



Assessing health consequences of geographical disparities in environmental risk factors for women in India

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ARTICLE INFO	ABSTRACT
Received : 22 September 2024 Revised : 25 November 2024 Accepted : 08 December 2024 Available online: 18 December 2024 Key Words: Environmental risks Geographical disparities Hygiene Sanitation Women's health	Environmental risks associated with poor environmental sanitation affect the health of large populations in the developing world in general and vulnerable groups like women in significant ways. Several tropical diseases, like diarrhea, intestinal worm infections, trachoma, and stunting among children, have been linked to unsafe water, poor sanitation, and hygiene. Women, being the primary caregivers and also because they have specific sanitation needs, are more susceptible to health risks arising from poor sanitation. This study looked at how better sanitation facilities in India affected women's health and other related factors. It used national-level, large-sample survey data from the National Family Health Survey (NFHS-5, 2019–2021). Three major findings emerge from the study. First, the study finds a positive correlation between improved sanitation facilities and menstrual hygiene, maternal health, and women's literacy and a negative correlation between improved sanitation facilities and anemia, early marriage, and fertility, indicating that improved sanitation could reduce several health-related risks among women. Second, the study looks at how access to better sanitation facilities varies significantly across India's states and union territories. It finds that women in some parts of the country are adversely affected more than others. Finally, the study suggests a need for more gender-disaggregated data on sanitation to ascertain causal linkages between environmental sanitation and its associated environmental risks for women's health.

Introduction

The Sustainable Development Goals (SDGs) Agenda of 2030 made "access and sustainable management of sanitation and water" its SDG 6. This is because proper sanitation in the environment is a key part of preventing many diseases that affect people around the world. While most national governments adopted sanitation as a primary target to be achieved by 2030, as recently as 2022 it was found that 3.4 billion people still lacked safely managed sanitation, including 545 million with unimproved services and 419 million practicing open defecation. Around 2.2 billion people still lacked access to safely managed water, including 115 million who collected drinking water from surface water sources like lakes, rivers, etc. (UNICEF/WHO, 2023). The report with a special focus on gender inequalities stated that the lack of water supply, sanitation, and hygiene (WASH) affects women and girls more disproportionately. It estimates that in 70 percent of the households that lack access to water, women and girls aged 15 or more bear the brunt of the task of fetching water for household use. About half a billion people use shared sanitation facilities, and women in these households face a lack of privacy, dignity, and security. Understanding the magnitude of the problem,

the Government of India under its Swachh Bharat Mission (SBM), or the Clean India Mission, pursued the cause of sanitation and promised to end open defecation by 2019. The most recent report from the National Family Health Survey (NFHS-5) for 2019–21 (IIPS, 2021) says that 83 percent of households in India have access to a toilet and 96 percent of households use a better source of drinking water. This shows that India has come a long way in terms of sanitation since 2015. According to the report, households practicing open defecation have decreased from 39 percent in 2015-16 to 19 percent in 2019-21. Given this context, this study attempts to understand the implications of improved sanitation facilities on some dimensions of women's health in India using the NFHS-5 data.

Materials and methods

The study used data from a representative large sample survey, namely the National Family Health Survey (NFHS-5) (IIPS, 2021). The NFHS surveys are conducted under the purview of the Ministry of Health and Family Welfare (MoHFW) with the Institute of Population Studies as the nodal agency. The present study accessed NFHS-5 data for 28 states and eight UTs on various indicators relating to sani-

tation and women. The access to improved sanitation facilities indicator refers to the percentage of the population with improved sanitation facilities that are not shared with other households. Improved sanitation facilities include any non-shared toilet of the following types: flush/pour flush toilets to piped water systems, septic tanks, pit latrines, or an unknown destination; ventilated improved pits; pit latrines with slabs; and twin pit composting toilets. Data on a number of aspects related to women were also accessed, including the number of women with anemia, their nutritional status, ability to read and write, early marriage, fertility rate, access to maternal health interventions, use of hygienic methods for menstrual protection, and how society views women's periods based on how they bathe during them. Data on bathing practices during menstruation has been collected for the first time in NFHS-5. The study used graphs and bivariate correlation analysis to establish the nature of the relationships between environmental risks from inadequate sanitation and, in particular, its impact on women's health.

