

Research

Overview of menstrual hygiene management and other risk factors concerning bacterial vaginosis

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Abstract

Background Bangladesh is a developing nation where, for a variety of reasons, adequate female reproductive health is not maintained. A variety of health issues, including but not limited to bacterial vaginosis, pelvic inflammatory disease, and cervical cancer, plague Bangladeshi women.

Methods The study employed a one-year cross-sectional design, combining a quantitative participatory approach. It was conducted at two healthcare facilities, AK Memorial Hospital in Maona, Gazipur, and Lubana General Hospital & Uttara Cardiac Centre, involving 244 voluntary participants. Among them, 153 women meeting specific inclusion criteria (reproductive and menopausal age, bacterial vaginosis diagnosis) were selected, while those with a negative bacterial vaginosis (BV) diagnosis were excluded. Data collection primarily occurred in the outpatient department, with participants covering a wide age range and representing diverse socioeconomic and educational backgrounds, ensuring the study's findings were comprehensive and representative.

Results 65.4% of the BV-positive women were married. It was observed that married women were more susceptible to BV than unmarried women. The study also revealed that poor menstrual hygiene was the leading cause of BV. Around 81% of women had poor menstrual hygiene, whereas 68% of them changed their absorbents more than once or twice a day.

Keywords Bacterial vaginosis · Amsel criteria · Menstrual hygiene · Menstrual absorbent · Absorbent change rate

1 Introduction

An imbalance of the bacteria typically found in the vagina leads to vaginal irritation, known as bacterial vaginosis [1]. Bacterial vaginosis (BV) most commonly affects women in their reproductive years. However, it can afflict women of any age [2]. Half of all women have symptoms such as a foul odour, discharge, itching, and an elevated vaginal PH [3]. Bacterial vaginosis is a common condition that can affect as many as 30% of women of reproductive age all over the world [4]. Bacterial vaginosis affects around 23% of women in Europe and Central Asia, 24% in East Asia and the Pacific, 24% in Latin America and the Caribbean, 25% in the Middle East and North Africa, 25% in sub-Saharan Africa, 27% in North America, and 29% in South Asia. The estimated annual global economic burden of treating symptomatic BV is between \$3.7 and \$6.1 billion (95% confidence interval).

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The reproductive health of many women in Bangladesh is negatively impacted by bacterial vaginosis. It has been reported that 38.09% of women in Bangladesh who go to reproductive health clinics are infected with BV, making this a significant problem for the country's public health [5]. The high rate of BV in Bangladesh is likely due to a combination of reasons. The absence of hygienic facilities, clean water, and menstrual hygiene products for women is a significant contributor to the widespread problem of improper menstrual hygiene management [6]. Cultural stigmas and taboos around menstruation might also discourage women and girls from seeking help for managing their periods [7].

Bacterial vaginosis (BV) is a matter of public health concern in Bangladesh due to its potential to result in a range of complications, such as preterm labour, pelvic inflammatory disease, and sexually transmitted infections. [i] Bacterial vaginosis (BV) is correlated with an elevated likelihood of maternal and neonatal infections, which may be sent from the colonised vaginal tract of the mother [8]. Bacterial vaginosis (BV) has been found to facilitate.

and expedite the emergence of antibiotic resistance potentially accelerate, facilitate the transmission of antibiotic-resistant bacteria to humans, elicit allergic reactions, and induce various other serious pathologies, including but not limited to cancers, anaphylactic shock, nephropathy, bone marrow toxicity, mutagenic effects, and reproductive disorders [9]. Despite the high prevalence and devastating consequences of BV in Bangladesh, women and healthcare providers lack awareness and comprehension of the condition. This lack of knowledge may lead to delayed diagnosis and treatment, which can have serious health consequences, including pelvic inflammatory disease and infertility [10]. However, due to different study designs and methods of data collection worldwide, the interpretation of data is rather complex. Specifically, there is a substantial considerable variance in geographical locations, ranging from urban to rural areas, socio-economic statuses (low-income, middle income, and high-end income), educational backgrounds, religious practices, cultural customs, etc., among the developed and developing countries. It can hence be argued that not only does the variance play across the development levels of nations but also within the same level, meaning inter-country differences also prevail and are a barrier to setting a standard for data interpretation. In general, female reproductive health depends on the factors mentioned above. Each patient individually shows signs of different symptoms and faces various complications regarding the variation of the factors causing the disease. For instance, most non-sexually transmitted reproductive tract diseases are linked to the level of menstrual health management [11].

