

## **ASSOCIATION OF MENSTRUAL HYGIENE AND REPRODUCTIVE TRACT INFECTIONS: A REVIEW**

**AYASHA PARVEEN AND M.P SACHDEVA**

### **ABSTRACT**

Menstrual hygiene is very essential to lead healthy life and if it is improperly managed then it would lead to reproductive tract infections. The extent to which reproductive tract infections (RTIs) are associated with poor menstrual hygiene management (MHM) practices have not been extensively studied. The aim of the study is to determine the association of menstrual hygiene and reproductive tract infections. A preliminary search using MeSH terms (“menstrual hygiene” AND “reproductive tract infections” OR “reproductive morbidities”) was conducted in English, supplemented by hand searching, for additional references on electronic databases. Retrieved articles were reviewed, synthesized, and summarized. Unsatisfactory cleaning of the external genitalia was found to be practiced in these studies and statistically significant association was found between perceived reproductive morbidity and poor menstrual hygiene practices. The associated symptoms of reproductive tract infections were abnormal vaginal discharge, burning micturition, and lower abdominal and back pain. There were significant findings of not washing hands with soap before touching the genitalia, unclean toilets and reusing absorbent and not changing absorbent frequently. According to literature those women who can have access to WASH facilities during menstruation are protected against development of RTIs.

**Keywords:** *Bacterial vaginosis (BV), Menstrual Hygiene Management (MHM), Reproductive tract infections (RTIs), Sanitary napkin, Trichomonas vaginalis (TV)*

### **INTRODUCTION**

Globally women in reproductive age do not have sufficient access to sanitary napkins as menstrual blood is going to shed every month of reproductive women life. Girls are not having adequate or proper knowledge about the management of menstruation; there is gap in making girls to understand about menstruation openly or freely. Various studies indicate that girls don't attain any prior

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**Ayasha Parveen** (Corresponding Author), Department of Anthropology, University of Delhi, New Delhi-110007, India, Email: ayashaparveen@gmail.com; **M. P. Sachdeva**, Professor and Head, Department of Anthropology, University of Delhi, New Delhi-110007, India, Email: mpsachdeva@rediffmail.com

information about menstruation before the starting of important phase of life cycle of a woman (Nnennaya *et al.*, 2021) as menstrual hygiene is very crucial for women to sustain a healthy life, (Van Eijk *et al.*, 2016) and if it is not maintained, it may lead to adverse effect on health (Anand *et al.*, 2015).

Menstrual Hygiene Management (MHM) is defined by practices such as the type of absorbent material used and the frequency with which it is changed, as well as associated body washing, drying, and storing reusable pads, and other contextual factors such as the location of menstruation-related changing and washing practices (Marni *et al.*, 2016; UNICEF JMP, 2012). Water, sanitation, and hygiene (WASH) facilities at the home level can influence these behaviors, and the quality of and availability to these facilities varies greatly between and within nations. Use of proper hygienic products like sanitary pads during menstruation and adequate washing of genital area are very crucial to sustain healthy reproductive life. Women and girls use clean menstrual hygiene management materials to absorb or collect blood, which can be changed in private as needed for the duration of the menstrual period, wash their bodies as needed with soap and water, and have access to facilities to dispose of used menstrual hygiene management materials (Mhlongo *et al.*, 2021). In rural areas and among women and girls from lower socioeconomic categories, unsanitary washing practices are particularly prevalent. Contextual factors such as access to venues where women can handle menstruation-related washing in privacy and comfort are likely to affect menstrual hygiene management (MHM) (Das *et al.*, 2018). Unhygienic practice of menstruation may lead to various reproductive morbidities. Menstruation is still a taboo among the Indian societies although it is a natural phenomenon (Dasgupta *et al.*, 2008). Due to social restraints and taboos, it has been discovered that garments are frequently cleaned without soap or with filthy water, and drying is commonly done indoors rather than in the sunlight or open air. These activities could result in the reuse of material that has not been properly sanitized (Narayan *et al.*, 2001; Sumpter *et al.*, 2013).

