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Article in *Global Public Health* · February 2019

DOI: 10.1080/17441692.2019.1583267

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**Assessing the Role of Caste/Ethnicity in Predicting Menstrual Knowledge, Attitudes,
and Practices in Nepal**

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Assessing the Role of Caste/Ethnicity in Predicting Menstrual Knowledge, Attitudes, and Practices in Nepal

Abstract

Menstruation is a natural, physiological process, but it can be a challenging experience for millions of women around the world. In Nepal, a geographically small yet diverse country of 125 caste/ethnic groups, understanding how caste/ethnicity impacts menstrual health is critical for developing context-specific interventions to improve women's health. A community-based, cross-sectional survey was conducted with 679 women and girls between the ages of 13-51 from the country's the most populous castes/ethnic groups. Forty eight percent had high menstrual knowledge, 60% had positive menstrual attitudes, and 59% had positive menstrual practices. Caste/ethnicity was a significant predictor of menstrual knowledge and practices. The caste/ethnic groups Terai/Madhese/Other, Newar, Janajati, and Muslim all had statistically significant fewer odds of positive menstrual practices compared to Brahman/Chhetri, with Janajati (indigenous ethnic groups) having the poorest outcomes. Despite Nepal making impressive advances in health, certain caste/ethnic groups have fallen behind in terms of menstrual health outcomes. Consequently, blanket menstrual health programs may not be sufficient for improving menstrual knowledge and practices for all. Future programming should consider the use of local languages and context-specific content that incorporates indigenous beliefs, cultivate partnerships with indigenous health organizations, and develop outcome indicators disaggregated by caste/ethnicity to ensure improved menstrual health for all.

Keywords

Nepal; menstrual health; menstrual hygiene management; caste; ethnicity

Introduction

Menstruation is a natural, physiological process (Dasgupta & Sarkar, 2008; Mitra et al., 2015; Sumpter & Torondel, 2013), however, it can be a challenging time for millions of women and girls around the globe (Geertz, Iyer, Kasen, Mazzola, & Peterson, 2016). Challenges include the lack of access to affordable materials (Kuhlmann, Henry, & Wall, 2017), lack of improved sanitation facilities to hygienically manage menstruation (Kuhlmann et al., 2017; Sommer & Sahin, 2013; Sommer, Schmitt, & Clatworthy, 2017), and missed educational opportunities during menstruation (Ali & Rizvi, 2010; Garg, Sharma, & Sahay, 2001; Hennegan & Montgomery, 2016; Kuhlmann et al., 2017; Mason et al., 2013; Montgomery, 2017; Sommer, Ackatia-Armah, Connolly, & Smiles, 2014).

Poor menstrual knowledge, attitudes and practices (KAP) can also have negative effects on women's and girls' health. For example, accurate menstrual knowledge is important for ensuring positive health outcomes, as some studies suggest that girls are often unaware about menstruation before their first period, which can result in stress, shame, and lack of hygienic menstrual management practices (Kapoor & Khari, 2016; Mahon & Fernandes, 2010; Sommer et al., 2014). Understanding attitudes and beliefs about menstruation, often influenced by social and cultural norms (Kapoor & Khari, 2016), are also key to improving menstrual practices and keeping women healthy. Finally, positive menstrual practices are critical for maintaining health, as poor menstrual practices such as infrequent changing of menstrual pads, or lack of appropriate cleaning and drying methods can lead to health concerns (Das et al., 2015; Kuhlmann et al., 2017). Some studies suggest that poor menstrual hygiene is associated with reproductive tract infections, specifically bacterial vaginosis (BV) (Balamurugan & Bendigeri, 2012). Other studies have found that girls have reported substance abuse in the form of smoking and alcohol to cope with the stress associated with menstruation (Karki et al., 2017; Ranabhat et al., 2015).

An environment of taboos and restrictions can also lead to mental health concerns, such as menstruation being associated with fear (Crawford, Menger, & Kaufman, 2014), loneliness (Lama & Kamaraj, 2015), stress (Crawford et al., 2014; Karki et al., 2017), inferiority (Action Works Nepal, 2012), disgust, shame (Dasgupta & Sarkar, 2008), and embarrassment (WaterAid, Water Supply and Sanitation Collaborative Council, & Unilever, 2013).

