Reproductive Health

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Drivers of hygienic menstrual practices among reproductive-age women: evidence from Nepal demographic health survey-2022

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Abstract

Background Exclusive use of hygienic methods during menstruation has not received adequate attention in Nepal, with limited research utilizing nationally representative data. Therefore, this study explored the prevalence and factors influencing exclusive hygienic menstrual practices among women of reproductive age in Nepal.

Methods This study included 13,065 reproductive-age women from the Nepal Demographic and Health Survey (NDHS-2022). To quantify the proportion of the total variance attributable to differences between communities, the study used multilevel logistic regression and identify significant factors of exclusive use of hygienic methods among women in Nepal. The concentration Index (CI) and Concentration curve (CC) were also calculated to measure the socio-economic inequality of exclusive use of hygienic methods among reproductive age women.

Results Only 48% of Nepalese women aged 15- 49 years used exclusively hygienic methods to prevent bloodstains during menstruation. The results from multilevel model revealed that young women aged 15–24 (AOR = 2.52, $p < 0.001$), women with 10 years and above education (AOR = 1.98, $p < 0.001$) from the richest wealth quintile (AOR = 2.26, $p < 0.001$), never married women (AOR = 1.44, $p < 0.001$), owned a smartphone (AOR = 1.41, $p < 0.001$) and women with exposure to mass media at least once a week (AOR = 1.35, $p < 0.001$) are more likely to use hygienic methods as compared to their counterparts. The concentration curve results indicated that the exclusive use of hygiene methods is concentrated in women from higher economic backgrounds (CI: 0.21). Among the geographical regions of Nepal, the highest inequality was witnessed in Madhesh province (CI: 0.25), followed by Bagmati province (CI: 0.22).

Conclusions The findings suggest the need for multidimensional interventions and educational programs targeting socioeconomically vulnerable women to address unhygienic menstrual practices. Also, there is a need to educate adult women on biological facts and good hygienic practices, as they can impose cultural taboos and restrictions on the next generation.

Keywords Menstrual hygiene management, Reproductive age women, Inequality, Nepal

Plain language summary

Menstruation is a natural and biological process that every woman experiences throughout her reproductive years. However, no study has been conducted in Nepal that has examined the prevalence of exclusive use of hygienic

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methods among women (15-49 years) using nationally representative data. The present study aims to assess the factors influencing the exclusive use of hygienic methods during menstruation among reproductive-age women in Nepal. The study utilized data from the Nepal Demographic and Health Survey (NDHS-2022). A multilevel logistic regression model was employed to assess factors associated with the exclusive use of hygienic methods among reproductive-age women in Nepal. The concentration Index (CI) and Concentration curve (CC) were also calculated to measure the socio-economic inequality of exclusive use of hygienic methods among reproductive-age women. Our study shows that only 48% of reproductive-age women exclusively used the hygienic methods during menstruation. The analysis also indicated a significant difference in the use of exclusive menstrual hygiene practices across Nepal's provinces and ecological levels. In this study, multivariable analysis showed that young women (15-24 years of age) with higher years of schooling, never-married women, women who belonged to the richest wealth quintiles, no restrictions on activities during the menstrual period, owned smartphone, exposed to mass media at least once a week, worked into a white-collar job, and higher community wealth were significantly higher usage of menstrual hygiene product than their counterpart. Our result points to a substantial geographic disparity at province and ecological region in the exclusive use of hygienic menstruation methods suggests targeted interventions to address this inequality to improve the practices of exclusive use of hygienic menstruation. Current study also suggested that media awareness is also another key determinant to improve menstrual hygiene practice.

Introduction

Menstruation is a natural and biological process that every woman experiences throughout her reproductive years. Maintaining menstrual hygiene is a process in which *"women and adolescent girls use a clean menstrual management material to absorb and collect blood, that can be changed in privacy as often as necessary for the duration of the period, using soap and water for washing the body as required and having access to facilities to dispose of used menstrual management materials"* [1]. However, in Nepal, menstruation is perceived as a taboo, stigma, and uncomfortable topic, and people are ashamed of the disclosure of their menarche [2]. Due to poor knowledge and awareness about menstrual hygiene, women face significant challenges in managing menstruation hygienically [3, 4]. To ensure menstruation hygienically and with dignity, menstrual hygiene management (MHM) has received particular attention from Sustainable Development Goals 6.1 and 6.2, which aim for the 'access to adequate and equitable sanitation and hygiene for all', paying particular attention to the needs of women and girls.

It is estimated that worldwide, 500 million women lack access to menstrual products and adequate facilities for MHM [5]. According to a recent study in Nepal, every day, approximately 2,90,000 women and girls experience menstruation [6]. However, around 39% of women still not use an appropriate material during their last menstruation [7]. To recognize the importance of promoting menstruation hygiene practices, in the year of 2020, Government of Nepal (GoN) introduced a national sanitary pad (distribution and management) procedure to distribute free sanitary pads to government-aided schools [8]. Despite GoN efforts, there is still a significant portion of women who are incapable of achieving exclusive use of hygienic methods of menstruation practices. A systematic review-based study explained that Nepal's socio-demographic and cultural features lead to unhygienic menstrual practices, such as use of unhygienic menstrual products, lack of information about menstruation hygiene, and access to safe water and clean toilets [4]. Moreover, previous studies conducted on Nepalese women reported that an unhygienic sanitation practice during menstruation exposes women to risks of various urogenital infections, including reproductive tract infections (RTIs) and urinary tract infections (UTIs) [9, 10]. Unhygienic menstrual practices are also associated with compromising women's educational and economic opportunities and resulting in a diminished quality of life [11, 12]. Therefore, the exclusive use of hygienic methods during menstruation is a major public health and social issue in Nepal. While the majority of the research in Nepal focuses on school girls and adolescents, it is not only adolescent and young girls who use unhygienic menstrual products—women of all reproductive ages are affected. Hence, it is crucial to address exclusive hygiene practices and its associated factors among reproductive age women in Nepal. Numerous studies reported that exclusive use of menstrual hygiene methods is influenced by a variety of factors, including age, age at menarche, educational status, marital status, wealth status, place of residence, source of water, toilet facility, media exposure, and social restriction etc. [2–4]. For instance, the level of knowledge regarding menstrual hygiene management, such as use of sanitary pads, frequency

in changing pads, bathing and cleaning genital areas during menstruation, and appropriate disposal of used sanitary pads, is significantly associated with age and place of residence [3, 13]. Studies have revealed that urban women and girls have more access to sanitary pads as compared to their rural counterparts [3, 10]. Evidence shows that only 9% of women from rural Nepal use sanitary pads, while 89% still use cloth during menstruation. Meanwhile, in urban areas, 34% of women use sanitary pads, and 64% use clothing during their periods [14].

In many parts of Nepal, menstrual practices are deeply influenced by social and cultural norms. According to UNICEF, more than two-thirds of women in Nepal did not participate in regular activities while menstruating [15]. A study conducted in three districts within the Terai region in Nepal explained that three out of four women experienced two or more types of menstrual restriction [16]. Also, cultural customs like 'Chhaupadi' (*a custom in which women and girls are banished to isolated huts or sheds and experience grossly unhygienic conditions while menstruating*) exacerbate unhygienic menstrual management as highlighted by previous studies [2, 17]. Although this practice was declared illegal by Nepal's Supreme Court in May 2005 and was criminalized under the Criminal Code Act (2017), the practice still exists in some areas and communities in Nepal [2, 18].