During menstruation, a lack of information and poor personal sanitary practices have been linked to major health problems such as genital tract infections, urinary tract infections and unpleasant odour (Bhatia *et al.*, 1995; Dasgupta *et al.*, 2008; Mathiyalagen *et al.*, 2017) infertility, cervical cancer, post abortive and puerperal sepsis, persistent pelvic discomfort, and ectopic pregnancy are among the problems of RTIs that the majority of women continue to experience (Balamurugan *et al.*, 2012).

The fraction of this burden that may be attributable to poor menstrual hygiene management (MHM) as opposed to sexually transmitted infections, iatrogenic infections, or endogenous infections caused by agents other than those introduced by poor menstrual management remains uncertain (Sumpter *et al.*, 2013). Bacterial vaginosis (BV) is the most common RTI, characterized by an imbalance of bacterial flora in the vaginal canal. Symptoms of BV include

vaginal irritation, pruritus, burning while urinating, and discharge with abnormal odor, color, and consistency, though sometimes as many of women are asymptomatic (CDC, Bacterial vaginosis, 2005; Das *et al.*, 2021; Joesoef *et al.*, 2005; Torondel *et al.*, 2018). Symptoms of BV and VVC are similar, with vaginal discharge and discomfort, though many infections are asymptomatic. A small amount of research suggests that bacterial vaginosis (BV) is more likely in women who adopt unsanitary menstrual hygiene management (MHM) (Baisley *et al.*, 2009; Balamurugan *et al.*, 2012; Wasserheit *et al.*, 1989).

Trichomonas Vaginalis (TV) infection can result in pregnancy loss, pre mature membrane rupture, preterm delivery, low birth weight and pelvic inflammatory disease (Fichorova, 2009). Although the etiologies of these infections are very distinct, the clinical signs and symptoms of these infections largely resemble. Dyspareunia, vaginal discharge, itching and a burning feeling sensation are typical clinical signs (CDC. Bacterial Vaginosis, 2007).

The prevalence of management methods varies widely depending on the situation. However, studies have shown widespread usage of unclean absorbents and insufficient washing and drying of reused absorbents (Sumpter *et al.*, 2013). Therefore, the aim of this study is to compile, describe, and critically evaluate peer-reviewed and published information on the menstrual hygiene and its consequences on the menstrual hygiene related reproductive tract infections.

## MATERIALS AND METHODS

A preliminary search of the literature using electronic databases, Google Scholars, Web of science and PUBMED using the Medical Subject Headings (MeSH terms), and keywords were Menstrual hygiene or Menstrual napkin or Sanitary napkin and Reproductive tract infection or Reproductive morbidities or Genital tract infection.

**Selection Strategy:** The inclusion criteria followed were: (i) studies published in English language journals, (ii) studies related to Human, (iii) original research studies and (iv) studies conducted exclusively in India.

Studies were excluded if they were (i) duplicated studies, (ii) reviews (iii) FGD's (iv) studies using secondary data

**Exposure Assessment:** There are various menstrual practices practiced by various communities, married girls and adolescent girls mentioned in the papers, which include: 1. Bathing practice, 2. Washing of genitalia with or without soap, 3. Drying of reusable pads, and 4. The use of disposable napkin or reusable cloth was all potentially satisfactory or unsatisfactory menstrual hygiene practices.

**Outcome:** All papers were recruited to investigate the extent to which menstrual hygiene were associated with reproductive tract infection. The search terms for health outcomes of interest were broad to capture all possible infections and diseases, including reproductive tract infections (like bacterial vaginosis,

vulvovaginal candidiasis and trichomonas vaginalis) and other reproductive infections and associated symptoms like vaginal discharge, irritation around vaginal area, foul smelling itchy discharge; chronic lower abdominal pain; any ulcer, swelling in genital area.

**Data extraction:** An initial screening of titles and abstracts was conducted online for this review to ensure that the papers that were included largely reflected the initial inclusion and exclusion criteria. When a title and abstract could not be definitively rejected, the abstract was downloaded for a more thorough examination using the initial inclusion and exclusion criteria. When abstracts were unable to unambiguously reject papers, the entire text of the publication was received for further examination. As many full-text papers as feasible were retrieved once the list of abstracts was complete. The papers were checked to see if they displayed the same data set.

