245<br>(50.3%)   | 155<br>(63.3%)        | 90<br>(36.7%)  |
| <b>Ethnicity</b>                        |                  |                       |                |
| Urdu                                    | 369<br>(75.8%)   | 191<br>(78.6%)        | 178<br>(73%)   |
| Punjabi                                 | 39<br>(8%)       | 17<br>(7%)            | 22<br>(9%)     |
| Pathan                                  | 32<br>(6.6%)     | 18<br>(7.4%)          | 22<br>(9%)     |
| Sindhi                                  | 35<br>(7.2%)     | 7<br>(2.9%)           | 17<br>(7%)     |
| Balochi                                 | 12<br>(2.5%)     | 14<br>(5.8%)          | 5<br>(2%)      |

| Categories                                         | Total<br>N = 487 | Sanitary<br>Pad Users | Cloth<br>Users |
|----------------------------------------------------|------------------|-----------------------|----------------|
|                                                    | 487              | 243<br>(49.9%)        | 244<br>(50.1%) |
| <b>Education of women</b>                          |                  |                       |                |
| No education                                       | 59<br>(12.1%)    | 16<br>(6.6%)          | 43<br>(17.6%)  |
| Primary                                            | 48<br>(9.9%)     | 14<br>(5.8%)          | 34<br>(13.9%)  |
| Secondary                                          | 38<br>(7.8%)     | 14<br>(5.8%)          | 24<br>(9.8%)   |
| Matriculation                                      | 181<br>(37.2%)   | 95<br>(39.1%)         | 86<br>(35.2%)  |
| Intermediate                                       | 123<br>(25.3%)   | 78<br>(32.1%)         | 45<br>(18.4%)  |
| Higher Education                                   | 38<br>(7.8%)     | 26<br>(10.7%)         | 12<br>(4.9%)   |
| <b>MENSTRUAL HYGIENE PRACTICES</b>                 |                  |                       |                |
| <b>Purchase of Pads</b>                            |                  |                       |                |
| Someone Provides                                   | 71<br>(14.6%)    | 55<br>(22.6%)         | 16<br>(6.6%)   |
| Monthly Grocery                                    | 235<br>(48.2%)   | 141<br>(58%)          | 94<br>(38.5%)  |
| Myself                                             | 77<br>(15.8%)    | 47<br>(19.3%)         | 30<br>(12.3%)  |
| Cloth Users                                        | -                | -                     | 104<br>(21.4%) |
| <b>Frequency of changing sanitary products</b>     |                  |                       |                |
| Every 4-8 hours                                    | 161<br>(33.1%)   | 83<br>(34.2%)         | 78<br>(32%)    |
| More than 8 hours                                  | 326<br>(66.9%)   | 160<br>(65.8%)        | 166<br>(68%)   |
| <b>Use of underwear during menstruation</b>        |                  |                       |                |
| Yes                                                | 352<br>(72.3%)   | 169<br>(69.5%)        | 183<br>(75%)   |
| No                                                 | 135<br>(27.7%)   | 74<br>(30.5%)         | 61<br>(25%)    |
| <b>Daily bathing practices during menstruation</b> |                  |                       |                |
| Yes                                                | 290<br>(59.5%)   | 133<br>(54.7%)        | 157<br>(64.3%) |
| No                                                 | 197<br>(40.5%)   | 110<br>(45.3%)        | 87<br>(35.7%)  |

Table 2 shows the association between types of sanitary products used with symptoms of lower reproductive tract infections. The majority of participants in this study were clothes users. Sanitary pad users were 0.688 (CI:0.48-0.985) times less likely to experience foul smell with symptoms of lower reproductive tract infections as compared to cloth users with a p-value of 0.041. Sanitary pad users were 0.667 (CI: 0.467-0.954) times less likely to experience painful micturition with symptoms of lower reproductive tract infections as compared to cloth users with a p-value of 0.026.