In Nepal, constraints during menstruation are common, as 89% of women and girls throughout the country reported experiencing some form of restriction or exclusion (Karki et al., 2017). During their periods, women and girls often stay separate from their elders, children, and families, and refrain from cooking, visiting places of worship, or touching water taps (Action Works Nepal, 2012; Amgain, 2012). In the mid- and far-western regions of Nepal, a practice called *chhaupadi* is widespread, which is largely considered the most extreme form of menstrual restrictions (Karki et al., 2017). Under the centuries-old, culturally and religiously-rooted practice (Nepal Fertility Care Center, 2015), Hindu women and girls typically sleep in small sheds and are excluded from community life during their menstrual cycles (Karki et al., 2017; WaterAid, 2017; Ranabhat et al., 2015). Growing evidence reveals that many of these menstrual practices leave women vulnerable to poisonous snake bites, hypothermia, dehydration, pneumonia, asphyxiation from lighting fires in the sheds, increased rates of anemia and emaciation, infections, rape, and even death (Kadariya & Aro, 2015; Karki et al., 2017; Ranabhat et al., 2015; United Nations Resident and Humanitarian Coordinator's Office, 2011).

Though Nepal is a geographically small country of 29 million people (The World Bank, 2017), it has a diverse population, comprising 125 caste/ethnic groups (Central Bureau of Statistics Nepal, 2012). The Asian Development Bank (2015) points to the 'complex caste and ethnic structure' (p. 2) in Nepal as one of the greatest challenges to development. The caste system is a hierarchical social stratification system based on ritual impurity (Cameron, 1998),

which has been used to limit certain groups from acquiring land, attaining an education, and acquiring leadership roles in the government (Gellner, 2007). Although caste-based discrimination in Nepal has been illegal since 1963 (Cameron, 1998), disparities in health and education among caste/ethnic groups persist (Bennett, Dahal, & Govindasamy, 2008; Gellner, 2007; Jensen & Mandozai, 2014; Levine, 1987; The World Bank & DFID, 2005).

Given the complexities of caste/ethnic roles in the country, understanding how it impacts menstrual health is critical. This study is the first known exploration of the role of caste/ethnicity in menstrual knowledge, attitudes, and practices (KAP) in Nepal. The study team assessed differences in menstrual KAP between the six most populous caste/ethnic groups in Nepal and aims to inform future interventions and policies targeting the improvement of menstrual health outcomes for all caste/ethnic groups.

Materials and Methods

Study design, setting, and participants

Data was collected through a community-based, cross-sectional survey in 2015 with 679 women and girls of reproductive age, 13-51 years, from the most populous castes/ethnic groups. Purposive sampling was used for the selection of the study districts based on census data, ensuring that the caste/ethnic groups of interest were included, as well as representation from all of Nepal's five development regions. The sample districts included Doti, Dang, Kapilvastu, Lalitpur, Chitwan, Tanahun, Makwanpur, Saptari, and Jhapa.

Sampling procedures

Nepal Fertility Care Center (NFCC), a non-governmental organization working in menstrual health and women's rights in Nepal, designed the survey and collected the data. Participants were selected at the household level through quota sampling, where the population was divided into strata of interest (caste/ethnic group). Locally recruited data collectors went house

to house until they reached the target quota for caste/ethnic groups in each district. The quotas were based on national population coverage of those castes/ethnicities. Additionally, participants were selected equally from rural and urban areas from each district.

The unit of analysis for this study was individual female participants. The inclusion criteria were: 1) women and girls between the ages of 10-55 years, 2) belong to one of the castes/ethnic groups of interest, and 3) live in one of the nine selected districts.

Data collection methods

Data was collected using an in-person household survey administered by trained enumerators in Nepali. Since data collectors spoke both Nepali and local languages, they were able to provide language clarity for participants as necessary. The survey was developed by NFCC in collaboration with Water, Sanitation and Hygiene Resource Centre Network Nepal (WASH RCNN) and a statistician from Tribhuvan University, Nepal. Data collection was funded by the Dutch WASH Alliance. The survey was developed based on existing relevant questionnaires used by NFCC and other organizations to study menstrual practices and beliefs in the Nepal context, and was pre-tested in the field and revised before implementation. Enumerators were trained on the objectives of the study, conducting the survey, confidentiality, and informed consent. Data entry was completed using Statistical Package for Social Sciences (SPSS) and double data entry was completed for quality assurance.