The rationale for researching 'Overview of Menstrual Hygiene Management and Other Risk Factors about Concerning Bacterial Vaginosis' is multifaceted and compelling. Bacterial vaginosis (BV) is a widespread issue in Bangladesh, with a high prevalence rate and even higher rates observed in urban reproductive health clinics. BV is not only highly prevalent but is also associated with various health complications, including gynaecologic and obstetrical risks. Understanding bacterial vaginosis's epidemiology and risk factors is crucial for effective public health planning and intervention. Thus, it establishes the interconnection with other health issues, such as HIV prevention and maternal and child health. Additionally, recurrent BV has been shown to have a significant impact on women's self-esteem and sex life, affecting their sexual activities and self-confidence.

Investigating the factors contributing to BV can help address its psychological and social consequences, ultimately improving women's overall well-being.

The association between various socio-demographic factors in Bangladesh and common reproductive tract infections and how these factors relate to bacterial vaginosis (BV) can provide insights into reproductive health issues. It may guide interventions to reduce the prevalence of such diseases. The research also has implications for HIV prevention, as there is a link between BV and HIV-1 acquisition. Therefore, understanding the aetiology and risk factors for BV can not only contribute to improved BV management but also aid in HIV prevention efforts, which is crucial in a country like Bangladesh with a significant HIV burden.

Lastly, the prevalence of bacterial vaginosis (BV) among pregnant women underscores the relevance of the research for maternal and child health, as BV during pregnancy can lead to complications such as preterm birth and low birth weight. This research holds substantial importance in addressing public health, women's well-being, HIV prevention, and maternal and child health concerns associated with BV in Bangladesh. Its findings have the potential to bring about positive and far-reaching changes in the health outcomes and quality of life of women in the country and the broader region. This study explored the prevalence of different risk factors, symptoms, and complications of reproductive tract disease bacterial vaginosis. The objective of the investigation was to find out the status of menstrual hygiene management and other risk factors among Bangladeshi BV patients alongside their socio-demographic background and menstrual health management (MHM) practices. The investigation also looked for which symptoms and sequelae are most prevalent among BV patients and the difference between risk factors, symptoms, and sequelae among married and unmarried BV patients.

2 Research question

- Is there any difference in risk factors among Bacterial Vaginosis patients based on the patient's marital status?
- Which symptoms and sequelae are most prevalent among Bacterial vaginosis patients?
- What are the major causes of poor menstrual hygiene practice?

3 The hypothesis of the study

Inadequate menstrual hygiene management practices, particularly inadequate menstrual hygiene resources, and unsanitary activities are related to an increased risk of BV among Bangladeshi women.

4 Methods

4.1 Study design

A cross-sectional design was followed through a quantitative participatory approach.

4.2 Study location

The study was conducted at AK Memorial Hospital in Maona, Gazipur, and Lubana General Hospital, Uttara Cardiac Centre. These sites were chosen to ensure a comprehensive understanding of menstrual hygiene management and BV. The geographical diversity of the study sites, with one hospital located in a modern urban area and the other in a peri-urban area, added to the comprehensiveness of the research.

4.3 Study duration

The study was conducted from April 2019 up till March 2020.

4.4 Study participant

The study commenced with 244 voluntary participants; among them, 153 participants were recruited based on study inclusion criteria, which were (i) Females of reproductive and menopause age; (ii) Females visiting the selected healthcare facilities; and (iii) Females with a positive diagnosis of BV. The exclusion of the female with a negative BV diagnosis fell under the study exclusion criteria. Although few respondents were admitted to the hospital's gynaecological ward, most responses were obtained from the outpatient department. Patients' ages ranged from puberty through menopause and beyond. The study's participants came from diverse socioeconomic and educational backgrounds, contributing to its comprehensiveness. In addition, the geographical diversity of the study sites contributed to the study's comprehensiveness, as one hospital was located in a modern urban (divisional city) region and the other in a peri-urban (sub-district) area.

4.5 Ethical concern

Before the commencement of data collection, permission was taken from the concerned authorities. Lastly, access to the hospitals' pathology labs was granted to assist and closely observe the diagnostic method. Informed consent was obtained from all subjects involved in the study, including verbal and written consent from their legal guardians in case of minors. Participants were provided with detailed information sheets regarding the study purpose, methodology and implications of the study before consent was obtained. Participants were provided complete information on the topic and aim of the study. Furthermore, individual information was preserved to maintain confidentiality as per IRB.