**Table 2: Association of Types of Sanitary Products with symptoms of lower reproductive tract Infections (n=487)**

| Type of Sanitary Product | Symptoms of Lower Reproductive Tract Infections |             | OR    | 95% Confidence Interval |       | P-Value |
|--------------------------|-------------------------------------------------|-------------|-------|-------------------------|-------|---------|
|                          | Yes                                             | No          |       | Lower                   | Upper |         |
|                          | Abnormal Vaginal Discharge                      |             |       |                         |       |         |
| Sanitary Pad*            | 116 (47.7%)                                     | 127 (52.3%) | 0.871 | 0.609                   | 1.241 | 0.441   |
| Cloth                    | 125 (51.2%)                                     | 119 (48.8%) |       |                         |       |         |
|                          | Itch                                            |             |       |                         |       |         |
| Sanitary Pad*            | 117 (48.1%)                                     | 102 (41.8%) | 0.774 | 0.541                   | 1.106 | 0.159   |
| Cloth                    | 126 (51.9%)                                     | 142 (58.2%) |       |                         |       |         |
|                          | Foul Smell                                      |             |       |                         |       |         |
| Sanitary Pad*            | 124 (51%)                                       | 119 (49%)   | 0.688 | 0.48                    | 0.985 | 0.041*  |
| Cloth                    | 147 (60.2%)                                     | 97 (39.8%)  |       |                         |       |         |
|                          | Rashes                                          |             |       |                         |       |         |
| Sanitary Pad*            | 132 (54.3%)                                     | 111 (45.7%) | 0.812 | 0.567                   | 1.163 | 0.255   |
| Cloth                    | 145 (59.4%)                                     | 99 (40.6%)  |       |                         |       |         |
|                          | Painful Micturition                             |             |       |                         |       |         |
| Sanitary Pad*            | 104 (42.8%)                                     | 139 (57.2%) | 0.667 | 0.467                   | 0.954 | 0.026*  |
| Cloth                    | 129 (52.9%)                                     | 115 (47.1%) |       |                         |       |         |
|                          | Urinary Tract Infection                         |             |       |                         |       |         |
| Sanitary Pad*            | 123 (50.6%)                                     | 120 (49.4%) | 0.855 | 0.599                   | 1.221 | 0.391   |
| Cloth                    | 133 (54.5%)                                     | 111 (45.5%) |       |                         |       |         |

Table3 shows the association between inadequate menstrual hygiene management practices and Symptoms of Lower Reproductive Tract Infections. In this study, 487 women were grouped into two categories, 15-24 years and 25- 49 years. The majority of participants in this study, 367 (75.4%) belonged to the age group 25-49 years. The Odds Ratio (OR) for women aged was 1.018 (95% CI = 0.674-1.539), indicating an association between younger ages 15-24 years and increased odds of developing Lower Reproductive Tract Infections. The p-value for this association was 0.508 which is statistically insignificant. Additionally, most participants, 448 (92%), had a monthly household income of ≤50,000 and an increased number of infected participants was seen in household income of ≤50,000 182 (55.0%) followed by blue-collar 131 (54.4%)

as compared to >50,000 monthly income and white-collar participants.

Overall, 49.9% of participants reported the use of an appropriate MHM material including sanitary pads, the use of sanitary pads was found to be significantly associated with LRTIs, ( $p < 0.05$ ), and the odds of developing LRTIs were 0.644 times (CI: 0.447-0.929) less likely as compared to those women who used cloths. Women whose blood flow days were 1 to 2 days were 0.614 times (CI: 0.426-0.884) less likely to develop LRTIs as compared to those whose blood flow was more than 2 days (p-value 0.006). The frequency of change of sanitary pad/cloth more than 8 hours was 2.008 times (CI: 1.335-3.005) higher to develop LRTIs as compared to those who change sanitary pad/cloth in 4-8 hours (p-value 0.001).

**Table 3: Factors associated with inadequate Menstrual Hygiene Management Practices and Lower Reproductive Tract Infections (n=487)**