## RESULTS AND DISCUSSION

The search returned 18342 articles on PubMed, Google Scholar and Web of Science. An initial screening identified 528 articles after removing duplicates and rejecting studies on other animals and studies not done in India. Of these, 466 articles were removed based on title and 36 articles were rejected based on abstract reading. On further screening, 9 articles were rejected due to irrelevant analysis and contained no aspects to study the menstrual hygiene and reproductive tract infections. Type of study design adopted for studying menstrual hygiene and its associated RTI are given in Table-1. Various study descriptions showing association of menstrual practices and reproductive health outcome are provided in Table-2.

There are 15 studies extracted from databases and also by manual search of time period 2011-2021. Studies primarily relied on subjective exposure or outcome measures such as self-reported menstrual hygiene and many relied on self-reported health outcomes, i.e., reproductive tract infection. A small number of studies that reported general RTIs have diagnosed the infection clinically, while others that reported on BV confirmed the diagnoses using Nugent scores or Amsel criteria (Sumpter *et al.*, 2013).

In this paper, we have found that there are 11 cross-sectional studies out of which two studies are hospital-based. There are two case-control studies out of which one is hospital-based case control. Studies were conducted in different setting, (6) studies conducted in rural setting, (2) conducted in urban setting, (3) conducted in rural/urban setting, (3) conducted in slum area and (1) study conducted in peri-urban/rural area of India.

3 studies were conducted in S-E region of India, Odisha and rest conducted in various states of India. The most of studies were conducted amongst women aged around 15 to 50 years and there are 4 studies which have been conducted exclusively on adolescent girls. Sample sizes of the studies were ranged from 92

to 3952.

### **Exposure and Outcome:**

Papers were required to incorporate a clear description of the menstrual hygiene methods under investigation. Based on papers containing information on menstrual practices comprise of absorbent type, genital washing with or without soap and bathing practices. In most of the studies, use of sanitary napkin was considered as hygienic practice/satisfactory practice/good practice /proper hygiene practices except Das *et al.*, 2021 study in which they have mentioned use of reusable cloth piece as an absorbent. All articles were identified based on reproductive health outcome and papers constituting menstrual hygiene practices and associated symptoms of reproductive tract infections. Studies investigated up to the extent to which menstruation/ menstrual practice was associated with symptoms of reproductive tract infection (RTI) and in few papers they have confirmed reproductive tract infections with clinical findings. The search parameters for health outcomes of relevance were purposely left broad in order to include all possible infections and disorders, including reproductive tract infections (including bacterial vaginosis and vulvo-vaginal candidasies, trichomonas vaginalis). Four Papers included had clinically confirmed bacterial vaginosis, candidiasis and trichomonas, syphilis and remainder relied on self-reported symptoms. The majority of RTI studies (both self-reported and confirmed) found one or more statistically significant associations between RTI and MH; unsatisfactory; MHM, as defined in each study and in the specific populations studied. There is a strong association of satisfactory hygienic practices and RTI and it is statistically significant.

In this review, 11 cross sectional studies have been included in which 4 studies are from north India region, 3 studies from south India region and 4 studies from South east region. There are three studies from Odisha containing (1) hospital based cross sectional Das *et al.*, 2021, (1) case control, Torondel *et al.*, 2021 and (1) hospital-based case control study Das *et al.*, 2015.

### **Menstrual Hygiene Practices During Menstrual Flow:**

There are various menstrual practices taken into account by different authors to categorize it into Hygienic/Unhygienic, satisfactory/ Unsatisfactory and Proper/ Improper menstrual hygiene. The basic idea behind this is that what kind of absorbent is used whether cloth piece or disposable pad, genital washing practices and bathing practices used by the participants.