In Nepal, menstrual hygiene practices are issues that have not received adequate attention. Most studies on mensuration hygiene particularly focused on adolescent girls and were centered on rural communities or specific geographical areas, and therefore, the study results could not be generalised for the whole country [6, 10, 19]. To the best of our knowledge, none of the previous studies investigated the factors associated with hygiene menstruation practices in reproductive-age women (15–49 years) at the national level in Nepal. To fill this gap, the present study hypothesized that the exclusive use of menstrual hygiene practices was positively associated with socio-demographic, socio-cultural, economic, and factors related to the ecological and provincial distribution of Nepal. Thus, the present study aims to assess the factors influencing the exclusive use of hygienic methods during menstruation among reproductive-age women in Nepal. This study also measures socio-economic inequality in Nepalese women's exclusive use of hygienic materials during menstruation. Understanding socio-economic inequalities in exclusive use of hygienic methods during menstruation should be an integral part of any effort to promote equity across the provinces of Nepal. Overall, the result of the study will assist policymakers and planners in framing policies for preventing women from unhygienic menstrual practices. Also, understanding predictors of menstrual hygiene practice among Nepalese women will help formulate effective intervention strategies to promote the exclusive use of hygienic methods during menstruation.

Data and methods

Data

The study utilized data from the Nepal Demographic and Health Survey (NDHS), conducted between January 5 and June 22, 2022. The survey collected information on fertility, marriage, family planning, breastfeeding practices, nutrition, food insecurity, maternal and child health, childhood mortality, awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections (STIs), women's empowerment, domestic violence, fistula, mental health, accident and injury, disability, and other health-related issues such as smoking, knowledge of tuberculosis, and prevalence of hypertension.

Study design

Nepal Demographic and Health Survey (NDHS) used a sampling frame from an updated version of the 2011 Nepal Population and Housing Census (NPHC) provided by the National Statistical Office. The NDHS-2022 considered wards from the 2011 census as sub-wards, the smallest administrative unit for the survey. The survey used a stratified sample that was selected in two stages. Stratification was done by dividing each of the seven provinces into urban and rural areas, which together formed the sampling stratum for that province. A total of 14 sampling strata were created in this way. In the first sampling stage, 476 primary sampling units (PSUs) were selected with probability proportional to PSU size and with independent selection in each sampling stratum within the sample allocation. Among the 476 PSUs, 248 were from urban areas and 228 from rural areas. Detailed sampling design and data collection procedure are given elsewhere [7]. A total of 13,786 households, 14,845 women and 4,913 men aged 15–49 years, were successfully interviewed, with a response rate of 99.7%, 97.4%, and 94.8%, respectively. The final sample size of this study was 13065 women aged 15–49 years.

Outcome variable

NDHS-2022 asked a multiple-response question to eligible female respondents about the specified materials used to collect or absorb blood from the most recent menstrual period during their menstruation to prevent blood stains from becoming evident. Response options included ten categories: (i) reusable sanitary pads, (ii) disposable sanitary pads, (iii) tampons, (iv) menstrual cups, (v) cloth, (vi) toilet paper, (vii) cotton wool, (viii)

underwear only, (ix) other, and (x) nothing. The outcome variable was classified based on the Demographic and Health Survey (DHS) definition [7]. Similar definitions also employed in previous literature on menstrual hygiene practices [20–22]. The first four and vi, vii of these are labelled as hygienic methods, and the remaining as unhygienic. The outcome variable of this study is "exclusive use of hygienic methods". A woman is considered "an exclusive user of hygienic methods" if she uses hygienic methods only. Any woman who uses either unhygienic methods or a combination of hygienic and unhygienic methods is considered "not an exclusive user of hygienic methods".

Predictor variables

In the realm of research, identifying predictors based on prior literature is a fundamental step in ensuring the robustness and relevance of a study. These predictors, often derived from a comprehensive review of existing studies, provide a foundation for formulating hypotheses and guiding the research design. Therefore, we used the predictors in this study based on previous research [3, 4, 11, 13].

Variables	Description
Age:	Respondent's age collected at the time of the survey was classified into three groups: "15–24 years", "25–34 years, and "35 + years"
Age at menarche:	Age at menarche were grouped into following categories—'less than 13 years', '13–15 years', 'more than 15 years', and "Don't know" (for women who do not remember the age.)
Marital status:	The survey collected the current marital status as follows: 0 "Never in union," 1 "married," 2 "living with a partner," 3 "widowed," 4 "divorced," and 5 "no longer living together/separated." However, for this study, we grouped it into two categories: (0) "Never married" and (1,2,3,4,5) "Ever married"
Years of schooling:	Education in single years of schooling was recoded into the following categories: "< 5 years", "5–9 years", and "10 + years"
Wealth index:	Wealth quintile variable was recoded into three categories: "Poor," "Middle," and "Rich."
Religion:	Religion was recorded as "Hindu" and "Non-Hindu"
Ethnicity	Ethnicity was grouped into Brahmin/Chhetri, Tarai/Madhesi others, Dalit, Janjati, and Muslim/ Others [23]
Type of home:	Type of home is created based on the respondent's relationship with the household head; three categories were created, – marital home, natal home, and household head. 'Marital home' (1) includes wife, daughter-in-law, mother, mother-in-law, co-spouse, sister-in-law; 'natal home' (2) includes daughter, granddaughter, sister, other relative, adopted/foster child, not relative, niece by blood; 'Head' (3) respondents who are household head themselves [11]
Restrictions on activities during menstrual period:	Respondents reported the activities they are excluded from during the menstrual period, like entering the temple, getting involved in religious activities, touching or cooking food, eating with family members, staying in the main house, touching plants, touching other people, touching cattle, fetching water, sleep with husband, and other. A variable was created- the number of activities respondents were excluded from then recoded into four categories- 0 No restriction, 1–2 restrictions, 3–4 restrictions, and 5 + restrictions
Households using improved sanitation facility:	Households that were using improved sanitation facilities without sharing it with any other household were recorded as "Yes," otherwise, "No." Improved sanitation facility includes toilets of the following types: flush to piped sewer systems, septic tanks, pit latrines, or an unknown destination; ventilated improved pit (VIP; pit latrines with slabs; and composting toilets
Ecological region:	Nepal is classified into three ecological regions- Mountain, Hill, and Terai
Province:	The 7 provinces of Nepal are Koshi, Madhesh, Bagmati, Gandaki, Lumbini, Karnali, and Sudurpashchim
Residence:	Residence was categorized into two groups: "Urban" and "Rural"
Occupation of the woman:	Respondent's occupation was grouped into three categories: 1 "Not working"; 2 "White collar" includes professional/technical/ managerial, clerical, and sales; 3 "Blue collar" includes agricultural-self-employed, skilled manual, unskilled manual, and others