Results and discussion

Government programs like the Swachh Bharat Mission (SBM) have succeeded in increasing the percentage of the population with access to improved sanitation facilities. However, there are considerable geographical disparities, as seen in Figure 1, which shows the percentage of the population with access to improved sanitation facilities in India. The bottom ten ranked states include those with large populations, like Uttar Pradesh (UP), Bihar, West Bengal (WB), and Madhya Pradesh (MP). These four states, along with Odisha, accounted for 40 percent of India's population as per Census 2011. Moreover,

these states are primarily rural and have low per capita incomes. In Bihar and Ladakh, access to improved sanitation is about half or less than that of a state like Kerala.

The following graphs, from Figure 2 to Figure 7, examine the correlations between access to improved sanitation and indicators relating to women's health and status. The ten states with the lowest access to improved sanitation are identified by the following abbreviations: Assam, BI-Bihar, DDD-Dadra & Nagar Haveli and Daman & Diu, JH-Jharkhand, LA-Ladakh, MA-Manipur, MP-Madhya Pradesh, OD-Odisha, UP-Uttar Pradesh, and WB-West Bengal.

Figure 2 plots access to improved sanitation facilities against the percentage of women aged 15-49 with anemia (hemoglobin less than 12 g/d) and the percentage of women with low body mass index (BMI less than 18.5 kg/m²). We observed a sharp downward trend and a negative correlation (-0.666) between improved sanitation facilities and the prevalence of anemia among women and a negative correlation (-0.475) between improved sanitation and low BMI in women. States with improved sanitation had a smaller percentage of women with anemia, and Figure 2 displays that states like Ladakh, West Bengal, Assam, Bihar, and Jharkhand, which were ranked the lowest for access to better sanitation, had more women with anemia. On the other hand, states like Bihar, Jharkhand, Dadra, Nagar, Haveli, Daman, Diu, and MP had more women with a low body mass index.

Studies indicate an interconnected vicious cycle between sanitation, diarrheal diseases, undernutrition, low BMI, and anemia that affect women's health in

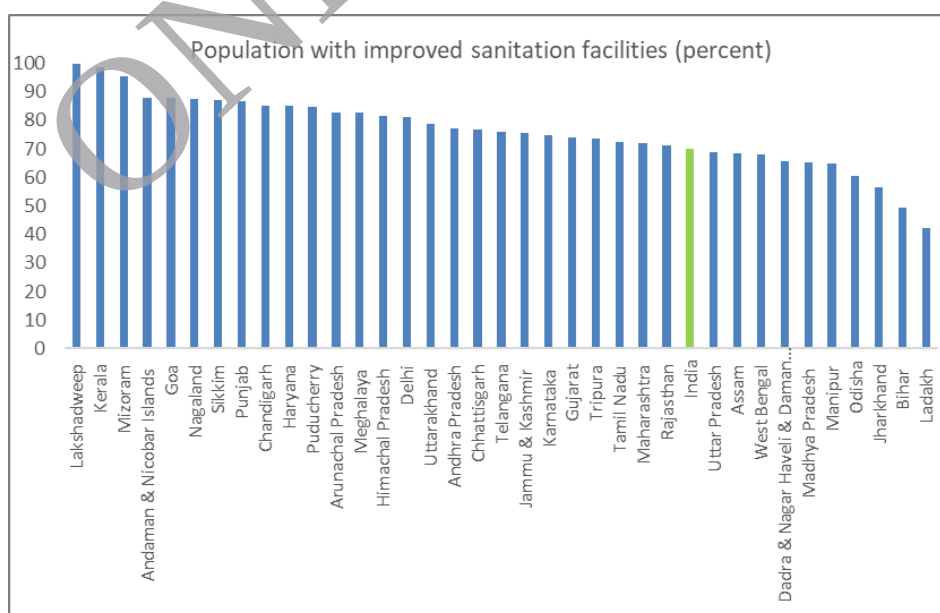


Figure 1. Population living in households with improved sanitation facilities in states and UTs of India, 2019-21(%)