| Variables                                     |             | Symptoms of Lower Reproductive Tract Infections |       | OR    | 95% Confidence Interval |        | P-Value |
|-----------------------------------------------|-------------|-------------------------------------------------|-------|-------|-------------------------|--------|---------|
|                                               |             | Yes                                             | No    |       | Lower                   | Upper  |         |
| Age in years                                  |             |                                                 |       |       |                         |        |         |
| 15-24 years                                   | 63(52.5%)   | 57(47.5%)                                       | 1.018 | 0.674 | 1.539                   | 0.508  |         |
| 25-49 years*                                  | 191(52.0%)  | 176 (48.0%)                                     |       |       |                         |        |         |
| Father/Husband's monthly income               |             |                                                 |       |       |                         |        |         |
| ≤50,000                                       | 182 (55.0%) | 148 (44.7%)                                     | 0.596 | 0.302 | 1.117                   | 0.090  |         |
| >50,000*                                      | 51 (40.5%)  | 74(58.7%)                                       |       |       |                         |        |         |
| Fathers/Husband's occupation                  |             |                                                 |       |       |                         |        |         |
| Blue collar                                   | 131 (54.4%) | 110 (45.6%)                                     | 1.153 | 0.808 | 1.646                   | 0.244  |         |
| White collar*                                 | 125(50.8%)  | 121 (49.2%)                                     |       |       |                         |        |         |
| Blood flow days                               |             |                                                 |       |       |                         |        |         |
| 1-2 days*                                     | 135 (47.5%) | 149 (52.5%)                                     | 0.614 | 0.426 | 0.884                   | 0.006* |         |
| 3-4 days                                      | 121(59.6%)  | 82 (40.4%)                                      |       |       |                         |        |         |
| Type of sanitary product (sanitary pad/cloth) |             |                                                 |       |       |                         |        |         |
| Sanitary Pad*                                 | 135 (55.6%) | 108 (44.4%)                                     | 0.644 | 0.447 | 0.929                   | 0.018* |         |
| Cloth                                         | 161 (66%)   | 83 (34%)                                        |       |       |                         |        |         |
| Frequency of change of sanitary pad/cloth     |             |                                                 |       |       |                         |        |         |
| 4-8 hours*                                    | 115 (71.4%) | 46 (28.6%)                                      | 2.003 | 1.335 | 3.005                   | 0.001* |         |
| More than 8 hours                             | 181 (55.5%) | 145 (44.5%)                                     |       |       |                         |        |         |

Table 4 shows that taking a bath during menstruation was found to be significantly associated with LRTIs, ( $p < 0.05$ ), followed by using underwear during menstruation ( $p < 0.05$ ).

**Table 4: Association of bathing practices and use of underwear with symptoms of lower reproductive tract infections (n=487)**

| Variables                                   | Symptoms of Lower Reproductive Tract Infections | 95% Confidence Interval |       | P-Value |        |
|---------------------------------------------|-------------------------------------------------|-------------------------|-------|---------|--------|
|                                             |                                                 | Lower                   | Upper |         |        |
| Daily bathing practices during menstruation |                                                 |                         |       |         |        |
|                                             | Yes                                             | No                      |       |         |        |
| Yes                                         | 11<br>(5.6%)                                    | 186<br>(94.4%)          | 0.001 | 0.003*  | 0.001* |
| No                                          | 285<br>(98.3%)                                  | 5<br>(1.7%)             |       |         |        |
| Use of underwear during menstruation        |                                                 |                         |       |         |        |
| Yes                                         | 15<br>(11.1%)                                   | 120<br>(88.9%)          | 0.017 | 0.057   | 0.001* |
| No                                          | 281<br>(9.8%)                                   | 71<br>(20.2%)           |       |         |        |

## Discussion

Menstrual Hygiene practices globally are associated with taboos. According to WHO, 500 million women worldwide do not have access to menstrual Health and Hygiene (1). The existing literature recommends that several socio-cultural and structural reasons are significant to why countless girls and women living in LMICs regularly do not exercise proper MHM (19,20). Particularly, within South Asia, MHM is generally excluded from public substructure strategy and public health promotion campaigns, and there are inadequate guidelines for healthcare workers.

The study identified a significant association between poor MHM and LRTIs as 66% of the women reported infection while using clothes as compared to sanitary pads users. Another study conducted in India reported a strong association between poor MHM and LRTIs. In our study, more frequent changing of sanitary pads/cloth, and underwear during menstruation were significantly associated with a lower risk of LRTIs. Relating studies suggest that Lactobacilli grows in the vagina if a sanitary product is used or reused for long intervals, which can lead to infections having symptoms such as Itch, Foul smell, Rashes, and pain during urination (7,21).

Bathing during menstruation should be an essential practice. This study found a strong association between the women who did not bath and lower reproductive tract infections. The infections were prevalent in women who did not bathe during their menstrual cycle. Similar results have been reported in a study conducted in North Karnataka, India (22). Another study in Pakistan reported, that 58.2% of the participants did not take a bath

during menstruation. Several societies limit menstruating females from many activities such as preparation of food, religious gatherings, and taking bath (22).