Operational definitions of variables

Menstrual knowledge. Participants were asked a series of four questions regarding menstrual knowledge: 1) definition of menstruation, 2) reason for menstruation, 3) knowledge about menstruation before menarche, and 4) knowledge of menstrual hygiene (**Table 2**). The responses to the four knowledge questions were used to calculate a Menstrual Knowledge Index Score (MKIS), where each correct response earned 1 point, and each negative or don't know

response earned 0 points. The mean MKIS ($M=2.41$, $SD=0.10$) was used to calculate the cutoffs for high and low menstrual knowledge. Those above the mean score (3-4) were classified as having high menstrual knowledge, and those at or below the mean (0-2) were classified as having low menstrual knowledge. This scoring approach is based on similar studies that measured menstrual knowledge, attitudes and practices in the literature (Kitesa, Getahun, & Wako, 2016; Upashe, Tekelab, & Mekonnen, 2015)

Menstrual attitudes. Participants were asked a series of three questions regarding menstrual attitudes: 1) necessary to bathe after menstruation, 2) effect of menstruation and 3) perceptions of menstruation in your community (**Table 2**). The responses to the three attitude questions were used to calculate a Menstrual Attitudes Index Score (MAIS), where each positive response earned 1 point, and each negative or don't know response earned 0 points. The mean MAIS ($M=2.5$, $SD=0.68$) was used to calculate the cutoffs for positive and negative menstrual attitudes. Those above the mean score (3) were classified as having positive mensural attitudes, and those at or below the mean (0-2) were classified as having negative menstrual attitudes.

Menstrual practices. Participants were asked a series of 11 questions regarding their menstrual practices, which included: 1) telling others about menarche, 2) materials used to absorb blood, 3) frequency of changing sanitary pads/cloths, 4) disposal practices of sanitary pads/cloths, 5) handwashing with soap after changing sanitary pads/cloths, 6) bathing restrictions, 7) number of baths per day, 8) use of the water tap, 9) talking openly about menstruation in their community, 10) household rules, and 11) attending school during menstruation (**Table 2**). The responses to the 11 practice questions were used to calculate a Menstrual Practices Index Score (MPIS) where each positive practice earned 1 point, and each negative practice or don't know response earned 0 points. The mean MPIS ($M=8.64$, $SD=0.05$) was used to calculate the cutoffs for positive and negative practices. Those above the mean score (9-11) were classified as having positive menstrual

practices, and those at or below the mean (4-8) were classified as having negative menstrual practices.

Caste/ethnicity. The six caste/ethnic groups were based on classifications in the 2011 Nepali census and a similar study that explored the role of caste on health outcomes in Nepal (Bennett et al., 2008; Central Bureau of Statistics Nepal, 2012). The caste/ethnic groups in this study were: 1) Brahman/Chhetri, 2) Terai/Madhesi/Other Castes, 3) Dalits, 4) Newar, 5) Janajati, and 6) Muslim (Central Bureau of Statistics Nepal, 2012).

District was reported as either hill or tarai (lowland region). Nepal is comprised of three ecological regions, specifically the mountains, hills, and tarai. The tarai is Nepal's southern fertile region, which is more populated than the hill and mountain regions. Infrastructure, resources, and socioeconomic development outcomes differ between Nepal's ecological regions. For example, moving from the tarai to the northern hills and mountain areas, farmland becomes more scarce, poverty levels increase, and accessibility in terms of road access and government resources become limited (Asian Development Bank, 2002; Goli, Bhandari, Atla, & Chattopadhyay, 2017).

Residence was reported as municipality or Village Development Committee (VDC). VDC is the lower administrative part of Nepal's Ministry of Federal Affairs and Local Development (VDCs have been replaced by Gaupalika in 2017 under the new constitution). VDCs tend to be more rural and with limited resources as compared to municipalities, which are larger cities and towns with additional infrastructure and revenue.

Demographic characteristics included measures of age, profession, marital status, education and type of family. For profession, participants were asked to select the best answer to describe their profession, which included employed (agriculture, daily wage, business or service), student, or housewife. Marital status was coded as married or unmarried. Education was coded as

illiterate, literate or up to class 5, class 6-10, class 11-12, or bachelor or above. Type of family was coded as nuclear (a couple and their dependent children) or joint (extended family composed of parents, their children and their children's spouses and offspring in one household).

Statistical analysis

Data were exported from SPSS to be cleaned and analyzed in STATA/SE version 15.0 for Mac. First, bivariate analyses were performed between the dependent variables (i.e. menstrual knowledge, attitudes, and practices) and each of the independent variables (i.e., age, district, caste/ethnicity, profession, marital status, education, type of family and residence) separately. Odds ratios, confidence intervals, and P-values were obtained to determine important candidate variables for multivariate analysis. Variables found to be significant at the bivariate level using a P-value <0.10 were entered into a multivariate logistic regression model. After fitting the multivariate model, diagnostic tests were performed.