Source: Authors' construction based on NFHS-5 data

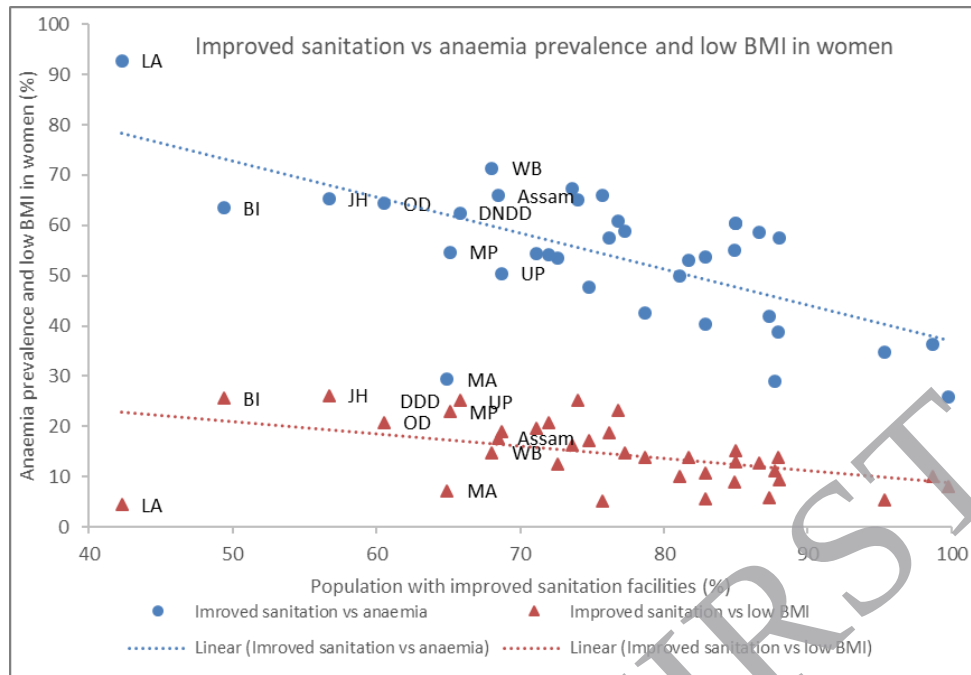


Figure 2. Improved sanitation and prevalence of anemia and low BMI in women in states and UTs of India, 2019-21 (%).

Source: Authors' construction based on NFHS-5 data.

