Assessing Clean Water and Sanitation Among Rural Tribal Communities in Simdega, India

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Abstract
Inadequate access to improved water, sanitation and hygiene (WASH) facilities excessively affects low- and middle-income nations. Access to clean water and reliable sanitation are indispensable for safeguarding health, dignity, and overall well-being.This study aimed to assess the sources, accessibility, and treatment practices of drinking water among tribal women, to evaluate the availability of toilet facilities and types of sanitation facilities, and open defecation prevalence, to assess hygiene practices such as handwashing and footwear use among the study population, and to compare sanitation conditions between government-built and privately-owned toilet facilities.The study was conducted in Simdega District, Jharkhand. A cross-sectional study sampled 203 respondents through a multistage probability sampling design. Data were collected through a pre-tested structured interview questionnaire. Although all households had toilets, primarily two pit latrines (82.3%), access to improved water sources was limited, with 63.1% depending on water within premises. Water purification practices were poor; only 46.3% of households boiled water for purification 80.3% of households had access to handwashing with soap and water after using the toilet. 22.7**%** of the women who still continue to practice open defecation,6.4% uses neighbours' toilet, and 2.5% relies on community toilets, which creates sanitation. Despite universal toilet access, WASH infrastructure remained inadequate. The study highlights emphasising the importance of promoting hygiene alongside infrastructure development in rural areas.

Keywords: clean water, hygiene, sanitation, tribal, women

1. Introduction

Suboptimal water, sanitation, and hygiene (WASH) practices constitute a serious public health risk, affecting one-third of the world's population. Water, sanitation, and hygiene (WASH) remain essential for maintaining public health. As a result, the sixth Sustainable Development Goal (SDG) aims to ensure that everyone has access to safe drinking water and sanitation. SDG target 6.1 aims to provide everyone with fair access to safe, affordable drinking water, while SDG target 6.2 aims to abolish open defecation and facilitate access to sanitation and hygiene services. The World Health Organization (WHO) estimates that unsafe WASH practices contributed to 8.29 million global fatalities and 49.8 million disability-adjusted life years in 2016, with a mortality rate of 11.7 deaths per 100,000 people.

According to an updated evaluation of WHO statistics, remarkable progress has been made to improve WASH; however, challenges remain, with rapid population growth adding pressure on WASH systems. They recognized WASH as a major public health concern helps disrupt the intergenerational cycles of

malnutrition, in which inadequate food intake and diseases are influenced by variables such as a lack of safety, potable water, sanitation, and hygiene. (OJ Okesanya et al., 2024).

Moreover, the pandemic, which claimed hundreds of lives worldwide, prompted us to practice adequate hygiene and sanitation, along with the provision of clean drinking water. The United Nations Sustainable Development Goals focus on global access to safe drinking water and adequate sanitation facilities. The two act as a challenge to public health safety to safeguard the prosperity of the entire community. The United Nations set a 2025 target to eliminate open defecation worldwide, recognising it as an essential matter of public health and human dignity.

Together with the rest of the SDGs, it aims to improve the quality of life for billions of people worldwide. In the MDGs, access to safe drinking water was measured using access to improved sources of water with no consideration of water quality. Cecilia Tortajada (2018)

The Sustainable Development Goals (S.D.G.s) aim to achieve accessible, adequate and equitable sanitation and hygiene for all. The United Nations has set a 2025 deadline to end open defecation.

In contrast, unimproved water sources are characterised by stagnant water from rivers, ponds or dams, as well as water collected and stored in rainwater tanks. Similarly, sanitation facilities are categorised as 'improved' if the excreta are safely disposed of in situ or removed from off-site (UNICEF & WHO 2023). Households lacking any latrine or toilet facility are considered to have 'unimproved' sanitation (Kassie & Hayelom 2017). Hygiene practices are deemed 'poor' if there are no handwashing or bathing facilities with detergents available in the household, or if hands are washed with only water and no soap (Wolf et al. 2023). In contrast, good hygiene practices involve readily available handwashing and bathing facilities with soap and detergents (Kassie & Hayelom, 2017; UNICEF & WHO, 2023)

A proper sanitary system, which integrates human behaviours, facilities, and services, plays a crucial role in promoting public health, preventing infections, and ensuring sustainable development. This directly aligns with United Nations Sustainable Development Goal (SDG) 6: Clean Water and Sanitation, as well as other interconnected SDGs such as SDG 3: Good Health and Well-being and SDG 11: Sustainable Cities and Communities. Without the alignment of human behaviour, proper facilities, and adequate services, an effective sanitary system cannot be established, leaving infections unchecked and healthy growth unattainable. On the other hand, women without basic sanitation facilities are forced to use community latrines or practice open defecation, putting their health and livelihoods at risk.