4.6 Sampling method

4.6.1 Laboratory test

Laboratory test results were a crucial component of data collection. With the approval of the hospital authorities, the study closely observed the laboratory tests conducted in the selected healthcare facilities. The Amsel test was the method of choice for diagnosing BV. This method was chosen for its ease, speed, precision, and cost-effectiveness compared to other techniques like the Nugent score. High vaginal and endocervical swabs were collected from participants who exhibited symptoms of BV. These swabs were used to perform the Amsel test to confirm the diagnosis. The results of these tests were carefully noted.

4.7 Data collection method

4.7.1 Patient interview

The study used patient interviews as a primary data collection method. A systematic survey was also conducted among the 153 BV-positive women, which was divided into two segments: Part A and Part B.

Part A: This questionnaire segment gathered demographic information about the participants, including age, educational background, and socio-economic status.

Part B: This segment focused on the personal hygiene habits and potential risk factors associated with BV. The participants' hygiene practices and relevant variables were assessed.

4.8 Statistical analysis

Upon collection of the data, they were summarised and analysed by using IBM SPSS.

5 Results

5.1 Socio-demographic status of the participants

This study presents a comprehensive overview of the socio-demographic characteristics of 153 patients diagnosed with Bacterial Vaginosis (BV), focusing on their marital status. The study aims to shed light on the prevalence of BV among married and unmarried women and their age distribution. Of the 153 BV patients, 100 were married, while 53 were unmarried. This data indicates that 65.35% of the diagnosed individuals were married, highlighting a higher prevalence of BV among married women compared to unmarried women, who constituted 34.65% of the total cases. The findings reveal that BV prevalence varies significantly based on marital status and age. Married women, particularly those between 25 and 30 years old (53%), are more likely to be diagnosed with BV, whereas unmarried women, primarily those aged 15 to 24 years (75.47%), also exhibit a noteworthy prevalence. The absence of unmarried patients older than 35 in the sample highlights a pattern in the age distribution of unmarried BV patients.

Our analysis of educational qualifications among 153 BV patients revealed disparities between married and unmarried women. Notably, 26.42% of unmarried patients had completed higher secondary education (HSC), whereas only 13% of married patients had, indicating an educational gap. Trends emerged among middle-class patients in terms of higher education. Approximately 12% of married patients in this category had graduated, while 9.43% of unmarried patients reached this level.

None of the BV patients from poor socioeconomic backgrounds had obtained graduate degrees, highlighting disparities linked to socioeconomic status. We examined patients from poor socioeconomic backgrounds and found that 29% were married, compared to 15.09% unmarried, as shown in Table 1. Both married and unmarried BV patients in this socioeconomic group shared similar educational backgrounds regarding primary and secondary education, with approximately 9% completing primary education and 3% finishing secondary education, as shown in Table 1.

Table 1 Types of absorbent and change rate and other risk factors among BV patients based on marital status

Absorbent type and change rate	Married	%	Unmarried	%	Total	%
Cloth	53	53	13	24.53	66	43.14
One time	47	47	11	20.76%	58	37.91
Two times	6	6	2	3.77	8	5.23
Sanitary napkin	17	17	24	45.29	41	26.81
One time	5	5	13	24.53	18	11.76
Two times	12	12	11	20.76	23	15.03
Both	20	20	16	30.18	36	23.54
One time	16	16	13	24.53	29	18.95
Two times	4	4	3	5.66	7	4.58
None	10	10	0	0	10	6.54
None	10	10	0	0	10	6.54
Other risk factors						
Use of over the counter antibiotic for symptoms of BV	15	15	13	24.53	28	18.3
Diabetes	2	2	1	1.89	3	1.96
Non-cotton and unclean undergarments	21	21	29	54.72	50	32.68
Unsafe intercourse	74	74	0	0	74	48.36
Others	0	0	1	1.89	1	0.65

Our study examined menstruation absorbent behaviours among BV patients and observed significant distinctions between married and unmarried BV patients. The results show that 53% of married patients use the predominant menstrual absorbent compared to 24.53% of unmarried patients. Married patients tended to change their cloth absorbents less often than unmarried patients. Regarding cloth absorbent change frequency, 47% of married patients and 20.76% of unmarried patients changed it once daily, while only 6% of married and 3.77% of unmarried patients changed it twice daily.