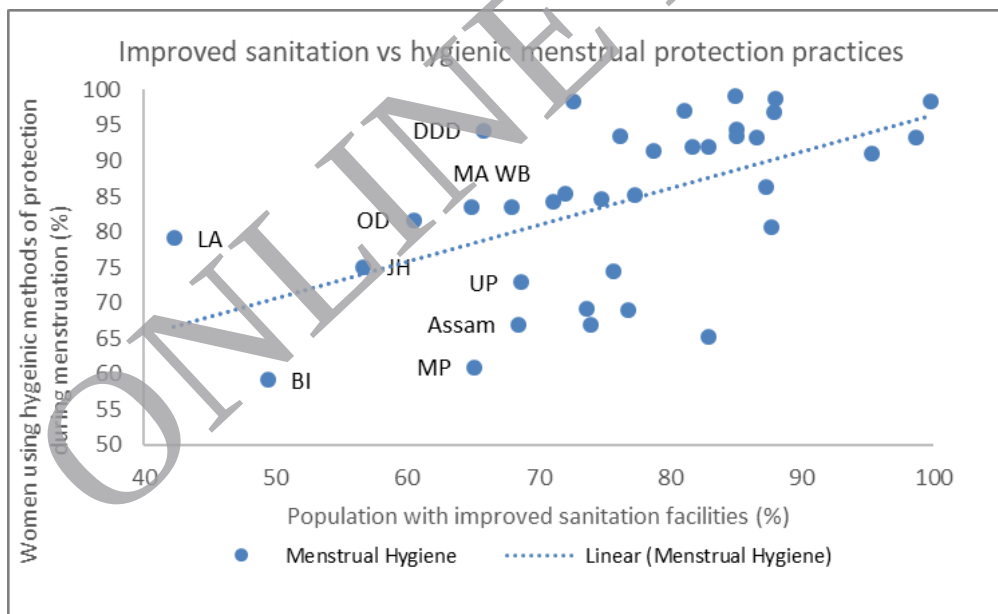


Figure 3. Population living in households with improved sanitation facilities vs women using hygienic methods of menstrual protection in states and UTs of India, 2019-21 (%)

Source: Authors' construction based on NFHS-5 data.

different ways, including pregnancy outcomes. It reduces productivity in adults and is also associated with maternal mortality (Rush, 2000). Anemia is usually caused by not getting enough nutrients or getting malaria, but Coffey *et al.* (2018) found a link between open defecation and anemia in children in Nepal. They say that poor sanitation is the third main

cause of anemia because intestinal parasites and other infections spread by open defecation damage the intestinal walls, making it harder to absorb nutrients that are needed to make hemoglobin. This results in anemia. Wendland *et al.* (2017) and Jalali (2021) contend that since women are the primary caregivers, poor hygiene makes them more vulnerable to

diarrheal and other water-related infections. Studies also link the lack of access to toilets to the prevalence of diarrheal diseases among women, leading to undernutrition, a primary cause of anemia, especially during their reproductive age (Corburn and Hildebrand, 2015).

Since women have specific sanitation needs during menstruation, pregnancy, and post-natal stages, and in caregiving that sets them apart from other categories, inadequate sanitation leads to several diseases and infections (Kayser *et al.*, 2019, Vogel *et al.*

2022). In particular, adverse sanitation and hygiene have been linked to infections in the reproductive tract, anemia in mothers, adverse pregnancy outcomes, and death in mothers (Benova *et al.*, 2014; Padhi *et al.*, 2015; Strunz *et al.* 2014). Inadequate sanitation can lead to various diseases and infections. The NFHS-5 data set provides us with state-level data on two such indicators to assess menstrual health, namely menstrual protection and bathing practices during menstruation. In Figure 3, we correlated improved sanitation facilities with the use of