Ethical considerations

Local Institutional Review Board (IRB) approval in Nepal was not obtained for the original data collection since the intent was to inform programming. However, verbal informed consent (and parental consent for those under the age of 18 years) was collected for all participants during data collection. After deciding to do a secondary analysis, the University of Pittsburgh Institutional Review Board (IRB) reviewed and approved this study as an exempt secondary data analysis (IRB Number: PRO17030138). Confidentiality was maintained by providing a unique ID for each participant, and all personal identifiers were removed from the dataset before analysis.

Results

Socio-demographic characteristics of the respondents

A total of 679 respondents completed the survey. The majority were Brahman/Chhetri (43.9%), followed by Janajati (28.0%), and the fewest were Terai/Madhesi/Other Castes (6.2%) (**Table 1**). The majority of participants (54.2%) were from Terai (lowland) districts. Nearly half (48.0%) were employed, while 29.7% were housewives and 22.4% were students. Most participants were educated between class 6-10 (35.7%), whereas 11.8% of the participants were illiterate.

Menstrual knowledge

Less than half (48.1%) of the respondents responded correctly to more than two of the four menstrual knowledge questions. Of the total respondents, 462 (68.1%) knew that menstruation is a natural monthly cycle, but nearly 15% did not know the definition of menstruation. More than half of the respondents (53.2%) thought that the reason for menstruation was to release impure blood, and only 27.8% knew that menstruation is associated with preparing for pregnancy. Less than half (46%) knew about menstruation before their first period, though most respondents (91.0%) expressed that at the time of the survey they had knowledge about menstrual hygiene (**Table 2**).

Caste/ethnicity was a significant predictor of menstrual knowledge, controlling for age, marital status, education, profession, district, and residence type, which were significant in the bivariate analysis. Women and girls who identified as Janajati had 0.53 fewer odds (AOR=0.53, 95% CI: 0.35-0.82) of high menstrual knowledge compared to women and girls who identified as Brahman/Chhetri. Furthermore, residence type was also a significant predictor of menstrual knowledge. Those who lived in hill districts had 0.29 fewer odds (AOR=0.29, 95% CI: 0.20-0.43) of high menstrual knowledge compared to those who lived in Terai (lowland) districts (**Table 3**).

Menstrual attitudes

According to the data, 60% of study participants had positive menstrual attitudes. A majority (89.0%) expressed that it is necessary to bathe after menstruation. In terms of the effect of menstruation on their lives, the highest percentage (44.1%) of women and girls expressed that menstruation had a ‘positive effect’ on their lives, whereas 24.4% said that it had ‘no effect,’ followed by 19.7% that said it had a ‘negative effect,’ and 11.8% said they ‘don’t know’ the effect that mensuration has had on their lives. Most expressed that menstruation is perceived as a ‘natural event’ by their communities (88.0%) (**Table 2**).

District and residence type were important predictors of menstrual attitudes; however, caste/ethnicity was not significant. Women and girls that lived in hill districts had 0.52 fewer odds (AOR=0.52, 95% CI: 0.35-0.77) of having positive menstrual attitudes compared to those who lived in tarai (lowland) districts. Those who lived in municipalities had 1.5 greater odds (AOR=1.50, 95% CI: 1.05-2.16) of positive menstrual attitudes compared to those who lived in VDCs (**Table 3**).

Menstrual practices

Overall, 58.8% of respondents had positive menstrual practices. Most of the respondents (85.3%) expressed that they told someone when they experienced their first period. To absorb blood during menstruation, 61.1% reported using cloth, 35.9% reported using commercially-produced sanitary pads, and 3.0% reported that they do not use any material. Of those using commercially-produced sanitary pads, 41.7% reported changing the pad three times per day, fewer reported changing the pad two times per day (33.5%), and some reported changing the pad only one time per day (8.7%). Most commercially-produced sanitary pad users (66.7%) reported that they disposed of their sanitary pads with the household waste, and 14.6% of respondents reported disposing of their pads by burial. Of cloth users, the highest percentage of respondents reported changing the cloth two times per day (34.7%), the second highest percentage of

respondents reported changing the cloth three times per day (33.7%), and the smallest percentage reported changing the cloth only one time per day (17.1%). Nearly all of the respondents expressed that they washed the cloth after use with soap and water (98.5%). Similarly, almost all of the respondents reported washing their hands with soap and water after changing their menstrual products (93.6%).

In terms of menstrual restrictions, 95.7% expressed that they were not prohibited from bathing during menstruation. However, nearly 15% of respondents expressed that women and girls are not allowed to use the same water tap for bathing and washing during menstruation. The most common rules women and girls experience in their homes during menstruation include no involvement in religious activities (605), not touching the kitchen (409), sleeping separately (234), not touching plants or animals (184), and not touching men (181). Of those with a girl in their household of school-going age, 83.7% expressed that girls in their household attend school during menstruation, and only 5.3% expressed that girls in their household do not attend school during menstruation (**Table 2**).