Variables	Description
Owned smartphone:	Whether a respondent owns a smartphone by herself. Recorded as "Yes" and "No"
Exposure to any mass media:	Respondents were asked how often they read newspapers or magazines, listen to the radio, and watch television in three different variables in the following categories: 0 "Not at all," 1 "Less than once a week," and 2 "At least once a week." In this study, we combined all three sources to create exposure to any mass media (Newspapers or magazines/ Radio/ Television)
Community education:	Communities were grouped into two groups based on the proportion of women with less than 5 years of schooling in PSUs. 1 "High" if the proportion was less than the national average and 2 "Low" otherwise
Community wealth:	Communities were grouped into two groups based on the proportion of poor women in PSUs. 1 "High" if proportion was less than the 25th percentile and 2 "Low" otherwise
Community exposure to media:	Communities were grouped into two groups based on the proportion of women exposed to mass media at least once a week in PSUs. 1 "High" if proportion was more than the 75th percentile and 2 "Low" otherwise

Statistical analysis

The analysis of this study is based on reproductive-age women (aged 15–49 years) in Nepal sampled in the NDHS-2022. The study used bivariate analysis to examine the association between the exclusive use of hygienic methods and other socio-demographic predictors. The chi-square test was applied to observe the significant association between them. Further, a multilevel logistic regression model was employed to assess factors associated with the exclusive use of hygienic methods among reproductive-age women in Nepal. The model accounts for the hierarchical structure of the data, where women (Level 1) were nested within communities or clusters (Level 2). This approach allowed for the estimation of both fixed effects (individual-level and community-level predictors) and random effects (unobserved heterogeneity across communities). Intra-class correlation coefficients (ICCs) were calculated to quantify the proportion of the total variance attributable to differences between communities. The concentration Index (CI) and Concentration curve (CC) were also calculated to measure the socio-economic inequality of exclusive use of hygienic methods among reproductive-age women.

Results

Differentials in use of various types of menstrual products

The distribution of various menstrual hygiene products according to age is represented in Table 1. A total of seven methods have been reported to protect from bloodstains during menstruation. Disposable menstrual pads (59.8%) and cloth (47.6%) were the most commonly used across all age groups. Age-wise results show that over 75 percent of young women (15–24) used a disposable sanitary pad. About 59 percent of women in the older age group (35 years and above) use cloth to prevent menstruation. It is very surprising to report that still more than 10 percent of older age women (35 years and above) either used underwear to prevent bloodstains during menstruation or did not use anything.

Socio-demographic and economic characteristics of the study participants

We evaluated the socio-demographic and economic characteristics of Nepalese women aged (15–49) as shown in Table 2. Out of 13,065 reproductive-age women in Nepal, more than one-third (37.2%) were in the young (15–24 years) age group. The mean age of the women was 33.33 years, ranging from 15 to 49 years. Most women (65.5%) had their menarche between 13 and 15 years of age. Nearly one-third (33.4%) had less than 5 years of schooling and majority of women (67%) were living in households that had improved sanitation facilities. In terms of restrictions on activities during the menstrual

Table 1 Differentials in the use of various types of menstrual products among reproductive-age women, Nepal 2022

Type of menstruation products	All women (Total)	Age group		
		15–24	25–34	35 years and above
Reusable sanitary pads[a]	1.1	1.3	1.0	0.9
Disposable sanitary pads[a]	59.8	75.8	59.2	41.6
Cloth[b]	47.6	36.5	49.7	58.8
Tampons[a]	0.1	0.1	0.2	0.0
Menstrual cup[a]	0.1	0.1	0.1	0.1
Toilet paper/cotton wool[b]	0.2	0.1	0.3	0.3
Underwear only[b]	2.5	0.6	2.3	5.0
Nothing[b]	2.4	0.7	1.5	5.4

Total percentage exceeds 100 due to multiple responses

[a] Hygienic product

[b] Unhygienic product

Table 2 Weighted percentage distribution of reproductive-age women by background characteristics in Nepal, 2022

Background characteristics	N (13,065)	Percentage
Individual-level variables		
Age of the women (in years)		
15–24	4,858	37.2
25–34	4,086	31.3
35 years and above	4,122	31.5
Mean age (SD)		33.33 (7.65)
Age at menarche (in years)		
< 13	2,782	21.3
13–15	8,556	65.5
> 15	1,287	9.9
Do not remember	439	3.3
Marital status		
Never married	3,167	24.2
Married	9,898	75.8
Years of schooling		
< 5	4,366	33.4
5–9	4,216	32.3
10 years and above	4,483	34.3
Wealth index		
Poor	4,723	36.1
Middle	2,636	20.2
Rich	5,707	43.7
Religion		
Non-Hindu	2,166	16.6
Hindu	10,899	83.4
Ethnicity		
Brahmin/Chhetri	3,894	29.8
Tarai/Madhesi others	1,783	13.6
Dalit	1,934	14.8
Janjati	4,879	37.3
Muslim/others	576	4.4
Type of home		
Marital home	6,531	50.0
Natal home	3,886	29.7
Head	2,648	20.3
Restrictions on activities during menstrual period		
No restriction	1,960	15.0
1–2	7,149	54.7
3–4	2,909	22.3
5 +	1,047	8.0
Households using improved sanitation facility		
No	4,330	33.1
Yes	8,735	66.9
Ecological region		
Mountain	665	5.1
Hill	5,294	40.5
Terai	7,106	54.4
Province		
Koshi	2,193	16.8

Table 2 (continued)

Background characteristics	N (13,065)	Percentage
Madhesh	2,467	18.9
Bagmati	2,763	21.1
Gandaki	1,292	9.9
Lumbini	2,456	18.8
Karnali	781	6.0
Sudurpashchim	1,113	8.5
Residence		
Rural	4,081	31.2
Urban	8,985	68.8
Occupation of the woman		
Not working	3,650	27.9
White collar	2,151	16.5
Blue collar	7,264	55.6
Owns a smartphone		
No	5,032	38.5
Yes	8,033	61.5
Exposure to mass media (Newspaper/Radio/Television)		
Not at all	2,652	20.3
Less than once a week	3,605	27.6
At least once a week	6,809	52.1
Community-level variables		
Community Education		
Low	5,142	39.4
High	7,923	60.6
Community wealth		
Low	4,928	37.7
High	8,137	62.3
Community exposure to media		
Low	5,732	43.9
High	7,333	56.1

N = sample size

period, more than 50 percent of women reported facing restrictions on at least 1–2 activities during menstruation. More than half of women (52.1%) had exposure to mass media at least once a week, and 61.5% had personal smartphones. Only 16.5% of women were in white-collar jobs, while 27.9% of the women currently did not work.

Exclusive use of hygienic methods by provinces of Nepal

Figure 1 shows the distribution of women using the hygiene method for menstrual blood collection. Overall, 47.6% of women used hygienic methods. Exclusive use of hygienic methods varied across provinces of Nepal. Only 35.8% of women living in Karnali province exclusively used hygienic methods, while 59% of women residing in Bagmati and Gandaki provinces used hygienic methods only.