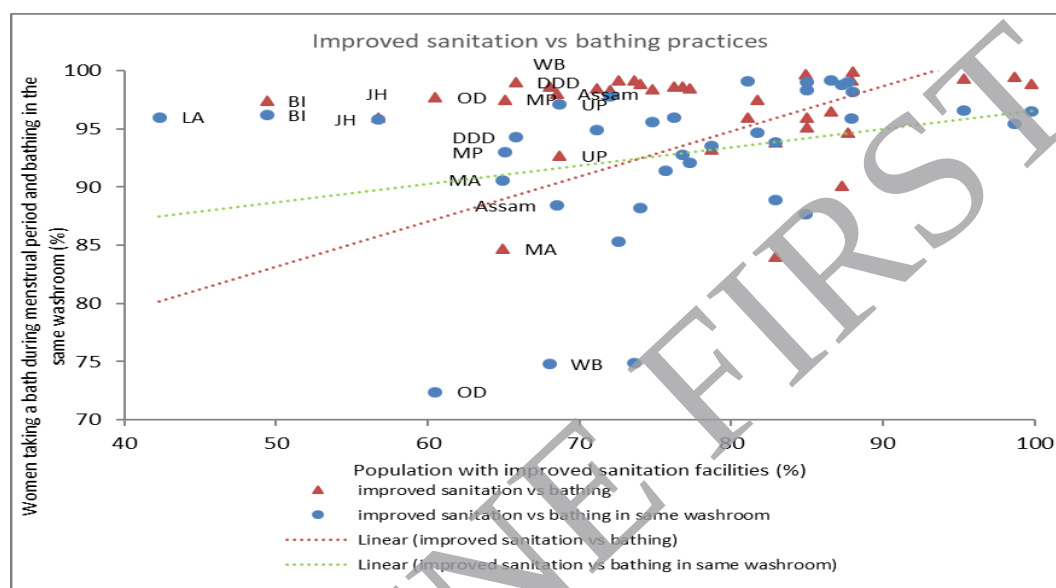


Figure 4. Population living in households with improved sanitation facilities vs bathing practices among women during menstruation in states and UTs of India, 2019-21(%)

Source: Authors' construction based on NFHS-5 data.

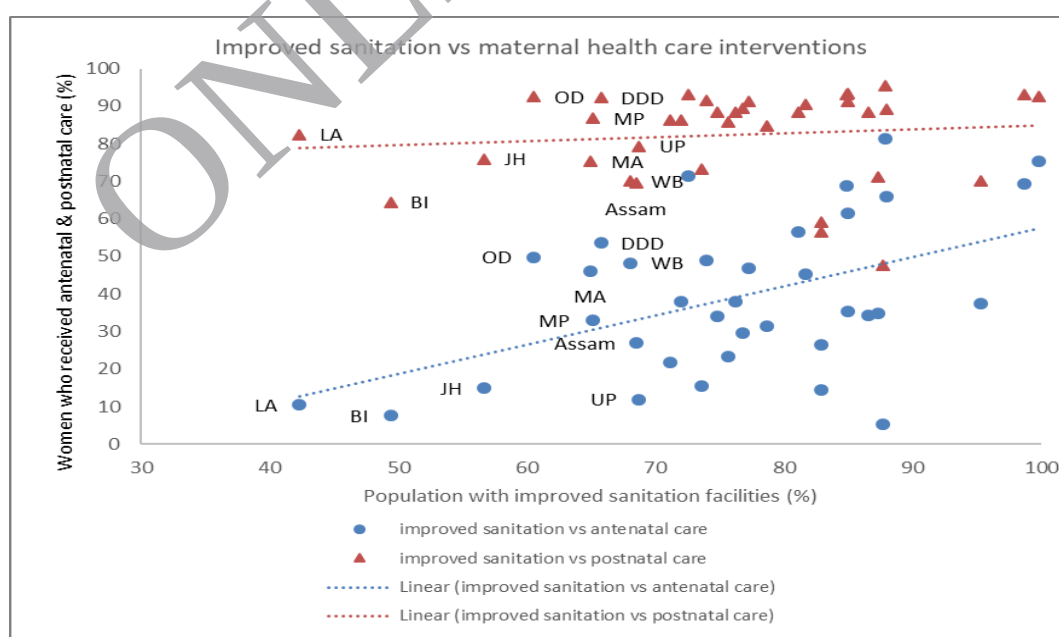


Figure 5. Population living in households with improved sanitation facilities vs antenatal and postnatal care received by women in states and UTs of India, 2019-21(%)