In our study, monthly income had an association with the LRTI participants who have monthly income  $\leq 50,000$  are more likely to have lower reproductive tract infection as compared to those who had  $>50,000$  monthly income. Economically is a restriction to the use of suitable MHM materials, especially in LMICs (12,23). Several studies have been conducted in African and Asian countries that have recommended the proper use of MHM supplies. Most findings were from school-based studies (12,23). The limitations of this study were its cross-sectional design and the inability to establish a cause-effect relationship between Menstrual Health Hygiene and lower reproductive tract infections. Limited by funding constraints, medical tests were not conducted. Additionally, sanitary products couldn't be provided to women in need, especially clothing users, for the same reasons. However, medical advice was offered, and immediate help/referral was provided for severe discomfort. The study primarily comprised married women, as fewer single women visited Family Health Centers. As the study was family planning centre-based and it did not include the broader population, especially not so many single women therefore it affected the generalizability of the study.

## Conclusion

Our study shows that the prevalence of 49.9% of participants who reported the use of an appropriate MHM material during menstruation. The use of sanitary pads was found to be protective against LRTIs. Factors such as blood flow days, duration of change of sanitary pad/cloth, taking a bath and using underwear during menstruation were also found to be associated with LRTIs. The study highlights the need for safe, and affordable menstrual hygiene products, emphasizing the importance of robust national and provincial policies to address reproductive health challenges through education and capacity-building, especially targeting the youth.

### Ethical Approval:

This study was approved by Institutional Ethical Review Board of SZABIST Karachi.