Differentials in exclusive use of hygienic methods among reproductive-age women

Table 3 shows the proportion of reproductive-age women using only hygienic methods based on background characteristics in Nepal. The exclusive use of hygienic methods was two times higher among young women (aged 15–24) (62.3%) than older women (35 years and above) (31.0%). It was also found that never-married women used more hygienic methods (71%) than ever-married women (40.1%). Moreover, the exclusive use of hygienic methods was three times higher among women with 10 years and above schooling (68.3%) than women with less than 5 years of education (23.8%). Women from affluent households had a higher proportion of exclusively used hygienic methods (65.3%) than women from poor families (29.8%). Dalit women were less likely to use hygienic methods exclusively compared to other

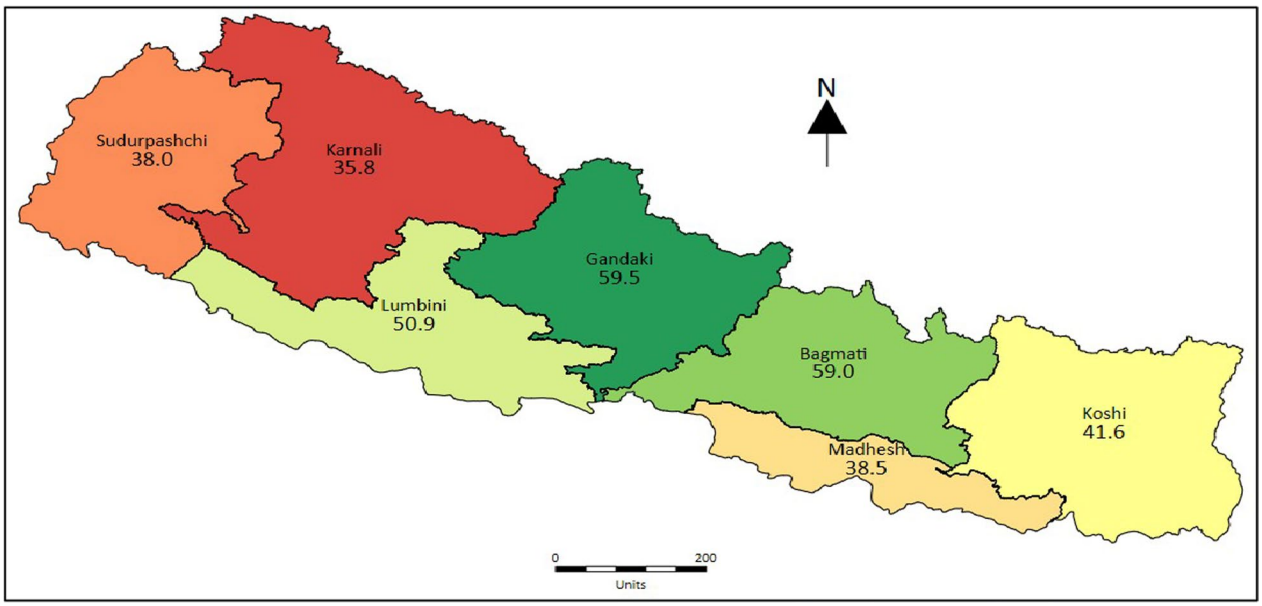

Fig. 1 Exclusive use of hygienic methods in different province of Nepal, 2022

ethnic groups. About one-third (32.4%) of women who faced multiple restrictions (more than five activities) on their daily activities during menstruation had a lower percentage of using hygienic methods.

The exclusive use of hygienic methods was significantly higher among women who are currently not working (60.7%) and women working in white-collar jobs (70.5%) than women working in blue-collar jobs (34.1%). Women with exposure to mass media at least once a week exclusively used more hygienic methods (53.8%) than those without exposure to media (36.6%). In addition, women who owned smartphones had higher exclusively used hygienic methods (57.6%) than women who did not (31.6%).

Variance estimates across communities and intra-class correlation coefficients (ICCs)

A model applied without covariates (called the null model) on the exclusive use of hygienic methods among reproductive-age women (Table 4) showed significant variation in the exclusive use of hygienic methods communities. Based on intra-class correlation coefficient (ICC) values, 16.6% of the total variance in using hygienic methods was attributable to differences across communities. After including individual variables (Model 1) in the null model, the ICC values decreased to 10.0% (community level).

Results of the multilevel logistic regression model

The determinants of the exclusive use of hygienic methods were examined using a multilevel logistic regression model (Table 5). Results of the multilevel model show that young women aged 15–24 years (AOR = 2.52, CI 2.18–2.90) were 2.5 times and women aged 25–34 (AOR = 1.69, CI 1.51–1.90) were 1.69 times more likely to use exclusively hygienic methods than women aged 35 years and higher. The odds of exclusive use of hygienic methods in women were 45% higher among never-married women (AOR = 1.45, CI 1.22–1.73) than their married counterparts. Women with 10 years and above of schooling (AOR = 1.98, CI 1.72–2.28) were 98%, and women with 5–9 years of schooling (AOR = 1.78, CI 1.58–2.00) were 78% more likely to use hygienic methods than women with less than 5 years of schooling. The odds of exclusive use of hygienic methods were 2.26 times higher among women in rich households (AOR = 2.26, CI 1.95–2.62).

Restrictions on women during their menstruation period were negatively associated with the use of hygienic methods. Women with no restrictions (AOR = 1.30, CI 1.07–1.58) were 30% more likely to use hygienic methods than women with five or more restrictions on activities, respectively. The odds of exclusive use of hygienic methods varied significantly by the occupational status of the woman. Regarding women working in blue-collar jobs, exclusive hygienic methods were used twice among women in white-collar jobs (AOR = 2.18, CI 1.90–2.49). The chances of exclusive use of hygienic methods were 41% higher among women who owned a smartphone than those who did not (AOR = 1.41, CI 1.28–1.56). In addition, women exposed to mass media at least once a week were 35% more likely to use hygienic methods than

Table 3 Exclusive use of hygienic methods during menstruation among reproductive-age women by selected Background characteristics, Nepal 2022

Background characteristics	Exclusively use hygienic methods (% weighted)
Individual-level variables	
Age of the women (in years)	p = 0.000
15–24	62.3
25–34	46.7
35 years and above	31.0
Age at menarche (in years)	p = 0.000
< 13	55.2
13–15	47.5
> 15	37.1
Do not remember	31.4
Marital status	p = 0.000
Never married	71.0
Married	40.1
Years of schooling	p = 0.000
< 5	23.8
5–9	50.1
10 years and above	68.3
Wealth index	p = 0.000
Poor	29.8
Middle	41.0
Rich	65.3
Religion	p = 0.235
Non-hindu	48.5
Hindu	47.4
Ethnicity	p = 0.000
Brahmin/Chhetri	50.3
Tarai/Madhesi others	45.1
Dalit	37.4
Janjati	50.8
Muslim/others	43.4
Type of home	p = 0.000
Marital home	39.5
Natal home	66.8
Head	39.1
Restrictions on activities during menstrual period	p = 0.000
No restriction	49.0
1–2	49.3
3–4	47.7
5 +	32.4
Households using improved sanitation facility	p = 0.045
No	45.2
Yes	48.7
Ecological region	p = 0.000
Mountain	33.7
Hill	51.4
Terai	46.0
Province	p = 0.000

Table 3 (continued)

Background characteristics	Exclusively use hygienic methods (% weighted)
Koshi	41.6
Madhesh	38.5
Bagmati	59.0
Gandaki	59.5
Lumbini	50.9
Karnali	35.8
Sudurpashchim	38.0
Residence	p = 0.000
Rural	38.8
Urban	51.5
Occupation of the woman	p = 0.000
Not working	60.7
White collar	70.5
Blue collar	34.1
Owns a smartphone	p = 0.000
No	31.6
Yes	57.6
Exposure to any mass media (Newspaper/Radio/TV)	p = 0.000
Not at all	36.6
Less than once a week	43.8
At least once a week	53.8
Community-level variables	
Community education	p = 0.000
Low	35.8
High	55.2
Community wealth	p = 0.000
Low	33.5
High	56.1
Community exposure to media	p = 0.000
Low	43.9
High	50.4

women without exposure to mass media (AOR = 1.35, CI 1.20–1.53). At the community level, higher community wealth was positively associated with the exclusive use of hygienic methods during menstruation.