The buildup of organic waste and overflowing trash can contaminate the air, land and water. Also, it can attract pests that contribute to unsanitary conditions (Wang et al., 2019). Therefore, it significantly impacts public health and potentially spreads additional diseases. Conversely, good household hygiene practices play a crucial role in controlling pest infestations.

Geographic factors often shape cultural practices and taboos related to toilet usage, as the environment and local conditions significantly influence societal norms and behaviours. For instance, in regions with abundant open spaces, such as rural plains or forested areas, cultural practices like open defecation may persist, partly because it has historically been seen as a natural and accessible solution. Additionally, in areas where water scarcity is prevalent, cultural taboos around water usage for cleaning purposes may emerge, affecting how sanitation is perceived and practiced.

Improved sanitation coverage, as a proxy for environmental hygiene, was measured by the proportion of households with an improved toilet facility in the community. Monden, C. W. et al., (2009).

The overarching objective of optimal sanitation standards is to foster a health-centric living environment, preserve critical natural resources such as surface water, groundwater, and soil, and uphold the fundame-

ntal principles of safety, security, and human dignity in the act of sanitation.
Water plays a fundamental role in food and sanitation, making it an important commodity and a basic resource for economic development (Gomez et al., 2019). Inadequate access to drinking water and sanitation poses significant obstacles to economic and social development, hinders poverty alleviation, and contributes to environmental degradation. Sanitation, a crucial factor in determining quality of life and the Human Development Index, encompasses both public and private aspects. Without proper sanitation and access to clean water, meaningful progress remains unattainable, and poor personal hygiene can profoundly impact community health. Access to safe water is a fundamental human right (United Nations, 2018).
Over the past quarter-century, significant advances have been made in the quest to achieve the Millennium Development Goals, with billions gaining better-quality access to water and sanitation and experiencing comprehensible shifts toward hygienic practices across populations. But much remains to be done.
In 2015, the United Nations set the Sustainable Development Goal of providing equitable access to safe and affordable drinking water for all by 2030. (Ismail et al., 2023; Monneya & Ocloo, 2017). Many people living in low-resource settings tranquil lack access to these essential services. Reports on WASH practices, especially from rural areas of Simdega District, are limited.

2. Objective:

1. This study aimed to assess the sources, accessibility, and treatment practices of drinking water among tribal women.
2. To evaluate the availability of toilet facilities and types of sanitation facilities, and open defecation prevalence,
3. To assess hygiene practices such as handwashing and footwear use among the study population,
4. To compare sanitation conditions between government-built and privately-owned toilet facilities.

3. Review of Related Literature

Timothy O. Ogunbode et al., 2026, in their paper, studied 31 rural communities in Osun West Senatorial District, Nigeria, to assess awareness, practice, and barriers to SDG 6 among 310 households. The largely female sample was socioeconomically vulnerable, with 79.57% earning less than the national minimum wage, highlighting the socioeconomic factors driving WASH problems in the study area. Serious sanitation problems were present, including 63.44% practising open defecation and 49.46% drinking surface and ground water. Previous water infrastructure investments were ineffective,61.29% of communities did not benefit from MDG water projects, and only five of eleven projects were in operation. Factor analysis (KMO = 60.2% and 77.5%; $p<0.005$) revealed that perception of communal water use was the main factor influencing water awareness (24.62%), and lack of household sanitation facilities was the main factor for sanitation (41.27%). Overall, the results show that lack of awareness, socioeconomic vulnerability and institutional failure are the main barriers to achieving SDG 6 in rural Osun State.
Rajendrakumar S. et al., 2025 paper, offers an in-depth look at India's progress towards the United Nations' 2030 Agenda. Using the PRISMA method, the paper highlights that India has made noteworthy progress through large-scale government programs such as the Swachh Bharat Mission (SBM), which effectively scaled up access to toilets, and the Jal Jeevan Mission (JJM), which aims to provide tap water to all households. The research identifies key challenges that may undermine sustainability, such as rapid groundwater depletion, the growing impacts of climate change, and a pressing need to improve wastewater