For menstrual practices, caste/ethnicity was a significant predictor. Caste/ethnic groups Terai/Madhese/Other, Newar, Janajati, and Muslim all had statistically significant fewer odds of positive menstrual practices compared to Brahman/Chhetri. Janajatis had 0.43 fewer odds (AOR=0.43, 95% CI: 0.26-0.71) of positive menstrual practices and Newars had 0.41 fewer odds (AOR= 0.41, 95% CI: 0.20-0.86) compared to Brahmin/Chhetri. Terai/Madhese/Other had slightly fewer odds (AOR=0.07, 95% CI: 0.03-0.18) of positive menstrual practices compared to Brahmin/Chhetri, controlling for other variables. Additionally, residence type was significant in predicting menstrual practices, but in the opposite direction of menstrual attitudes, where those living in a municipality reported slightly fewer odds (AOR: 0.10, 95% CI: 0.06-0.16) of positive menstrual practices compared to those living in a VDC, controlling for other variables (**Table 3**).

Discussion

In this study, menstrual knowledge was relatively low with less than half (48.1%) of the respondents reporting high menstrual knowledge. This level of menstrual knowledge falls in between percentages found in two similar studies conducted in Nepal. One menstrual KAP study conducted in Doti district of Nepal found 67.4% of respondents had fair knowledge of menstrual hygiene management (Yadav, Joshi, Poudel, & Pandeya, 2017), whereas another study conducted in Chitwan district found 40.6% of respondents had knowledge of menstruation (Adhikari, Kadel, Dhungel, & Mandal, 2007). However, both of the aforementioned studies were limited to one district and limited to adolescents. This study builds upon these previous studies by including women and girls from a variety of districts, caste/ethnic groups, and ages, which may account for some of the differences in menstrual knowledge outcomes. Similarly designed studies in Ethiopia and Nigeria found high/good menstrual knowledge outcomes to be 60.9% and 55.9% respectively (Fehintola et al., 2017; Upashe et al., 2015). Our results are generally consistent with prior studies in Nepal and when comparing to other country contexts, suggest that menstrual knowledge is relatively low among Nepali women and girls.

Sixty percent of study participants reported positive menstrual attitudes. This is notably higher than previously conducted studies in Nepal. One study found that 49% of adolescent girls had positive attitudes toward menstruation (Yadav et al., 2017), and another found that 50.8% of adolescent girls had satisfactory attitudes toward menstruation (Sapkota, Sharma, Pokharel, Budhathoki, & Khanal, 2014). Higher menstrual attitude outcomes in this study may be due to different sampling approaches and different populations between the studies, as this study population was more diverse than previous studies in terms of age, caste/ethnicity and geographic location. Comparing these results to a study conducted on menstrual attitudes in neighboring India, the majority of respondents (88%) in Nepal believed that menstruation is a natural event,

whereas in India the majority (69.8%) believed that menstruation is not a natural process (Khanna, Goyal, & Bhawsar, 2005). Overall, the results of this study found that menstrual attitudes were higher than in previously conducted studies in Nepal.

A total of 58.8% of respondents reported positive menstrual practices, which is considerably higher than previous studies in Nepal. In a study conducted in Doti, 40% of adolescent girls reported positive menstrual practices (Yadav et al., 2017), and only 12.9% of adolescent girls in Chitwan had satisfactory menstrual practices (Adhikari et al., 2007). Though the results of our study are encouraging, different sampling and analysis procedures make it challenging to directly compare the results between studies. Traditional menstrual practices reported in this study were consistent with responses found in other studies on menstrual practices in Nepal, where women and girls are often not allowed to participate in religious activities, talk with or touch males, or prepare food (Sapkota et al., 2014). Overall, positive menstrual practices were higher in this study than in previous studies, but there is still considerable room for improvement.

Caste/Ethnicity, Residence and District Type as Significant Predictors of Menstrual Knowledge and Practices

Of the 125 caste/ethnic in Nepal, the most populous ones include Chhetri (16.6%), Brahmin (12.2%), Magar (7.1%), Tharu (6.6%), Tamang (5.8%), Newar (5.0%), Kami (4.8%), Muslim (4.4%), Yadav (4.0%), and Rai (2.3%) (Central Bureau of Statistics Nepal, 2012). This study sample similarly reflects this distribution. As a result, we can be more confident in the generalizability of the findings of this study.