Table 4 Variance estimates across communities and intra-class correlation coefficients (ICCs) for the multilevel models for exclusive use of hygienic methods among reproductive-age women

Model	Community (PSU)	
	Variance (95% CI)	ICC (95% CI)
Null model	0.653 (0.548, 0.777)	16.6 (14.3, 19.1)
Adjusted model (Model 1)	0.364 (0.293, 0.451)	10.0 (8.2, 12.1)

Figure 2 shows the concentration curve for the exclusive use of hygienic methods among reproductive-age women in Nepal. The concentration curve (CC) lies below the line of equality; it implies that the exclusive use of hygienic methods among women is concentrated among the rich. Moreover, if CC were formed above the line of equality, the inequality would concentrate on the poor and vice-versa. Additionally, the more areas between the line of equality and the curve, the higher the inequality. Nepal had an inequality of 0.21, which describes that exclusive use of hygienic methods was concentrated among rich women. Among the geographical regions of Nepal, the highest inequality was witnessed in Madhesh province (0.25), followed by Bagmati province (0.22). The lowest inequality was

Table 5 Multilevel logistic regression analysis assessing the effect of background characteristics on the exclusive use of hygienic methods among reproductive age women in Nepal, 2022

Background characteristics	Adjusted odds ratio	p-value	95% CI	
			Lower	Upper
Individual-level variables				
Age of the women (in years)				
15–24	2.52	0.000	2.18	2.90
25–34	1.69	0.000	1.51	1.90
35 +	1			
Age at menarche (in years)				
< 13	1.17	0.053	1.00	1.38
13–15	1.05	0.454	0.92	1.21
> 15	1			
Don't know	0.97	0.863	0.73	1.30
Marital status				
Never married	1.45	0.000	1.22	1.73
Married	1			
Years of schooling				
< 5	1			
05-	1.78	0.000	1.58	2.00
10 +	1.98	0.000	1.72	2.28
Wealth index				
Poor	1			
Middle	1.37	0.000	1.20	1.56
Rich	2.26	0.000	1.95	2.62
Ethnicity				
Brahmin/Chhetri	0.96	0.630	0.83	1.12
Tarai/Madhesi others	1.20	0.071	0.98	1.46
Dalit	1			
Janjati	1.21	0.010	1.05	1.40
Muslim/others	1.03	0.848	0.76	1.39
Type of home				
Marital home	1			
Natal home	1.47	0.000	1.25	1.73
Head	1.10	0.120	0.98	1.23
Restrictions on activities during menstrual period				
No restriction	1.30	0.010	1.07	1.58
1–2	1.40	0.000	1.19	1.64
3–4	1.28	0.003	1.09	1.50
5 +	1			
Households using improved sanitation facility				
No	1			
Yes	1.12	0.021	1.02	1.23
Ecological region				
Mountain	1			
Hill	0.80	0.106	0.62	1.05
Terai	0.61	0.001	0.46	0.82
Residence				
Rural	1			
Urban	1.03	0.697	0.89	1.20
Occupation of the woman				
Not working	1.44	0.000	1.29	1.61
White collar	2.18	0.000	1.90	2.49
Blue collar	1			
Owns a smartphone				
No	1			
Yes	1.41	0.000	1.28	1.56
Exposure to mass media (Newspaper/Radio/Television)				
Not at all	1			
Less than once a week	1.03	0.622	0.91	1.18
At least once a week	1.35	0.000	1.20	1.53
Community-level variables				
Community education				
Low	1			
High	1.11	0.232	0.94	1.30
Community wealth				
Low	1			
High	1.27	0.011	1.06	1.54
Community exposure to media				
Low	1			
High	0.89	0.116	0.76	1.03

observed in Sudurpashchim province (0.08), followed by Karnali province (0.11). In all the provinces of Nepal, the exclusive use of hygienic methods is concentrated among rich women only.

Figure 3 presents the restrictions faced by women during their menstruation period in Nepal by province for each activity. In Nepal, about 65% of women were not allowed to enter the temple or to get involved in religious activities, and one-third of women were also not allowed to touch or cook food during menstruation. In addition, 14.3% of women were restricted even from fetching water to plants.

Discussion

The current study aimed to evaluate the factors influencing exclusive use of hygienic methods during menstruation among reproductive-age women in Nepal. Using nationally representative recent data from Nepal, this study is one of the first studies to highlight various socio-demographic factors of exclusive use of hygienic methods during the menstruation period in Nepal. Our study shows that only 48% of reproductive-age women exclusively used the hygienic method during menstruation. However, 39% of women reported that they are still using unhygienic menstrual absorbents

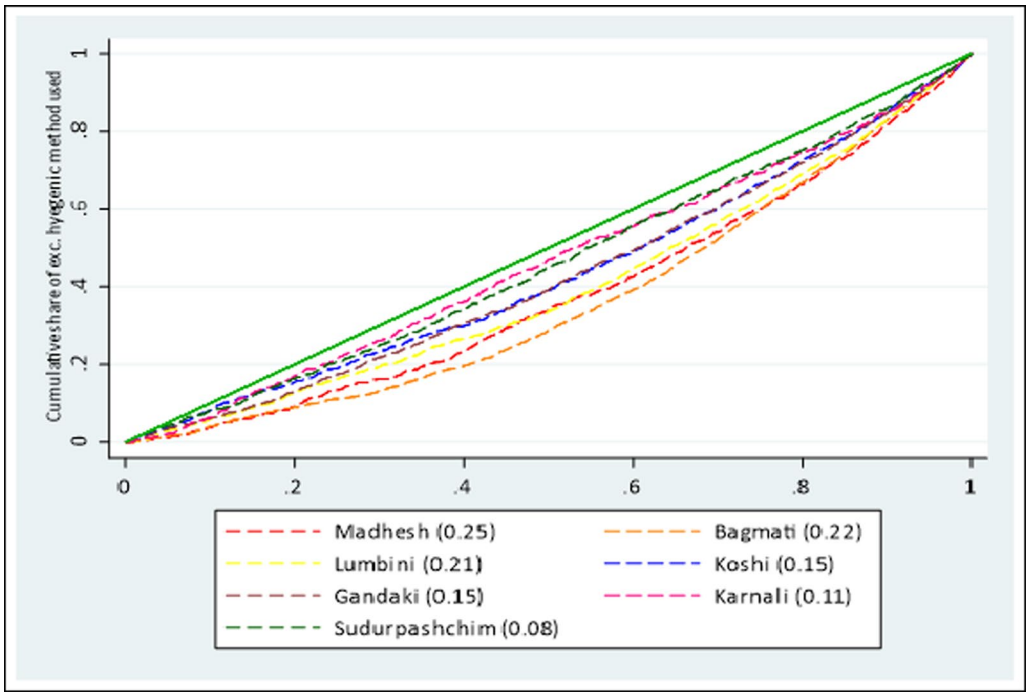

Fig. 2 Socio-economic inequality in exclusive use of hygienic methods by provinces of Nepal, 2022. Overall CI = 0.21