**Table-1: Study design adopted for studying menstrual hygiene and its associated RTI**

Study design	No. of studies	Area of study	References
Cross-sectional	11	Dehradun Himachal Pradesh Chandigarh Varanasi Karnataka Puducherry West Bengal Odisha West Bengal Assam Tamil Nadu	Juyal <i>et al.</i> (2014) Kalyan <i>et al.</i> (2017) Sharma <i>et al.</i> (2018) Kansal <i>et al.</i> (2016) Balamurugan and Bendigeri (2012) Mathiyalagen <i>et al.</i> (2017) Paul <i>et al.</i> (2020) Baker <i>et al.</i> (2017) Mukherjee and Yasmin (2012) Barman <i>et al.</i> (2017) Geeta Mani (2014)
Hospital-based	2	Delhi	Bhilwar <i>et al.</i> (2015)
Cross-sectional		Odisha	Das <i>et al.</i> (2021)
Case control	1	Odisha	Torondel <i>et al.</i> (2021)
Hospital-based Case control	1	Odisha	Das <i>et al.</i> (2015)

Table-2: Study descriptions showing association of menstrual practices and reproductive health outcome

S. No	Sample description	Exposure assessment	Outcome assessment	Beta (OR (95 % CI))	p-value	References
01.	453 girls; 15-18 yrs; Rural/Urban; Dehradun	<b>Satisfactory MH</b> (Washing >2 times /day, use of sanitary napkin/ new cloth or rag every time / If washing, then drying the cloth in direct sunlight, taking daily bath during menstrual periods)/ <b>Unsatisfactory MH</b> (Sanitary, Clothes or both)	Self-Reported; Vaginal discharge with or without lower abdominal/back pain.	NR	<0.001	Juyal <i>et al.</i> (2014)
02.	656; 15-45 yrs; Urban Karnataka	<b>Types of Nappkins</b> (Sanitary, Clothes or both)	Clinically confirmed infections (Syphilis, Trichomoniasis, Bacterial vaginosis, Candidiasis and Mixed infections)	NR	<0.05	Balamugan and Bendigeri (2012)
03.	385; 15-49 yrs ;Rural West Bengal	<b>Improper menstrual hygiene</b> (Use of old washed cloth)/ <b>Proper menstrual hygiene</b>	Self-reported; Cases defined by excessive white discharge; foul smelling, itchy discharge; chronic lower abdominal pain; any ulcer, swelling irritation around vaginal area; any other gynaecological abnormality Clinically confirmed RTI (Pap smear) (n=86)	OR= 17.12 (2.3-135.9)	0.000	Mukherjee and Yasmin <i>et al.</i> (2012)
04.	558; 18-45yrs; Slum; Odisha	<b>MHM Practices</b> (Absorbent type (Disposable/ reusable)  Frequency of change of absorbent (More than twice)  Place of change of absorbent (inside or outside the toilet)  Frequency of washing during menstruation	Candidiasis TV BV Candidiasis TV BV Candidiasis	0.24 (0.09-0.64) 1.28 (1.0-1.54) 1.54 (1.31-2.0) 1.78 (0.81-3.9) 0.56 (0.4-0.75) 1.08 (0.78-1.5) 0.72 (0.61-0.86) 1.21 (1.0-1.48) 1.09 (0.8-1.3) 0.8 (0.4-1.64) 1.21 (1.0-1.55) 1.34 (1.07-1.7)	0.0036 0.014 0.01 0.218 0.001 0.869 0.053 0.023 0.231 0.799 0.047 0.029	Torondel <i>et al.</i> (2021)
05.	276; 18-45yrs; Rural; Chandigarh	<b>Menstrual hygiene practices</b> (Cloth, sanitary pad and both)	Self-reported: Abnormal vaginal discharge accompanied by foul smell, ulcers in and around the genital region, pain in the lower abdomen not related to menstruation, burning sensation	1.09 (0.43-2.3) NR	0.869 0.001	Sharma <i>et al.</i> (2018)