treatment systems. Currently, only 28% to 44% of urban sewage is treated. The authors recommend a transition towards a circular economy, with a focus on wastewater reuse and faecal sludge management, and re-emphasising village-level governance, as well as making WASH (Water, Sanitation, and Hygiene) education part of the school curriculum to promote equitable and sustainable access for all.
B.C. Werku et.al., 2025, the research explored inequalities in access to clean water and sanitation across rural areas of 15 African countries using panel data analysis and descriptive statistics. The findings disclose serious gaps, with only 7.4% of the population consuming safe drinking water and 29.3% still practising open defecation, compromising health. Further shortcomings include inadequate sanitation services (20.1%), limited access to electricity (20.6%), limited access to clean cooking fuel (26.7%), and limited access to basic handwashing facilities (14.4%). These compounding challenges contribute to a 50.3% average mortality rate from infectious diseases and insufficient diarrhoea treatment in children under five (39.3%). The study accomplishes that achieving SDG 6 by 2030 demands urgent, integrated policies that align infrastructure development, public health education, and strong community participation.
Pambuko, Z. B. et al., (2025) investigated awareness and understanding of Sustainable Development Goal 6 among Indonesian higher education institutions. They evaluated the SDG literacy of 271 students across three Indonesian residencies, focusing on their knowledge of safe drinking water, proper sanitation, and sustainable development practices. The water quality was suitable, even though sanitation conditions were inadequate. However, stakeholders' efforts to boost sanitation management effectiveness have been praiseworthy in addressing the issue. Furthermore, the management of clean water across the three regencies was similar; Magelang Regency performed better in improving sanitation management effectiveness compared to Temanggung Regency.

4. Research methods and Design

4.1 Study design

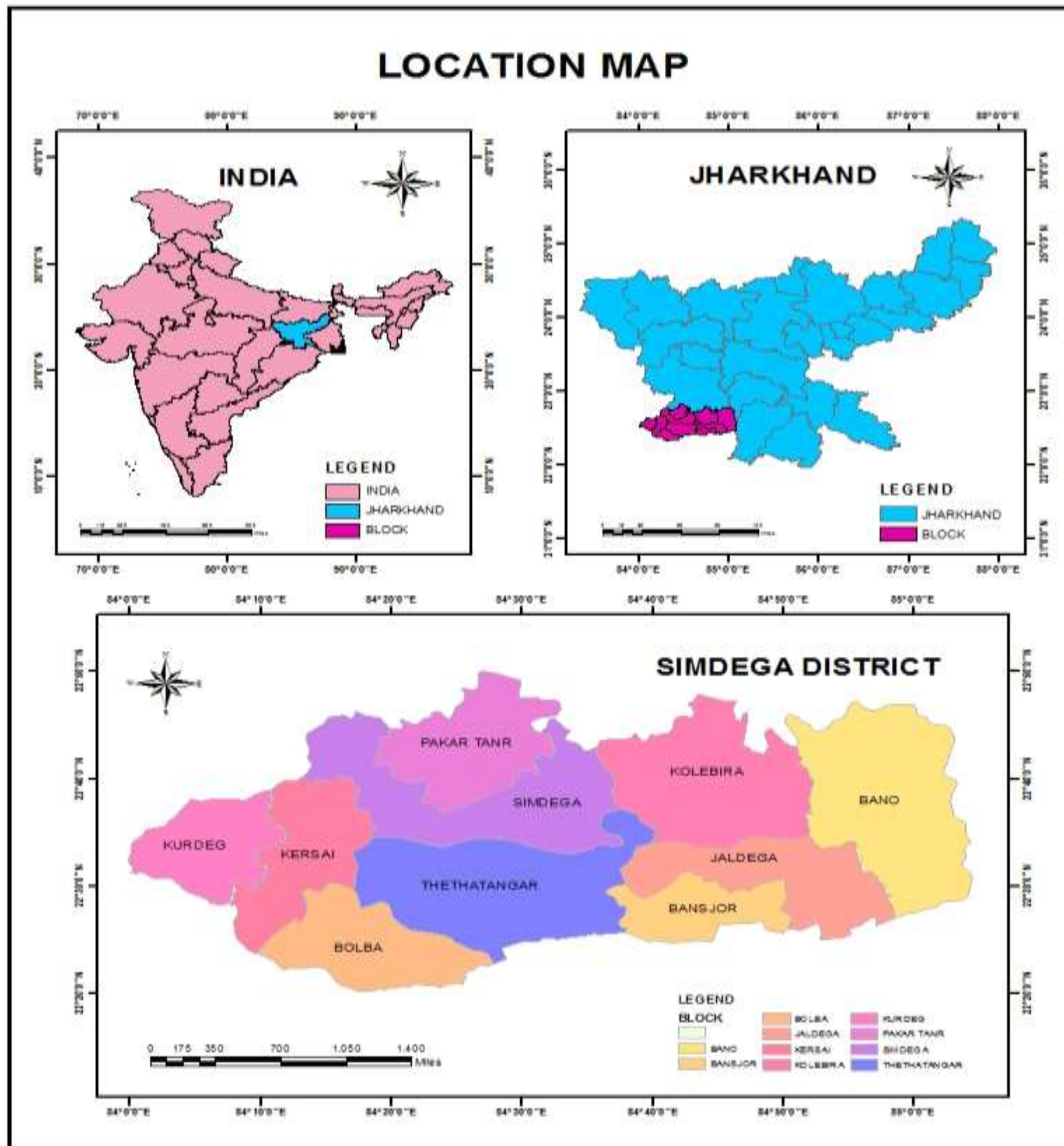
The cross-sectional survey was conducted in December 2025 with 203 tribal women respondents in the rural area of Simdega district. Data analysts used a Pearson chi-square test to assess the relationship between WASH practices and several independent covariates.