such as old clothes, rags, or other unclean menstruation absorbents. The exclusive use of hygienic methods was seen to be higher than the studies conducted in Pakistan (25%) [24], Ethiopia (46.4%) [25] and sub-Saharan Africa (45%) [26]. Contrary to the findings of this study, a higher prevalence (50–70%) of using hygienic method was obtained in a similar study conducted in India [20, 22]. The possible explanation for discrepancies is mainly due to socioeconomic and cultural differences between countries that directly affect menstrual hygiene practices. Furthermore, it can be due to the difference in implementing programs and schemes at school and community level on menstruation hygiene management.

The present study identified several important individual, household, and community-level factors significantly associated with hygienic menstrual practices. The analysis also indicated a significant difference in the use of exclusive menstrual hygiene practices across Nepal's provinces and ecological levels. In this study, multivariable analysis showed that young women (15–24 years of age) with higher years of schooling, never-married women, women who belonged to the richest wealth quintiles, no restrictions on activities during the menstrual period, owned smartphone, exposed to mass media at least once a week, worked into a white-collar job, and higher community wealth were significantly higher usage of menstrual hygiene product than their counterpart.

The chances of exclusive use of hygienic methods decreased with the increase in age of women. We found that exclusive use of hygienic methods was significantly higher among younger women (15–24) than their older counterparts (aged 35 and above). This finding corroborates a previous study in Nepal that analyzed adolescent girl practicing more hygienic methods (67%) during the mensuration period than their counterpart [3]. This finding also aligns with the study from India and Bangladesh [11, 20, 27]. This result implies that younger women are more aware and serious regarding the importance of hygienic methods during menstruation. In recent years, the Nepalese government and other non-governmental organizations (NGOs), specifically UNICEF, have promoted the WASH for Schools (WinS) program and provided menstrual management facilities in schools to encourage hygienic and safe menstruation habits among adolescent girls. As a result, it has positively impacted knowledge and practices of hygiene menstruation among young women [28, 29]. This study also highlighted that the exclusive use of hygienic methods was more prevalent among never-married women than married women. Similar results were reported from another study conducted in India that found exclusive hygienic methods were relatively higher among unmarried women (71.0%) than married women [11]. A possible explanation for these similarities may be that most of the unmarried women

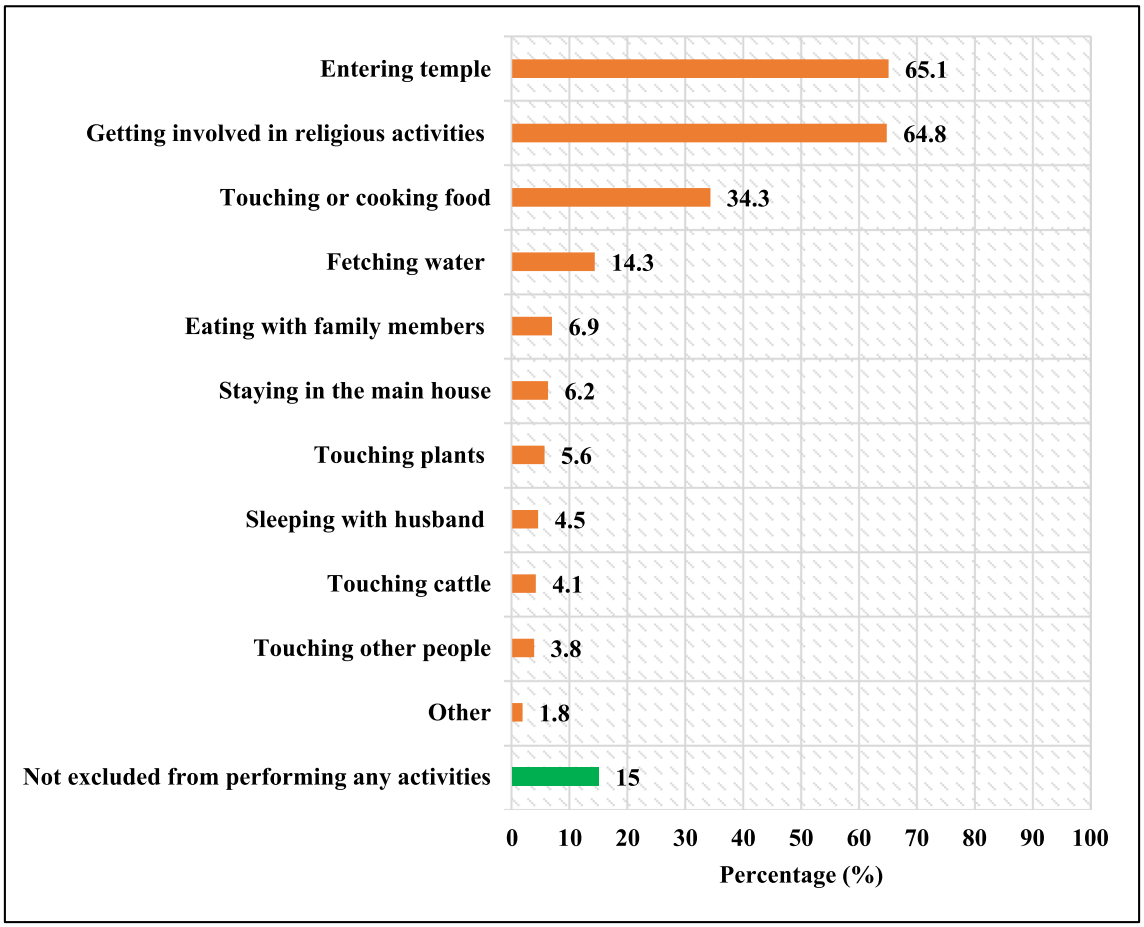

Fig. 3 Restrictions on women's daily activities during menstruation period by the province of Nepal

enrolled in school or colleges have more opportunities to obtain relevant information about menstrual hygiene and safe hygiene practicing during menstruation than those who are married and have less exposure to getting information.