Source: Authors' construction based on NFHS-5 data

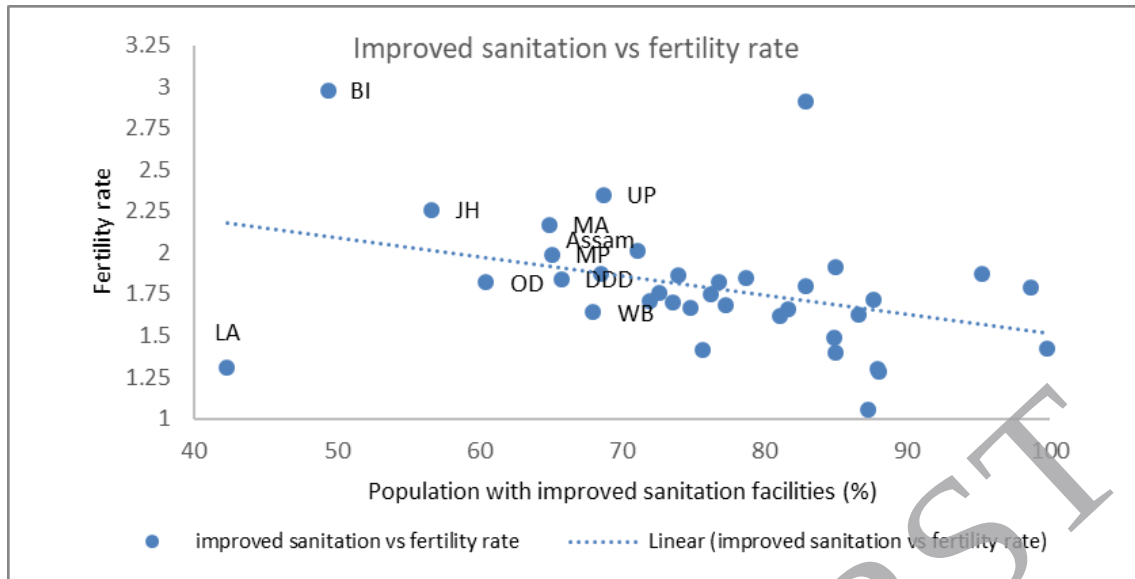


Figure 6. Population living in households with improved sanitation facilities vs fertility rates in states and UTs of India, 2019-21(%)

Source: Authors' construction based on NFHS-5 data

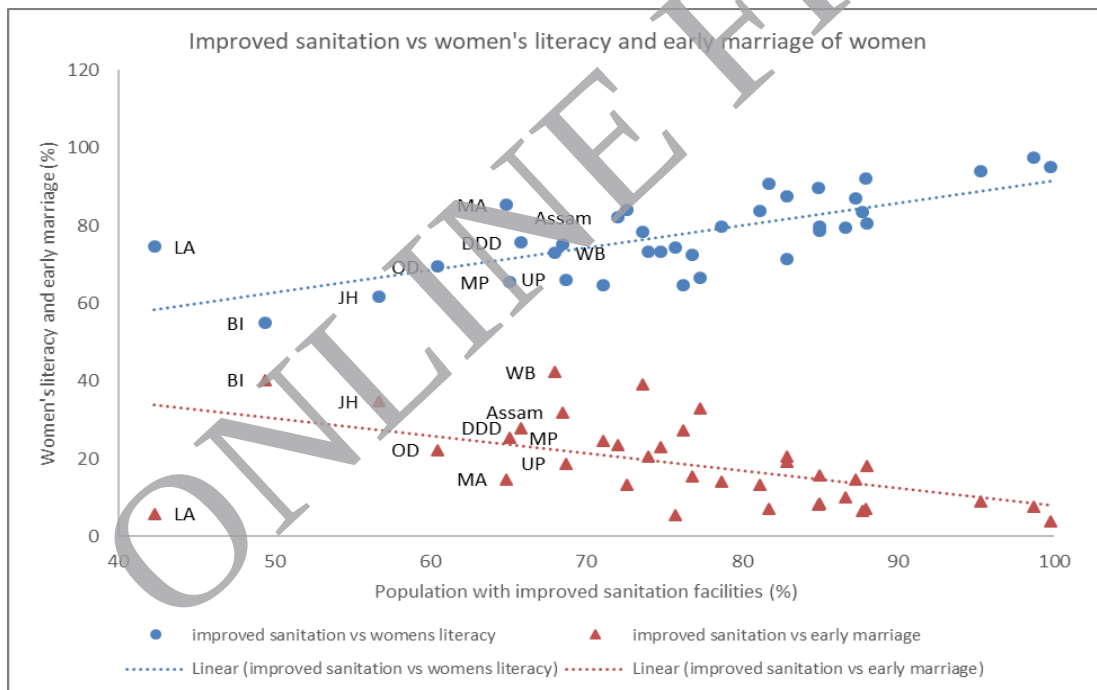


Figure 7. Population living in households with improved sanitation facilities vs women's literacy and early marriage in states and UTs of India, 2019-21(%)

Source: Authors' construction based on NFHS-5 data

hygienic menstrual protection, and in Figure 4 with bathing practices during menstruation. We used data on menstrual protection as the data set did not contain direct information about menstrual hygiene.