06.	242; Rural/Urban; Puducherry	12-18yrs;	<b>Menstrual hygiene practice</b> Satisfactory (sanitary napkin or cloth or both, changing frequency of absorbent, genital washing)/Unsatisfactory	Reported symptom: Discharge from genitalia, Itching in genitalia, Pustules over abdomen/lower back, difficulty in micturition	NR	Mathiyalagen <i>et al.</i> (2017)
07.	210;15-19yrs; Slum; Assam		<b>Menstrual Hygiene Practices</b> , Type of absorbent	Self-reported symptoms: excessive vaginal discharge, pain or itching in vagina, lower abdominal pain, lower back pain, burning sensation while passing urine, genital ulcer and inguinal bulb	NR	Barmen <i>et al.</i> (2017)
08.	802, Urban; N-E Delhi	15-49yrs;	Washing of external genitalia <b>Menstrual Practices:</b> Material used(sanitary napkin/cloth) Bathing Practices Private parts washing	Vaginal discharge, burning micturition, Itching in genitalia, Pain, lower back, Pain, lower abdomen, Genital ulcers	NR	Bhilwar <i>et al.</i> (2015)
09.	3952 Rural; Odisha	14-45yrs	<b>MHM variable:</b> Type of absorbent: Disposable/ Reusable	Self-reported symptoms of abnormal vaginal discharge, itching, and irritation	NR	Baker <i>et al.</i> (2017)
10.	486, urban and rural; Odisha	18-45yrs; Peri urban and rural;	Location for MHM: Toilet and Private space <b>MHM Practices:</b> Absorbent material (Disposable / reusable) Absorbent changing frequency (3,2,1) Washing practices (body and vagina/ bath/ vaginal wash only) Washing (With soap / Water only)	Bacterial vaginosis	NR	Padma Das (2015)
11.	494; Rural; Himachal Pradesh	15-49yrs;	<b>Hygiene:</b> Stuff used (Sanitary pad/cloth) Change/wash undergarments (Daily, alternate/sometimes)	Self-reported symptoms: Abnormal discharge, itching or irritation around vagina and lower abdominal pain	NR	Baker <i>et al.</i> (2017)



12.	520; Rural; Tamil Nadu	18-45yrs;	Bath Habit (Daily/alternative or sometimes/weekly) <b>Menstrual Hygiene Practices:</b> Absorbent (Cloth or homemade/ sanitary napkin /both). Reuse of napkin  Washing practices before reuse (Soap and water only/ Soap and water with disinfectant) Drying practices before reuse (Sunlight Shade)	Abnormal vaginal discharge (discharge accompanied by itching or irritation, bad odor, abdominal pain, fever), ulcers or boils in and around the genital region, pain in lower abdomen, pain or burning sensation during urination, swelling in the groin and painful blister-like lesions in and around vagina. Pain during sexual intercourse and spotting after sexual intercourse RTI	1.66 (1.29-3.32) NR NR NR NR	NR 0.014 0.193 0.000 0.000	Geeta (2014) Mani
13.	650 Rural; Varanasi	15-19yrs;	<b>Menstrual Practices:</b> Hygienic (Use sanitary napkin), Unhygienic (Use cloth)	RTI	NR	NS	Kansal <i>et al.</i> (2016)
14.	1164; Slum; Odisha	18-45yrs;	<b>Menstrual Practices:</b> Absorbent Material, (cotton) Changing absorbents (3 or <3) Washing the body, vaginal and full bath) Absorbent washing Drying (inside the house)	Clinically confirmed Bacterial vaginosis and Vulvo- vaginal candidiasis	<b>BV</b> 1.3 (0.9-1.8) 0.5 (0.3-0.9) 0.8 (0.6-1.2)	<b>VVC</b> 1.0 (0.7-1.4) 0.8(0.5-1.4) 0.6 (0.4-0.9)	Das <i>et al.</i> (2021)
15.	92;15-49yrs; Rural/Urban; Kolkata		<b>Menstrual hygiene Practice:</b> Number of absorbent use (<3 or >3 pad/days)  Frequency of perineal washing (<3 or> 3 in a day) Perineal washing (antiseptics/ only water/ Soap water)	Self-reported symptoms: Excessive vaginal discharge, burning sensation during urination, perineal itching	1.1 (0.8-1.6) 1.3(0.9-1.8)	0.7 (0.5-0.9) 3.4 (2.3-4.8)	Paul <i>et al.</i> (2020)  NR

p-value is statistical different at 0.05, **NR**-not reported, **NS**- not significant  
**BV**-Bacterial vaginosis; **VVC**- Vulvo vaginal candidiasis; **TV** – Trichomonas vaginalis; **MH** - Menstrual hygiene; **RTI**- Reproductive tract infection