According to the multivariate analysis, caste/ethnicity and district type were significant predictors of menstrual knowledge, and caste/ethnicity and residence were significant predictors of menstrual practices in Nepal. In analyzing the role of caste/ethnicity, the study results revealed

that women and girls who identified as Janajati were less likely to have high menstrual knowledge compared to women and girls who identified as Brahman/Chhetri. Additionally, all of the caste/ethnic groups in this study except for Dalits reported significantly poorer menstrual practices than Brahmins/Chhetris. Newars and Janajatis had the lowest outcomes, with 0.41 and 0.43 fewer odds of positive menstrual practices respectively. This is consistent with other studies that have explored caste/ethnic differences in Nepal. One study found similar patterns for maternal health outcomes, where Janajatis were among the lowest caste/ethnic groups in terms of antenatal care (34%), and assistance by skilled birth attendant during delivery (14%), and found overall that Janajati perform poorly on many, but not all, health indicators (Bennett et al., 2008).

Though this is the first known study to explore the relationship between caste/ethnicity and menstrual outcomes in Nepal, a similar study conducted in India also found caste/ethnicity and residence to be significant predictors of menstrual practices (Khanna et al., 2005). According to the study in India, those belonging to general castes were 1.9 times more likely to adopt safe menstrual practices than those belonging to scheduled castes or scheduled tribes; a similar pattern was found in this study high where Janajatis reported significantly poorer menstrual practices. Additionally, both studies also found that family structure was not an important predictor of menstrual practices. Overall, the results of this study align with similar findings in India.

Reasons for poorer menstrual knowledge and practice outcomes among Janajati may be linked to historically-situated discriminatory practices in against them in Nepal (Bennett et al., 2008). Janajati technically do not subscribe to Hindu caste system rules about hierarchy, yet the system generally places them in the middle position (Bennett, 2005; Bennett et al., 2008). Since the Hindu caste system still prevails as the dominant model for power hierarchies in Nepal for governance, occupation, marriage, and social structuring, placing them in this position has led them to be historically marginalized, and their presence in government positions was and still is negligible,

along with Dalits (DFID & The World Bank, 2006) Today, discrimination and social exclusion faced by Janajatis, as well as Dalits, Muslims and Madhesis is well-established, and activists have called for a more inclusive democracy (Bennett et al., 2008). Results from our study suggest that menstruation programming should pay particular attention to the unique challenges faced by Janajatis and those who fall outside the dominant Hindu-based belief system.

Furthermore, Janajati do not characteristically subscribe to Hindu traditions and beliefs around ritual purity and impurity (March, 2002), which may be another reason for lower menstrual knowledge and practice outcomes. Janajatis typically follow Kirat-animist religions or Himalayan Buddhism (DFID & The World Bank, 2006) and do not usually follow as many menstrual restrictions and rituals associated with menstrual impurity as seen among Brahman/Chhetri Hindus. For this reason, they may be generally less exposed to discussions of menstruation in their day to day lives, have less information on how to manage menstruation, leaving them less informed about menstruation with poorer menstrual practices.

Poor menstrual health outcomes among Janajatis may also be linked to the content, design, and targeting of menstrual health interventions. Understandably, many menstrual health education interventions in Nepal are framed around the Hindu belief system of purity and impurity, as these beliefs and traditions have been found to perpetuate poor menstrual health practices for women. For example, many menstrual education interventions target ritual purity and pollution taboos and misconceptions that leave women vulnerable during menstruation, such as being prohibited from using water taps, or the practice of chhaupadi where women are excluded from community life and often stay separate from the home, kitchen, and often sleep in remote sheds (Ranabhat et al., 2015). Certainly, targeting these practices and the root causes of these traditions is imperative for improving menstrual health outcomes in Nepal, however, the results of this study suggest that

other prominent belief systems, such as those of Janajati, require more attention as they are falling behind when it comes to menstrual knowledge and practice outcomes.

In addition to caste/ethnicity, residence (VDC vs. municipality) was also a significant predictor of menstrual practices. For menstrual knowledge, district type (hill vs. Terai) was an important predictor of menstrual knowledge. Women and girls living in hill districts were less likely to report high menstrual knowledge compared to those living in tarai (lowland) districts. One explanation for this finding is that hill districts are more remote, and resources tend to be scarcer. A study conducted in India also found differences in menstrual knowledge between urban and rural adolescent girls, with those living in urban areas having significantly better knowledge outcomes than those living in rural areas (43.5% and 16.5% respectively) (Vyas et al., 2017). Our study results also align with the findings of the Nepal Human Development Index (HDI) study, where differences in health and development outcomes have been observed between hill and tarai districts.