The present study also demonstrated that increased educational years was significantly associated with a decrease in poor menstrual hygiene practices. We found that women who had ten years and above educational levels had more chances of using an appropriate menstrual practice than women with less than 5 years of schooling. This finding is in line with previous studies conducted in Nepal and other countries [6, 11, 20, 27]. These studies consistently show that women with a higher level of education understand the benefits of using hygienic methods and are more aware of the risks associated with unhygienic menstruation practices. The exclusive use of hygienic menstrual practices is also significantly associated with the household's wealth status. Previous studies have documented that the prevalence of exclusive hygienic method is relatively low among women belonging to poor families [10, 11, 24]. Our results confirm the same and indicate that women who belonged to affluent families used twice the exclusive use of hygienic methods as poor women. Vishwakarma et al., (2021) explained that economic status of women is a major issue behind the consistent use of hygienic methods during menstruation. The continuous use of hygiene methods during menstruation becomes very challenging for women, especially for the one who depend on their spouse and families for economic support, or who belong to the economically deprived sections of the society [30]. The results from the concentration curve also demonstrated that the exclusive use of hygiene methods among women is concentrated in women from higher economic backgrounds. This is probably because women from lower income households are unable to seek higher education and are not able to afford sanitary products, which results in poor menstrual practices [10]. In connection with the economic status, women who worked in white collar jobs were more likely to use hygienic methods as compared with women with

blue collar jobs. Previous studies from India also found that women's working status significantly associated with the use of hygienic methods during menstruation [30, 31]. However, there is paucity of literature related to women working status and menstruation hygiene practice in Nepal. There are few studies in Nepal reported that occupation of fathers or mother was positively associated with menstrual hygiene practice [6, 32]. Another important finding of this study is that women who faced any menstrual restrictions, such as not allowed to enter the temple or get involved in religious activities, or women were also not allowed to touch or cook in the kitchen, are more likely to practice unhygienic menstruation methods than those who did not face any menstrual restriction. It is also reflected in our results that 85% of Nepalese women experience some sort of menstrual restriction. This result is consistent with a study in Nepal, which mentioned that due to social and individual restrictions against women when menstruating there are significant changes have been observed in menstrual practices [33]. Our findings highlighted deeply rooted menstruation-related socio-cultural and religious restrictions that continue to affect menstrual hygiene practices among Nepalese women. Unfortunately, these restrictions are still widespread and often overlooked by the society [2]. Regarding the province-based distribution of exclusive use of menstrual hygiene practices, we found geographical heterogeneity across Nepal, with Madhesh province and Bagmati province having the highest inequality of 0.25 and 0.22 during the study period. Alternatively, two northern provinces, Karnali and Sudurpashchim, showed comparatively good menstruation practices. Social restriction during menstruation is one of the reasons for high inequality in menstrual hygiene in Madhesh and Bagmati provinces. Due to social restriction during menstruating women were unprepared for menstruation and menstrual hygiene management [4, 34]. It is also supported by NDHS (2023) report, which showed that Nepalese women from Madhesh and Bagmati provinces have the most restrictions on socio-cultural activities during the menstrual period as compared to women from Karnali and Sudurpaschim provinces [7]. However, there are very few research that explains the reason for province-based behaviours change on menstrual hygiene practices in Nepal. Another significant finding of this study was the positive role of women's exposure to mass media on menstrual hygiene practices. The finding of this study revealed that exposure to mass media at least once a week is significantly associated with exclusive use of hygienic methods. The finding was congruent with a study conducted on school adolescents in Nepal reported that 70% of the girls received information on menstruation from the local radio station [13]. Many previous studies suggest that exposure to diverse mass media can play a prominent role in disseminating information, including menstruation and menstrual hygiene-related topics [11, 35]. Our study also found that the ownership of smartphones was significantly associated with higher use of hygienic methods during menstruation. This finding is consistent with earlier studies conducted in India and Bangladesh [11, 27]. The finding indicates that access to mobile phones is important in addressing awareness among women on menstruation practices as mobile phones provide easy access to information. Also, information on menstruation through various media and digital awareness among women reduces societal stigma on menstruation and promotes the safe and hygienic menstruation practice [4]. Based on our study findings, policy planners and program implementers could target economically disadvantaged groups of women to improve the exclusive use of hygienic methods among them and make the overall progress more equitable. Also, the current study's findings confirmed that older and married women were less likely to use hygienic methods than young and unmarried women. Therefore, comprehensive menstrual education programs were needed to educate the menstrual hygiene of this particular group. This study's findings suggest province-specific menstrual hygiene policies or schemes to reduce regional inequality in Nepal's exclusive use of hygienic methods. Also, it is essential to conduct further research to understand the root causes of provinces-based inequality in the exclusive use of hygienic methods in Nepal.

Strength and limitations

The present study exhibits several notable strengths. This is the first study on this topic at the national level that assesses the exclusive use of mensuration hygienic methods among Nepalese women. Moreover, the data quality and large sample size ensure the generalization of the findings. Secondly, the study identified potential determinants that are significantly associated with hygienic menstruation practices. The study's outcome will be important information for Nepal government and public health practitioners to design a programmatic set of actions to address the menstruation problems in the country. Moreover, this study provides further direction for future research to explore and enable appropriate solutions to hygiene menstrual practices. Nevertheless, our study has some limitations. The study's cross-sectional nature makes it difficult to build causal relationships between the outcome and exposure variables. The reliance on self-reported nature of the data can be subject to recall bias and social desirability bias. Also, due to the unavailability of data, we were unable

to investigate the association between knowledge and awareness of women on mensuration hygiene practices.

Conclusions

The study shows that less than half of the women are using hygienic menstrual methods. Also, unhygienic methods were concentrated in socioeconomically disadvantaged groups. Therefore, there is a need for multidimensional interventions and educational programs targeting socio-economically vulnerable women to address unhygienic menstrual practices. Also, socio–cultural restrictions regarding menstruation are still major factors for the unhygienic menstrual practices. Creating awareness and behaviour change communication at community level regarding misconceptions about menstrual hygiene could increase the use of hygienic menstrual methods. Moreover, there is a need to educate adult women on biological facts and good hygienic practices, as they can impose cultural taboos and restrictions on the next generation. More research is needed to determine the effect of social restrictions on menstruation hygiene practices.

We also found that wealth status of the household was one of the major reasons for avoiding hygiene practices during menstruation. Therefore, a special focus on providing poor households and communities with subsidized or free menstrual hygiene products can reduce the economic disparities. Our result points to a substantial geographic disparity at province level in the exclusive use of hygienic menstruation practices suggests province-based interventions are needed to reduce this inequality to promote the equal practices across the provinces of Nepal. Current study also suggested that media awareness is also another key determinant to improve menstrual hygiene practice. Therefore, engagement of digital media in advocating for menstruation management can help raise awareness throughout society.

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Conception and design of the study: N.H., P.K. and R.R.; analysis and/or interpretation of data: N.H. and P.K.; drafting the manuscript: R.R.; reading and approving the manuscript: N.H., P.K. and R.R.