Ref. No. IERB(13)/SZABIST-KHI(PH)/21104190/220152  
Date: 23-12-2022

**Financial support and sponsorship:** None

**Conflict of interest:** None declared.

### Authors' Contribution:

**AH:** Developed the research protocol and designed it.

**SAR:** Supervision and reviewing & editing

**STA:** Statistical analysis and manuscript formation



**SA and FS:** The final review of the draft and proofread it.

**SA, FS and NS:** The final review of the draft and proofread it.

All authors reviewed the manuscript

## References

- Kamga, Y.M., Ngunde, J. & Akoachere, J.F.K.T. Prevalence of bacterial vaginosis and associated risk factors in pregnant women receiving antenatal care at the Kumba Health District (KHD), Cameroon. *BMC Pregnancy Childbirth* 19, 166 (2019). <https://doi.org/10.1186/s12884-019-2312-9>
- Uzoечи, C.A.; Parsa, A.D.; Mahmud, I.; Alasqah, I.; Kabir, R. Menstruation among In-School Adolescent Girls and Its Literacy and Practices in Nigeria: A Systematic Review. *Medicina* 2023, 59, 2073. <https://doi.org/10.3390/medicina59122073>
- Sommer, M., Skolnik, A., Ramirez, A., Lee, J., Rasoazanany, H., & Ibitoye, M. (2019). Early Adolescence in Madagascar: Girls' Transitions Through Puberty in and out of School. *The Journal of Early Adolescence*. <https://doi.org/10.1177/0272431619847529>
- Sumpter, C., & Torondel, B. (2013). A systematic review of the health and social effects of menstrual hygiene management. *PloS one*, 8(4), e62004. <https://doi.org/10.1371/journal.pone.0062004>
- Hulland KR, Chase RP, Caruso BA, Swain R, Biswal B, Sahoo KC, Panigrahi P, Dreifelbis R. Sanitation, Stress, and Life Stage: A Systematic Data Collection Study among Women in Odisha, India. *PLoS One*. 2015 Nov 9;10(11):e0141883. doi: 10.1371/journal.pone.0141883. PMID: 26551866; PMCID: PMC4638353.
- Nchimbi, D. B., & Joho, A. A. (2022). Puerperal sepsis-related knowledge and reported self-care practices among postpartum women in Dar es salaam, Tanzania. *Women's Health*. <https://doi.org/10.1177/17455057221082954>
- Torondel, B., Sinha, S., Mohanty, J.R. et al. Association between unhygienic menstrual management practices and prevalence of lower reproductive tract infections: a hospital-based cross-sectional study in Odisha, India. *BMC Infect Dis* 18, 473 (2018). <https://doi.org/10.1186/s12879-018-3384-2>
- Mudi, P.K., Pradhan, M.R. & Meher, T. Menstrual health and hygiene among Juang women: a particularly vulnerable tribal group in Odisha, India. *Reprod Health* 20, 55 (2023). <https://doi.org/10.1186/s12978-023-01603-1>
- Pakistan Bureau of Statistics. Census [Internet]. Pakistan Bureau of Statistics. 2017. Available from: <https://www.pbs.gov.pk/content/final-results-census-2017>
- Eisha Abid. How the taboo around menstruation affects the education of young girls [Internet]. Available from: [https://cbs.lums.edu.pk/sites/default/files/2021-11/Eisha Abid.pdf](https://cbs.lums.edu.pk/sites/default/files/2021-11/Eisha%20Abid.pdf)
- Kamran I, Niazi RM, Khan K, Abbas F. Situation analysis of reproductive health of adolescents and youth in Pakistan. 2019. Available from: <https://api.semanticscholar.org/CorpusID:213836833>
- Wasan Y, Baxter JB, Rizvi A, et al. Practices and predictors of menstrual hygiene management material use among adolescent and young women in rural Pakistan: A cross-sectional assessment. *J Glob Health*. 2022 Aug 10;12:04059. doi: 10.7189/jogh.12.04059. PMID: 35908217; PMCID: PMC9339234.
- CBEC. Press Release on GST rate for Sanitary Napkins . :9619. Available from: <https://cbic-gst.gov.in/pdf/press-release/CBEC-Press-Release-dt10072017-Sanitary-Napkins.pdf>
- Nayab, D. (2005). Reproductive Tract Infections among Women in Pakistan: An Urban Case Study. *The Pakistan Development Review*, 44, 131-158.
- Sommer, M. (2012). Menstrual hygiene management in humanitarian emergencies: Gaps and recommendations. *Waterlines*, 31(1/2), 83-104. DOI: 10.3362/1756-3488.2012.008. Available at: <http://www.jstor.org/stable/24686762>
- Hennegan J, Shannon AK, Rubli J, et al. Women's and girls' experiences of menstruation in low- and middle-income countries: A systematic review and qualitative metasynthesis. *PLoS Med*. 2019 May;16(5): e1002803. doi: 10.1371/journal.pmed.1002803
- Van Eijk AM, Sivakami M, Thakkar MB, et al. Menstrual hygiene management among adolescent girls in India: a systematic review and meta-analysis. *BMJ Open*. 2016 Mar;6(3): e010290.
- Ali TS, Rizvi SN. Menstrual knowledge and practices of female adolescents in urban Karachi, Pakistan. *J Adolesc*. 2010 Aug;33(4):531-541. <https://doi.org/10.1016/j.adolescence.2009.05.013>
- Sommer M, Caruso BA, Sahin M, Calderon T, Cavill S, Mahon T, et al. A Time for Global Action: Addressing Girls' Menstrual Hygiene Management Needs in Schools. *PLoS Med*. 2016 Feb 23;13(2):e1001962. doi: 10.1371/journal.pmed.1001962. PMID: 26908274; PMCID: PMC4764363.
- van Eijk AM, Sivakami M, Thakkar MB, et al. Menstrual hygiene management among adolescent girls in India: a systematic review and meta-analysis. *BMJ Open*. 2016 Mar;6(3):e010290. doi: 10.1136/bmjopen-2015-010290.
- Chen Y, Bruning E, Rubino J, Eder SE. Role of female intimate hygiene in vulvovaginal health: Global hygiene practices and product usage. *Womens Health (Lond)*. 2017 Dec;13(3):58-67. doi: 10.1177/1745505717731011. Epub 2017 Sep 22. PMID: 28934912; PMCID: PMC7789027.
- Yaliwal RG, Biradar AM, Kori SS, Mudanur SCR, Puji SU, Shahnawaz M. Menstrual morbidities, menstrual hygiene, cultural practices during menstruation, and WASH practices at schools in adolescent girls of North Karnataka, India: A cross-sectional prospective study. *BLDE Univ J Health Sci*. 2020 Dec;5(Suppl 1):S44. doi: 10.4103/2468-838X.303803.
- Michael J, et al. Knowledge and practice of adolescent females about menstruation and menstruation hygiene visiting a public healthcare institute of Quetta, Pakistan. *BMC Womens Health*. 2020 Jan 6;20(1):4. doi: 10.1186/s12905-019-0874-3. PMID: 31906921; PMCID: PMC6945726.