The Nepal HDI study also found significant variations within caste/ethnic clusters, for example, HDI scores among hill Chhetris was nearly 9% lower than that of the hill Brahmins. Additionally, significant differences in scores emerged between hill and tarai Janajatis. These findings suggest caste/ethnic inequalities also have a geographic dimension (Government of Nepal & UNDP, 2014). Further explorations of differences between hill, tarai and mountain districts, along with caste/ethnic differences is required in future studies.

This study is the first known investigation of the role of caste/ethnicity and menstruation in Nepal, and highlights the need for future studies to explore the specific ways in which differences in caste/ethnicity are occurring. Though this was the first known menstrual health study in Nepal to explore the role of caste/ethnicity in menstrual health outcomes, the study did not include caste/ethnic groups that comprise less than 4% of the total population of Nepal based on the 2011

census. A limitation in this study is that some of the caste/ethnic groups had to be collapsed to ensure adequate power to conduct meaningful analyses. Future research exploring caste/ethnic differences in Nepal should ensure that less-populated caste/ethnic groups are adequately represented. Furthermore, though this study sampled from nine districts from all five development regions, providing a much more diverse sample than previous menstrual KAP studies in Nepal, no mountain districts were included as the most populous caste/ethnic groups were not dominant in those districts. Future studies may consider including participants from mountainous regions, as their menstrual experiences may differ from those in other geographical regions.

While this study was limited to exploring menstrual KAP among women and girls, existing literature also highlights the importance of studying the role of men and boys in menstrual health programming. This is particularly important with regards to bullying or teasing in schools, and perpetuating stigma and patriarchal attitudes regarding menstruation in communities (Mahon, Tripathy, & Singh, 2015; Peranovic & Bentley, 2017; PSI/Nepal, MIRA, & Maverick Collective, 2017). Measuring KAP among men and boys in Nepal would provide interesting insights and build upon the findings of this study.

Despite Nepal making impressive advances in many development and health outcomes, there is still room for significant improvement in menstrual knowledge, attitudes, and practices among women and girls. The results highlight the importance of considering caste/ethnic differences in menstrual knowledge and practice outcomes, which should be incorporated into the design of menstrual health programs in Nepal. Certain caste/ethnic groups have fallen behind when it comes to menstrual health outcomes, especially Janajatis, suggesting that blanket menstrual health programs may not be sufficient for improving menstrual knowledge and practices for all. Future programs should consider the use of local languages and context-specific content that incorporates indigenous beliefs, cultivate partnerships with indigenous health

organizations, and develop outcome indicators disaggregated by caste/ethnicity to ensure improved menstrual health for all.

Acknowledgements

The authors would like to thank Dr. Todd Bear, Dr. James Egan, and Dr. Ada Youk, University of Pittsburgh Graduate School of Public Health, for their contributions to the data analysis plan for this study.

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Tables

Table 1. Sociodemographic characteristics of participating women and girls, Nepal, 2015

Characteristics		Number (%)
Caste/Ethnicity (n=679)	Brahman/Chhetri	298 (43.9)
	Terai/Madhesi/Other Castes	42 (6.2)
	Dalits	51 (7.5)
	Newar	50 (7.4)
	Janajati	190 (28.0)
	Muslim	48 (7.1)
District (n=679)	Terai	368 (54.2)
	Hill	311 (45.8)
Residence (n=679)	Municipality	294 (43.3)
	VDC	385 (56.7)
Age, years (n=676)	Mean (SD)	27.6 (8.7)
	13-19	140 (20.7)
	20-29	262 (38.8)
	30-39	196 (29.0)
	40-51	78 (11.5)
Profession (n=671)	Employed	322 (48.0)
	Student	150 (22.4)
	Housewife	199 (29.7)
Marital Status (n=665)	Married	475 (71.4)
	Unmarried	190 (28.6)
Education (n=676)	Illiterate	80 (11.8)
	Literate or up to class 5	177 (26.2)
	Class 6-10	241 (35.7)
	Class 11-12	106 (15.7)
	Bachelor's Degree or above	72 (10.7)
Type of Family (n=674)	Nuclear	353 (52.4)
	Joint	321 (47.6)

Table 2. Results of menstrual knowledge, attitude, and practice questions and summary scores, Nepal 2015