Unmarried patients preferred sanitary napkins compared to 17% of married patients. However, unmarried patients had a greater absorbent change rate, with 24.53% replacing napkins once daily compared to 5% of married patients. Similarly, 20.76% of unmarried patients changed their napkins twice daily, compared to 12% of married patients. In terms of the behaviour of married patients, it was noted that they were more likely to report risky sexual behaviours. Meanwhile, unmarried patients did not report this.

Unmarried patients changed their absorbents more frequently than married patients, who both types 16% of the time. No patient changed their absorbents more than twice a day. Ten menopausal patients did not use absorbents since they were no longer menstruating.

Furthermore, only married patients, 74%, reported risky sexual behaviour. Unmarried patients did not report such encounters. However, there was no difference between the two groups regarding utilising over-the-counter antibiotics for BV symptoms, with 15% of married patients and 24.53% of unmarried patients using them. There is a notable difference in their practices of married and unmarried BV patients, which may reflect their cultural or social factors. Cloth absorbents were preferred by married patients, which may indicate an economic approach, as these are considered more readily available and cost-effective.

Alternative. Meanwhile, unmarried women may use sanitary napkins due to concern about hygiene without considering economics.

The symptoms and consequences of BV noted the difference between married and unmarried patients. Both groups had commonly experienced grey and malodorous vaginal discharge, which was reported slightly higher in married women (88%) in comparison to unmarried patients (77.36%) as shown in Table 2. Married women reported higher experiences of soreness, swelling or itching. The potential reasons for these differences could be the frequency of sexual activity and the hormonal changes associated with marriage. Moreover, irritation, soreness, and swelling near the genital area were more prevalent in married patients (27%) than unmarried patients (13.21%). Itching in the vaginal area was reported by 52.83% of unmarried women but was slightly lower (45%) among married patients as shown in Table 2. However, only 43% of married patients reported painful intercourse as a BV symptom. They also noted experiences of painful intercourse as a symptom. Married woman are more likely to associate pain during intercourse with BV due to

Table 2 Symptoms and sequelae of BV among patients based on their marital status

Symptoms and sequelae of BV	Married	%	Unmarried	%	Total	%
Symptoms						
Grey and smelly vaginal discharge	88	88	41	77.36	129	84.31
Irregular period	8	8	37	69.81	45	29.41
Pelvic/abdominal pain	26	26	19	35.85	45	29.41
Painful intercourse	43	43	0	0	43	28.11
Itching near the genital area	45	45	28	52.83	73	47.71
Swelling near the genital area	27	27	7	13.21	34	22.22
Fever	9	9	2	3.77	11	7.18
Sequelae						
Recurrence of infection	57	57	13	24.52	70	45.75%
PID	7	7	1	1.88	8	5.23%
Skin infection	23	23	11	20.75	34	22.22%
Infertility	4	4	0	0	4	2.61%
None	12	12	47	88.68	59	38.56%
STD	25	25	0	0	25	16.34%
Post operational endometriosis	3	3	0	0	3	1.96%

the frequent sexual activity which would potentially occur within their relationship. Furthermore, due to the nature of the issue, married women may be more likely to seek medical advice to prevent such problems. Meanwhile, unmarried women would be expected to be less sexually active and, therefore, less likely to experience this as a symptom.

Recurrence of infection was the most common sequelae reported by married and unmarried women, accounting for 57% and 24.52% of cases, respectively, totalling 45.75%. Skin infection was the second most prevalent complication, accounting for 22.22% of all inpatients. In particular, the proportion of women reporting no problems differed by marital status, with unmarried women reporting no complications at 88.68% while married women reported only 12%. In addition, no unmarried women reported infertility, although 4% of married women did. Furthermore, only 16.34% of married women reported having a sexually transmitted disease (STD), while none of the unmarried women did.

The results suggest that marital status could influence the different types of symptoms and the severity experienced. Cultural factors could affect how the woman's health is managed, as there is a societal expectation for married women to engage in sexual activity with their partner, which could lead to additional discomfort and BV-related complications to occur and be reported. Conversely, cultural norms would expect unmarried women to have less sexual activity and fewer sexual partners and, therefore, may make it more difficult to report any sexual or reproductive health issues. This could be due to the stigmatisation of unmarried women discussing sexual well-being.

5.2 Cause of poor menstrual health management (MHM) practice

Our study identified several key factors contributing to inadequate menstrual hygiene management practices among married and unmarried women, with variations noted between the two groups. These factors shed light on women's challenges in maintaining proper menstrual health management, highlighting the urgent need for collective action to address these issues. One of the most pressing issues identified in our study is the high cost of sanitary napkins, a significant barrier to adequate menstrual hygiene management. This financial constraint was cited by a substantial proportion of both married and unmarried women, with 38% of married women and 49% of unmarried women attributing their poor MHM practices to this factor. Secondly, the lack of menstrual health management education played a pivotal role, with 73% of married women and 26% of unmarried women acknowledging it as a reason for their suboptimal menstrual health management practices.