The NFHS-5 data gives the percentage of women aged 15-24 who used hygienic methods of protection during their menstrual period in the states/UT. Hygienic menstrual protection refers to the use of locally prepared napkins, sanitary pads, tampons, or men-

strual cups during the period. NFHS-5 also gives two measures of safe bathing practices that refer to the percentage of women aged 15-49 who bathe during their menstrual period and the percentage of women who bathe in the same washroom that other household members use. Figure 3 displays an upward trend.

A strong positive correlation of 0.554 indicates that as access to improved sanitation facilities increases,

the percentage of women using hygienic practices increases, menstrual protection also increases. States like Bihar, MP, Assam, UP, and Jharkhand that have low access to sanitation also show a smaller percentage of women use hygienic methods of protection during menstruation.

There are positive correlations of 0.355 and 0.292 between better sanitation facilities and the two indicators of bathing practices. Better sanitation facilities are associated with improved bathing practices, thereby promoting better menstrual hygiene and enhancing women's health. Menstruation is still considered taboo, and most cultures impose different kinds of religious, social, and cultural restrictions on women, like isolating them, forbidding them from entering the kitchen, or permitting them to bathe or use the same washroom as other household members (Amiya *et al.*, 2010; Hamal & Susma, 2014; Yaliwal *et al.*, 2020; Wagh *et al.*, 2018). The use of the same washroom as other household members during the menstrual period, as shown in Figure 4, indicates the persistence of such norms and restrictions in the eastern states of Odisha and West Bengal and the northeastern states of Assam and Manipur. The care that women receive during and after pregnancy is crucial to maternal and child health. Antenatal and postnatal care, which monitors pregnancies and deliveries, can significantly reduce the health risks among women. Owing to their bodily processes, women have specific sanitation and hygiene needs both before and after pregnancy. Studies have highlighted that women face three different kinds of psycho-social stressors environmental, social, and sexual owing to inadequate sanitation facilities (Sahoo *et al.*, 2015). Unmet needs often lead to health complications for both the mother and the child as they are more prone to catching infections. The present study correlated improved sanitation facilities with antenatal and postnatal care received in different states/UTs of India. The percentage of women aged 15-49 years who received the recommended full antenatal care for the last live birth and the percentage of deliveries with a postnatal health check for the mother within two days of birth are the two indicators considered.

The upward trends in Figure 5 demonstrate a link between improved sanitation and the use of maternal health interventions. There are positive correlations of 0.478 and 0.108 between better sanitation facilities and prenatal and postnatal care, respectively. The variations among the states/UTs are greater in antenatal care than in postnatal care. Ladakh, Bihar, Jharkhand, and UP have low access to sanitation, and women in these states have significantly less access to maternal care interventions. The primary cause of early infant death is unhygienic procedures adopted during delivery. Although tetanus toxoid injections lower the risk of dying, but they need to be combined with excellent hygiene during delivery

and prenatal checkups for this to work (Singh *et al.*, 2012; Khan *et al.*, 2015).

The present study assessed the relationship between improved sanitation facilities and indicators that are a measure of the status of women, like fertility rate, women's literacy, and early marriage among women. Figure 6 indicates a negative relation between improved sanitation facilities and fertility rate with a correlation of -0.373. Bihar has the highest fertility rate; except for Ladakh, all nine other states with the poorest access to improved sanitation exhibit high fertility rates.