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Declarations

Ethics approval and consent to participate
This study is based on secondary data which is available in public domain. Therefore, ethical approval is not required for conducting this study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. WHO/UNICEF. Guidance on Menstrual Health and Hygiene. 2019. https://www.unicef.org/media/91341/file/UNICEF-Guidance-menstrual-health-hygiene-2019.pdf. Accessed 02 Sept 2024.
2. Mukherjee A, Lama M, Khakurel U, Jha AN, Ajose F, Acharya S, et al. Perception and practices of menstruation restrictions among urban adolescent girls and women in Nepal: a cross-sectional survey. Reprod Health. 2020;17:81.
3. Bhusal CK. Practice of menstrual hygiene and associated factors among adolescent school girls in Dang District. Nepal Adv Prev Med. 2020;2020:1–7.
4. Sharma A, McCall-Hosenfeld JS, Cuffee Y. Systematic review of menstrual health and hygiene in Nepal employing a social ecological model. Reprod Health. 2022;19:154.
5. World Bank Group. Menstrual Health and Hygiene. 2022. https://www.worldbank.org/en/topic/water/brief/menstrual-health-and-hygiene. Accessed 14 Sept 2024.
6. Khanal G, Shrestha N, Adhikari K, Ghimire U. Menstruation hygiene management among secondary school students of Chitwan, Nepal:a cross-sectional study. BMC Womens Health. 2023;23:395.
7. Ministry of Health and Population [Nepal], New ERA, and ICF. Nepal Demographic and Health Survey 2022. 2023.
8. UNICEF and WaterAid South Asia Regional Team. Menstrual Hygiene in Schools in South Asia: Synthesis Report. 2021.
9. Samrat Basyal. How Menstruation is shaping Girls' Education in Rural Nepal. 2016. E Journal of Education Policy. 2016. https://files.eric.ed.gov/fulltext/EJ1158204.pdf. Accessed 28 Aug 2024.
10. Sapkota A, Karn VL, Chand S, Shastry CS, Pant BD. Knowledge and practice of menstrual hygiene among adolescent girls in Panauti Municipality, Kavrepalanchowk, Nepal: a study from low middle-income Country. Curr Women Health Rev. 2022;18:e041021192819.
11. Singh A, Chakrabarty M, Singh S, Chandra R, Chowdhury S, Singh A. Menstrual hygiene practices among adolescent women in rural India: a cross-sectional study. BMC Public Health. 2022;22:2126.
12. Upadhya S, Adhikari A. Menstruation hygiene practices among girl students in Kathmandu Valley. Pragyaratna. 2023;5:89–98.
13. Yadav R, Joshi S, Poudel R, Pandeya P. Knowledge, attitude, and practice on menstrual hygiene management among school adolescents. J Nepal Health Res Counc. 2017;15(37):212–6.
14. YUWA. Menstrual Hygiene Management in Nepal. 2018. https://www.asiapacificalliance.org/application/files/7415/5963/8758/YUWA_Menstrual_Hygiene_Management_in_Nepal__2018.pdf. Accessed 20 Aug 2024.
15. UNICEF. Menstrual health and hygiene management still out of reach for many. 2022. https://www.unicef.org/press-releases/fact-sheet-menstrual-health-and-hygiene-management-still-out-reach-many. Accessed 11 Aug 2024.

16. Cardoso LF, Clark CJ, Rivers K, Ferguson G, Shrestha B, Gupta J. Menstrual restriction prevalence and association with intimate partner violence among Nepali women. BMJ Sex Reprod Health. 2019;45:38–43.
17. Kumar R, Maity B. Cultural norms and women's health: Implications of the practice of menstrual restrictions in Nepal. World Dev Perspect. 2022;27:100450.
18. Thakuri DS, Thapa RK, Singh S, Khanal GN, Khatri RB. A harmful religio-cultural practice (Chhaupadi) during menstruation among adolescent girls in Nepal: prevalence and policies for eradication. PLOS ONE. 2021;16:e0256968.
19. Thapa S, Aro AR. 'Menstruation means impurity': multilevel interventions are needed to break the menstrual taboo in Nepal. BMC Womens Health. 2021;21:84.
20. Meher T, Sahoo H. Dynamics of usage of menstrual hygiene and unhygienic methods among young women in India: a spatial analysis. BMC Womens Health. 2023;23:573.
21. Singh A, Chakrabarty M, Chandra R, Chowdhury S, Singh S. Intra-urban differentials in the exclusive use of hygienic methods during menstruation among young women in India. PLOS Glob Public Health. 2023;3:e0002047.
22. Roy A, Paul P, Saha J, Barman B, Kapasia N, Chouhan P. Prevalence and correlates of menstrual hygiene practices among young currently married women aged 15–24 years: an analysis from a nationally representative survey of India. Eur J Contracept Reprod Health Care. 2021;26:1–10.
23. Bennett L, Dahal G. Caste, ethnic and regional identity in Nepal: further analysis of the 2006 Nepal demographic and health survey. Calverton: Macro International Inc; 2008.
24. Wasan Y, Baxter J-AB, Rizvi A, Shaheen F, Junejo Q, Abro MA, 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;12:04059.
25. Ahmed Shallo S, Willi W, Abubeker A. Factors affecting menstrual hygiene management practice among school adolescents in Ambo, Western Ethiopia, 2018: a cross-sectional mixed-method study. Risk Manag Healthc Policy. 2020;13:1579–87.
26. Anbesu EW, Asgedom DK. Menstrual hygiene practice and associated factors among adolescent girls in sub-Saharan Africa: a systematic review and meta-analysis. BMC Public Health. 2023;23:33.
27. Afiaz A, Biswas RK. Awareness on menstrual hygiene management in Bangladesh and the possibilities of media interventions: using a nationwide cross-sectional survey. BMJ Open. 2021;11:e042134.
28. Shrestha S, Shrestha S, Ito Y, Kobayashi Y, Nishida K, Futaba K, et al. Situation of menstrual management facilities in schools of peri-urban areas of Nepal: WASH, privacy, and healthcare. J Water Sanit Hyg Dev. 2022;12:41–51.
29. Dhakal SB, Sah N, Shrestha S, Ahmad T. Analysis of menstrual hygiene practices in Nepal: the role of WASH in Schools programme for girls' education. 2018. In: 41st WEDC International Conference, Egerton University, Nakuru, Kenya. Paper 2870, 6 pp.
30. Vishwakarma D, Puri P, Sharma SK. Interlinking menstrual hygiene with Women's empowerment and reproductive tract infections: Evidence from India. Clin Epidemiol Glob Health. 2021;10:100668.
31. Chakrabarty M, Singh A, Let S, Singh S. Decomposing the rural–urban gap in hygienic material use during menstruation among adolescent women in India. Sci Rep. 2023;13:22427.
32. Neupane MS, Sharma K, Bista AP, Subedi S, Lamichhane S. Knowledge on menstruation and menstrual hygiene practices among adolescent girls of selected schools. Chitwan J Chitwan Med Coll. 2020;10:69–73.
33. Subedi M, Parker S. Menstrual exclusions in Nepal: some evidence of transition. Dhaul J Sociol Anthropol. 2021;15:1–9.
34. Mohammed S, Larsen-Reindorf RE. Menstrual knowledge, sociocultural restrictions, and barriers to menstrual hygiene management in Ghana: Evidence from a multi-method survey among adolescent schoolgirls and schoolboys. PLOS ONE. 2020;15:e0241106.
35. Upashe SP, Tekelab T, Mekonnen J. Assessment of knowledge and practice of menstrual hygiene among high school girls in Western Ethiopia. BMC Womens Health. 2015;15:84.

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