Furthermore, our study revealed a significant challenge that affects both married and unmarried women- the unavailability of facilities for changing absorbents in public places or workplaces. This was cited by 92% of married women and 87% of unmarried women as a significant obstacle to proper menstrual health management. Moreover, the social stigma associated with purchasing sanitary napkins emerged as a prominent issue. Specifically, 81% of married and 30.2% of

unmarried women expressed reluctance due to the shame of buying hygienic napkins from drugstores. Additionally, 37% of married women and 83% of unmarried women felt uncomfortable asking male family members to purchase sanitary napkins on their behalf. Understanding these challenges is essential for developing targeted interventions to improve menstrual hygiene management and promote women's health and well-being.

6 Discussion

Despite some efforts to address the issue, many women continue to lack access to essential menstrual hygiene products and adequate sanitation facilities, which can raise the risk of infections like Bacterial Vaginosis [12]. Also, research on the association between menstrual hygiene behaviours and BV is scarce, making this study pertinent and essential. This study recruited one hundred and fifty-three women attending the gynaecological ward and outpatient department of selected healthcare gynaecological facilities gynaecological. The investigation was carried out over almost a year to observe the occurrence and several factors of BV among women in Bangladesh. By conducting research in two distinct healthcare institutions in different geographic locations, an effort was made to increase the diversity of the studied patient population. However, the study does not provide an accurate representation of the total female population of Bangladesh because, in the majority of women in Bangladesh, the symptoms persist for a more extended period or create severe complications.

The study shows that the prevalence of BV among women attending healthcare facilities is higher in Bangladesh, as more than half of the participants were tested to be BV-positive. Similar results have been observed in other studies where a similar number of women were tested to be BV positive; in Sudan, it was 49.8%, and in Nigeria, it was found to be 60% [13].

[iii] However, the data is only consistent for some. Only for some studies, inconsistent as a study conducted in 2019 in Cameroon found that BV was prevalent among 26.2% of the participants [14]. The difference in the prevalence may be due to various factors such as geographical, educational, environmental, and socioeconomic status.

Consistent with this study's findings, BV was prevalent among patients. This study concluded that the prevalence among patients between early to prime reproductive age and the vast majority of patients were married [15]. It can be inferred from this observation that sexually active women at their early reproductive age are more prone to be infected by BV than older and less sexually active women. Similar to other studies, there was a significant amount of difference in the incidence of BV among women who came from a variety of educational and socioeconomic backgrounds, in which lower financial conditions made women more susceptible to BV [16]. Another study found similar outcomes where 35.9% of women with a university degree were positive for bacterial vaginosis, compared to 44.7–55.5% of women with a high school degree or less [17, 18].

Patients who were more prosperous financially and educationally tended to have a greater understanding of reproductive health. As a result, these women were able to make improvements to their health, which reduced the likelihood that they would test positive for BV. Some investigations, however, have established the presence of BV in sexually inactive females [19, 20]. For instance, study analysis was conducted at the outpatient department of gynaecology and obstetrics at Dhaka Medical College Hospital, Dhaka, between July 2007 and December 2007. The study involved 200 sexually active females in the age range of 15–45 years with vaginal discharge and itching. Amsel's clinical criteria were used to diagnose bacterial vaginosis. The results showed that 24% of the participants were diagnosed with bacterial vaginosis [20].

Nonetheless, due to the lack of data comparing BV's risk factors and consequences based on marital status, we have compared the observations based on the factors above. Risk factors for bacterial vaginosis (BV) varied among married and unmarried women, which indicates the impact of behavioural and lifestyle variables on BV. First and foremost, we found that a prominent number of married women who have had unsafe intercourse tested positive for BV. In this regard, BV may be better understood as a sexually enhanced disease rather than a sexually transmitted infection, with the number of times a person engages in sexual activity being the most determining factor [21–23]. Nonetheless, the prevalence of poor menstrual hygiene management was also found to be a prominent risk factor in multiple studies. A study conducted in Odisha, India, found that the incidence of RTI was 71.7% among the 509 women who participated in that study and who used reusable absorbents (clothes/rags).