In Figure 7, the study examined the relationship between improved sanitation facilities and women's literacy and early marriage. In the NFHS-5 dataset, women's literacy refers to the percentage of women aged 15-49 who can read a whole sentence or part of a sentence and who completed Standard 9 or higher, while early marriage refers to the percentage of women aged 18-29 who were first married by the exact age of 18. A strong positive correlation of 0.717 and an upward trend in the relationship, as shown in Figure 7, show that better sanitation facilities are linked to a higher literacy rate among women. Similarly, the downward trend between improved sanitation facilities and early marriage reveals a negative correlation (-0.531), suggesting that improved sanitation is linked to a decline in early marriage rates in addition to a lower fertility rate. States like Bihar, Jharkhand, Odisha, MP, and UP that have limited sanitation have lower literacy rates and a larger prevalence of early marriage among women. This suggests that improved sanitation facilities could have led to more women attending school and higher literacy levels. For instance, a United Nations Children's Fund project in Bangladesh as early as 1999 found that the construction of latrines in schools had led to an 11 percent increase in the enrollment of girls (Cairncross *et al.* 2003). Higher literacy rates in the Indian context could, in turn, have impacted other related factors, like women's fertility and early marriages, affecting their overall well-being and health. Increased literacy levels also mean that women have a greater say in matters of sanitation as well as greater awareness of personal hygiene (Lee *et al.*, 2017, Bhardwaj *et al.*, 2017). Declines in fertility rates as well as early marriage are also reflective of better family planning and health practices, suggesting positive health outcomes.

The analysis showed the close interrelationships between access to improved sanitation and women's health, hygiene, education, marriage, fertility, and maternal health. The analysis also highlighted the geographical disparities, revealing that women residing in states with limited access to improved sanitation often experience poorer overall health compared to those living in states with improved sanitation facilities. States with limited access to sanitation facilities are also India's most backward states, are

predominantly rural, have low living standards, and are characterized by low literacy, early marriage, and high fertility. While significant improvements have been made in India in sanitation and women's health, there is a need for more gender-disaggregated data to establish the different pathways by which sanitation impacts women's health. The study suggests that sanitation in contemporary times needs sustainable, gender-responsive, and inclusive solutions. Sanitation policy can fail to achieve its desired objectives unless it addresses women's specific sanitation needs and takes their lived experiences into account. Yet, as our study shows, there is very little gender-disaggregated data on sanitation and women's health. The UNICEF/WHO (2023) report shows that the indicators used to measure menstrual health and hygiene are still evolving. It is still unclear how many women get sick and what kinds of diseases affect them because they do not have access to clean toilets during their periods, how many girls drop out of school because they have to go get water, how many women experience stress and anxiety due to lack of toilets, how many women get diarrhea from taking care of children and the elderly as their main caregivers, and how many women are victims of gender-based violence and sexual harassment because they can't use the toilets or get clean water on the premises. Although our study demonstrated a strong positive correlation between improved sanitation facilities and women's literacy rates, there exists little data to understand whether a higher literacy rate translates into empowering women so that they can make decisions about sanitation facilities within their households. Based on the results that show a strong link between sanitation and several aspects of women's health and the subsequent discussion, this study makes it even more important for India to take a more gender-sensitive approach to sanitation and women's health.

Conclusion

The neglect of environmental sanitation has environmental risk outcomes that affect health in significant ways. In particular, inadequate sanitation facilities adversely impact women's health, as they have specific sanitation needs owing to their bodily processes as well as the prevalence of certain sociocultural norms. This study utilized new data from NFHS-5 to demonstrate the correlation between improved sanitation facilities and menstrual hygiene, maternal health, women's literacy, anemia, early marriage, and fertility. This implies that various aspects of women's well-being are associated with improved sanitation facilities. Since there is insufficient gender-specific data on sanitation, it's hard to figure out how unmet sanitation needs affect women's health and well-being and what causes them. The study furthers the relevance of the collection of gender-disaggregated data. Incorporation of the same would

minimize the environmental risks to women's health and would also make policies on environmental sanitation and health more gender-responsive, inclusive, and effective.

Conflict of interest

The authors declare that they have no conflicts of interest.

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