### **Menstrual Hygiene Practices During Menstrual Flow:**

There are various menstrual practices taken into account by different authors to categorize it into Hygienic/Unhygienic, satisfactory/ Unsatisfactory and Proper/ Improper menstrual hygiene. The basic idea behind this is that what kind of absorbent is used whether cloth piece or disposable pad, genital washing practices and bathing practices used by the participants.

In majority of the studies menstrual hygiene practices include type of absorbent i.e., sanitary pad/cloth/both (n=9) or disposable/reusable (n=4), types of reusable cloth (old cotton/old silk/towel) (n=1), Cloth or homemade, use of old washed cloth or not (n=1). More than half of the studies shown usage of more cloth piece as compared to sanitary napkin (Balamurugan *et al.*, 2012; Narayan *et al.*, 2001; Baisley *et al.*, 2009) and may cause higher risk of RTI (Bhaisley *et al.*, 2009; Singh *et al.*, 2009).

Similar studies have shown that, in Malawi (Allah *et al.*, 2011) and Ethiopia (Abera *et al.*, 2004; Pillitteri, 2011,) most girls relied on the usage of homemade sanitary absorbent whereas various studies from Ghana (Hulland *et al.*, 2015) ,Egypt (Aluko *et al.*, 2014; Asimah *et al.*, 2017) and Nigeria (El-Gilany *et al.*, 2005; Lawan *et al.*, 2010 ,) have estimated that adolescent girls prefer to use sanitary napkins. Various hygienic practices used by the participants like frequency of changing absorbent ,washing of external genitalia, washing with soap or with detergent or with water only, bathing practice (only vaginal wash or full body), location of changing absorbent, drying and storage of absorbent in case of using reusable cloth were found out from ample number of research outcome. Three out of fifteen studies did not mention about washing practices during menstruation although showed association of number of children and Intra Uterine Devices (IUDs) used with RTI.

### **WASH guidelines followed:**

There are only three authors who have followed WASH guidelines in their research work and the rest of the papers did not mention about WASH guidelines but used few of variables of sanitation access. Baker *et al.*, 2017; Das *et al.*, 2018 and Torondel *et al.*, 2018 have mentioned use of WASH practices like type of absorbent (disposable pad/reusable cloth), frequency of changing absorbent(once/twice) and place of changing absorbent(inside/outside the toilet), type of body washing(vaginal wash / full body bath), frequency of body washing (once/twice or more per day)

### **Sanitation access variables:**

Presence of toilet facility inside the home or not, water source location (in the house/in the yard/neighbor house/public location) and primary location for urination. Only Baker *et al.*, 2017 took account of washing of body and hands after defecation with soap or with detergent or with water only and improved/

unimproved water source for drinking purpose as well as for bathing or washing purpose.

### **Reproductive tract Infections:**

Studies have shown that prevalence of RTIs is more in cloth users and associated common symptoms are abnormal vaginal discharge, itching in genitalia, and burning sensation during urination, pain in lower abdomen, lower backache and vaginal discharge is the commonest symptom in all the studies. The risk of BV is decreased in women who change their absorbent frequently (Torondel *et al.*, 2018).

The majority of RTI studies (both self-reported and confirmed) found another or more statistically significant links between RTI and and unsatisfactory, 'poor' MHM, as defined in each study and in the populations studied. Three out of fifteen studies have shown that participants had sought treatment for RTI.

In five studies (Balamurugan *et al.*, 2012; Das *et al.*, 2018; Das *et al.*, 2021; Torondel *et al.*, 2018; Mukherjee and Yasmin *et al.*, 2012), it is clinically confirmed that unhygienic menstrual practices may lead to Reproductive tract infections like bacterial vaginosis, vulvo vaginal candidiasis, trichomonas vaginalis, syphilis and mixed infection. Studies (Das *et al.*, 2018; Das *et al.*, 2021; Torondel *et al.*, 2018) used Nugent criterion and score was obtained for *Bacterial vaginosis* which is 4-10 positive for BV and Albiquick TM rapid test was performed for *Candida albicans* and *Trichomonas vaginalis* was identified by Nucleic Acid Amplification test and remaining studies utilized Pap smear technique and wet mount microscopy.