The prevalence of BV was 40.7% among the same group of women [22]. Another study supported this finding, concluding that certain MHM practices are connected with an increased risk of lower reproductive tract infections. Women using reusable absorbent pads had a higher incidence of BV than those using disposable pads [24]. Meanwhile, an intervention study in Kenya showed that the distribution of reusable sanitary pads to school girls did not lower the risk

of BV [25]. This is because the absorbent change rate is a significant factor in the development of RTI, including BV. In our study, we found a high rate of BV among participants who did not change their absorbent more than once a day.

Furthermore, the participants identified the higher price of sanitary napkins as a primary cause of such behaviour.

The results also showcased the need for targeted interventions and awareness aimed at this demographic and, potentially, further breakdown approaches dependent upon their marital status. Thus, we recognise the differences in cultural and socioeconomic factors being considered. Poor menstrual hygiene was found to be associated with a high risk of BV, with many women reporting infrequent absorbent changes and the usage of subpar menstrual products. Furthermore, this study showcased the accessibility to affordable products, which could open additional difficulties in discussing this due to social stigma, such as reluctance to talk about personal hygiene or reproductive health issues. Accessing affordable menstrual hygiene products points to the need for policy initiatives to make these products more accessible and affordable. This is a matter of hygiene and a crucial aspect of women's reproductive and overall health. It was noted in the research that without more suitable education on menstrual hygiene, social stigma will remain. Thus, the issue of BV is not addressed.

It emerged from the results that women from this study adopted a poor menstrual hygiene approach, resulting in a lead case of bacterial vaginosis (BV). Therefore, public health initiatives are needed to raise awareness of the importance of proper menstrual hygiene management to address BV and other associated health risks. Furthermore, empowers women to openly discuss this, allowing them to develop their knowledge and make more informed choices regarding their menstrual health.

A recognition of the cultural taboo could impact the accessibility to hygiene products and affect women's ability to seek medical advice or attention regarding BV. Furthermore, the taboo of unmarried women engaging in sexual activity or seeking support regarding sexual health. This results in unmarried women disengaging or not seeking help regarding bacterial vaginosis (BV), further leaving them in discomfort. This could lead to further medical issues and infertility if not addressed. It was also shown that the symptoms and complications of BV differed significantly between patients who were married and those who were not married. Consistent with the findings of our study, another study found that, in the preceding six months, 58% of women with BV reported odour, discharge, and/or wetness as symptoms [26]. In addition, The findings of a cross-sectional study conducted over six months at Sir Salimullah Medical College, Dhaka, indicated that 29.2% of women aged 15 to 45 years with abnormal vaginal discharge, with or without itching, were diagnosed with BV as the underlying cause [27]; which is also consistent with the present study. Furthermore, the most common complication of BV was found to be its recurrence. A similar outcome was found in another study, which observed that the treatment is beneficial in the short term, but between 69% and 80% of women will experience a recurrence of BV within 12 months of finishing treatment [28, 29] [30]. Despite this, several hormonal and genetic components need to be monitored and investigated, and several hormonal and genetic components need to be monitored and analysed to gain a deeper comprehension of the matter [28, 29] [30, 31].

7 Conclusion

This study showcases the association between marital status and the prevalence of bacterial vaginosis (BV), with married women having notably higher prevalence. It was noted that BV was higher in married women and was associated with a sexual activity rate which was unprotected taking place as well as them adopting different approaches to menstrual hygiene practices. It was noted that other socioeconomic factors contributed to the response to using materials to manage their symptoms. This disparity may result in married women experiencing further economic pressures, resulting in their response to hygiene practices being handled differently than unmarried women. Thus, there is a need to explore further innovative solutions, such as low-cost, sustainable menstrual hygiene products or public-private partnerships to make these products more affordable. Making them more accessible for women and thus reducing the risk of BV infections. The broader implications of this study include relevance not only in Bangladesh but also in many parts of the world where women face similar challenges regarding menstrual hygiene and BV. Improving menstrual hygiene practices and reducing the prevalence of BV can have a cascading positive effect on women's reproductive health, general well-being, and overall quality of life. The study's outcomes could serve as a foundation for designing policies and interventions to improve women's health and empower them with the necessary knowledge and resources.

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Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate The study protocol was approved by the authorities of the Institutional Reviewed Board (IRB) of Eminence Associates for Social Development containing the number (Emi/IRB/Oct/2010011001). The study carried out all the methods by institutional, relevant, national, or international guidelines and regulations.

Competing interests The authors declare no competing interests.

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