Variables (n)	Number (%)
Definition of menstruation (678)	
Natural monthly cycle	462 (68.1)
Impure stage	59 (8.7)
Feeling of adulthood	56 (8.3)
Don't know	101 (14.9)
Reason for menstruation (678)	
Release of impure blood	361 (53.2)
Prepare for pregnancy	189 (27.8)
Don't know	128 (18.9)
Knowledge of menstruation before menarche (674)	
Yes	310 (46.0)
No	364 (54.0)
Knowledge of menstrual hygiene (675)	
Yes	614 (91.0)
No	61 (9.0)
Menstrual Knowledge Summary Index (670)	
High menstrual knowledge	322 (48.1)
Low menstrual knowledge	348 (51.9)
Necessary to bathe after menstruation (675)	
Yes	607 (89.0)
No	68 (10.1)
Effect of menstruation (676)	
Positive effect	298 (44.1)
Negative effect	133 (19.7)
No effect	165 (24.4)
Don't know	80 (11.8)
Perceptions of menstruation in your community (624)	
Natural event	549 (88.0)
Impure event	75 (12.0)
Menstrual Attitudes Summary Index (622)	
Positive menstrual attitudes	373 (60.0)
Negative menstrual attitudes	249 (40.0)
Told others when experienced menarche (678)	
Yes	578 (85.3)
No	100 (14.8)

Method used to absorb blood (679)	
Sanitary pad	244 (35.9)
Cloth	415 (61.1)
Nothing	20 (3.0)
If sanitary pad – How often do you change it daily? (242)	
1	21 (8.7)
2	81 (33.5)
3	101 (41.7)
4 or more	39 (16.1)
If sanitary pad – How do you dispose of it? (240)	
With household waste	160 (66.7)
Burn	31 (12.9)
In toilet	14 (5.8)
Bury	35 (14.6)
If cloth – How often do you change it daily? (415)	
1	71 (17.1)
2	144 (34.7)
3	140 (33.7)
4 or more	60 (14.5)
If cloth – What do you do with it after use? (412)	
Wash with soap and clean water	406 (98.5)
Wash with water only	3 (0.7)
Dispose without washing	3 (0.7)
Wash hands with soap after changing sanitary pad/cloth (652)	
Yes	610 (93.6)
No	42 (6.4)
Prohibited from bathing during menstruation (673)	
Yes	
No	29 (4.3)
	644 (95.7)
Number of baths during menstruation (673)	
Once per day	427 (63.5)
Once every two days	160 (23.8)
Only on the fourth day	46 (6.8)
Immediately when menstruation starts	40 (5.9)

Use same water tap for bathing and washing during menstruation (671)		571 (85.1)
Yes		100 (14.9)
No		
People talk openly about menstruation in the community (654)		495 (75.7)
Yes		21 (3.2)
Limited		137 (21.0)
No		1 (0.2)
Don't wish to answer		
Rules in your household during menstruation		
Do not touch kitchen		409
Do not touch water source		163
Do not touch males		181
Sleep separately		234
Sleep outside		3
Sleep in animal shed (<i>chhaupadi</i>)		7
No involvement in religious activities		605
Do not touch plants or animals		184
No rules		62
Females in household attend school during menstruation (658)		551(83.7)
Yes		35 (5.3)
No		72 (10.9)
No female member of school going age in household		
Menstrual Practices Summary Index (542)		
Positive menstrual practices		345 (58.77)
Negative menstrual practices		242 (41.23)

Table 3. Predictors of Menstrual Knowledge, Attitudes and Practices among Women and Girls in Nepal, 2015

	Menstrual Knowledge (n=670)	Menstrual Attitudes (n=622)	Menstrual Practices (n=542)
	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>
Caste/Ethnicity			
Brahman/Chhetri (ref)	1.00	1.00	1.00
Terai/Madhesi/Other	0.49 (0.23-1.09)	1.44 (0.59-3.58)	0.07 (0.03-0.18)*
Dalits	0.64 (0.31-1.33)	2.02 (0.96-4.26)	0.87 (0.40-1.92)
Newar	0.57 (0.30-1.10)	0.56 (0.29-1.08)	0.41 (0.20-0.86)*
Janajati	0.53 (0.35-0.82)*	0.83 (0.53-1.29)	0.43 (0.26-0.71)*
Muslim	0.54 (0.25-1.16)	1.02 (0.43-2.38)	0.18 (0.07-0.46)*
District Type			
Terai (ref)	1.00	1.00	1.00
Hill	0.29 (0.20-0.43)*	0.52 (0.35-0.77)*	0.71 (0.48-1.05)
Residence Type			
VDC (ref)	1.00	1.00	1.00
Municipality	1.35 (0.96-1.89)	1.50 (1.05-2.16)*	0.10 (0.06-0.16)*

Key = *statistically significant (P-value <0.05); 1.00 = Reference category

Note: Each model controlled for age, marital status, education, and profession. Type of family was not significant for any of the outcome variables at the bivariate level and thus was not included in the models.