Associated symptoms with unhygienic menstrual practices include excessive white discharge; foul smelling itchy discharge; chronic lower abdominal pain; any ulcer, swelling, irritation around vaginal area; burning sensation during urination; any other gynaecological abnormality. The imbalance of vaginal flora that results in BV is known to be impacted by a number of variables, including sexual activity, douching and the immune system's reaction and those women who do not change their absorbent frequently are likely to be suffer from BV. Alternatively, more washing during menstruation may lead to alteration of vaginal flora and hence women can suffer from BV (CDC Bacterial vaginosis, 2007; Torondel *et al.*, 2018; Witkin *et al.*, 2007). Washing, drying, storing absorbent material are all closely related to VVC (Das *et al.*, 2018). The likelihood of developing candida infection was higher in women who dried their reusable menstruation pads at home and in those who hid the stored cloth in the toilet (Torondel *et al.*, 2018). Additionally, in line with other studies, drying absorbents in the sun or in an open area and storing absorbents in a cupboard or on shelves offered protection from VVC (Bahram *et al.*, 2009; Balamurugan *et al.*, 2012). Despite the fact that many infections remain undetected, BV and VVC have clinical manifestations, with vaginal discharge, irritation and discomfort (Sumpter *et al.*, 2013). However, the prevalence of TV is not associated with any hygienic practice but it might be associated with sexual activity. Factors associated to sexual activity and reproduction, such as marriage, pregnancy, biological age

and use of intrauterine contraceptive devices can increase the risk of RTIs (Anand *et al.*, 2015; Das *et al.*, 2018; Maitra *et al.*, 2001; Bhilwar *et al.*, 2015; Li *et al.*, 2014). If RTIs decrease in the population then there would be less significant effects on other reproductive diseases like STDs, pelvic inflammatory disease, miscarriage, low birth weight, premature delivery and ectopic pregnancy (Padhi *et al.*, 2015; Parikh *et al.*, 1989; Stevenson *et al.*, 2012; Wutich *et al.*, 2008). Education plays a vital role in preparing people to prevent them from disease (Das *et al.*, 2018; Garg *et al.*, 2012) and lower socioeconomic status may also lead women more prone to have RTIs (Ashorn *et al.*, 2015).

Papers including in this review do not discuss about any particular religious practices used during menstruation. According to the best knowledge of the authors, no studies have been focused on the religious perspectives affecting menstrual hygiene so far. More studies need to be focused in various states of India and especially the less developed states. In this, the research has not been done on a particular community and particular tribes. Study on menstrual hygiene and its associated outcome such as RTI among the females which is a one of the major health issue among reproductive female must be taken in account for future perspective and policy making.

### **CONCLUSIONS**

The review sought to study the association of menstrual hygiene and reproductive tract infection as menstruation is a crucial part of woman's life. This paper comprising of adolescent girls and ever married women and menstrual hygienic practices has strong significant relation with RTIs. On the basis of existing evidence, there is also a need for more research into the numerous practices, beliefs, cultural, behavioral taboos and socio-demographic characteristics that predispose women to RTIs. Women should feel comfortable receiving therapy and not be put off by concerns about privacy and confidentiality. Menstrual hygiene education and awareness should be emphasized more in both rural and urban areas. Community education, sanitary napkin use, appropriate menstrual hygiene, and increasing socioeconomic status are all elements of measures that can be taken. Aside from that, several stakeholders should be involved in the development of information, education, and communication in order to promote good attitudes on menstruation management and related difficulties among adolescent girls and uneducated females. Interventions should aim at giving training about menstrual hygienic practices and pre-menarcheal training of girls and also educational interventions will play a great role in reducing poor hygienic practices in rural/urban setting.

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