4.2 Study area

This study was conducted in Simdega district, Jharkhand, India. Simdega is a tribal dominated district where most of the residents are economically poor and face inadequate access to modern sanitation and water infrastructure. Simdega is in the southwestern part of Jharkhand. Geographically, the town is situated between 22° 20`and 22° 51' north latitude and 84° 01´ and 85° 5' east longitude. (Figure 1) It is bounded by Gumla in the north, Khunti and West Singhbhum in the east, Chhattisgarh in the west and Odisha in the south. It covers a total area of 3756.19 sq km and is divided into ten blocks, namely, Bolba, Bano, Bansjor, Jaldega, Kersai, Kurdeg, Kolebira, Pakartarn, Simdega and Thethaitangar. (Koirala et al., 2020) As of 2011 India census, Simdega had a population of 599,813. Males constitute 52% of the population and females 48%. Average literacy rate in Simdega as per census 2011 is 85.46% being higher than the national average, of which males and females are 89.22% and 81.54% literates respectively. Simdega is in a minority concentrated district. Almost, 51.14% of the Population is Christian included among these are Catholic, Lutheran, Church of North India and others. It is highest Christian majority region in Jharkhand and in Central India. Hinduism consists of 33.61% of the Population. Muslim Population consist of 2.52% of the Population. (SR Panda, R Xalxo,2021). The state has a tropical

monsoon climate, characterized by hot summers, a distinct rainy season, and mild winters. Annual average rainfall: 1,200–1,400 mm, mostly received during the Southwest Monsoon (June–September). Average temperature: Summer (up to 40°C), Winter (as low as 8–10°C). (Mr. Umesh Kumar et al., 2025)

Figure 1: Map Of The Study Area



4.3 Sampling Collection

The study used two quantitative methods: first, the housing unit survey; second, field observation. There are two qualitative methods: key informant interviews (KII) and literature review. Various sampling villages were identified for data collection. Sampling was done in four stages. In the first stage, panchayats were selected purposively from each block. In the second stage, 2 villages from each block were selected randomly. In the third stage, a systematic sampling technique was employed in which every fourth dwelling along the selected transect was included. For the purposes of this study, a household was defined as a co-residential unit of individuals who live together and share meals.

To avoid duplicate responses and maintain the independence of observations, only one respondent per household was selected. Eligibility was limited to permanent residents within the study villages; consequently, no household was represented by more than one respondent.

Table 1: Sampling concentration of study villages and households in Simdega

Block	**Villages**
Jaldega	Orga, Gangutoli
Kolebira	Bandarchuan, Saraipani
Thetaitangar	Pandripani, Rengari

4.4 Data collection strategy

The questionnaire was first prepared in English was translated into Nagpuri and back into English to maintain consistency. Before data collection, the questionnaire was pretested in the study area to ensure that the questions were complete and comprehensive. Feedback from the pilot survey was integrated into research questions prior to direct administration to the study participants. To assess water and sanitation hygiene practices, we collected data using researcher-developed core questions. Inquiries focused on drinking water supply, home water purification techniques, and latrine facilities. Participants reported details regarding the quality of their drinking water, sanitation practices, and hygiene routines. The evaluated participants' socioeconomic status was assessed using a modified version of the BG Prasad scale.

4.5 Data analysis

Microsoft Excel was used to enter all the gathered data. Data were cleaned and further analysed. Frequency and percentage were used to express descriptive variables. Chi-squared tests were used to measure the statistical significance.

5. Results

A total of 203 respondents participated in the survey conducted across three blocks of Simdega district, yielding a 100% response rate, with no attrition following consent. Using the modified B.G. Prasad's SES Scale 2024, most of them belonged to the lower middle class (36.9%), followed by the middle class (25.1%), the upper middle class (17.7%), the lower class (11.8%), and the upper class (8.4%), respectively. The most common household size was medium, with 4 to 6 people (53.2%), followed by 7+ people (26.6%) and 1 to 3 people (20.2%). Table 1 details the water sources, sanitation facilities and utilised by participating households, as reported by the study participants.

Table 2: Socio-Demographic distribution in the study area

Sociodemographic Characteristics	**Frequency (n)**	**Percent (%)**
Age		
18-40	148	72.9%
41-60	29	14.3%
>60	26	12.8%
Education		
No education	45	22.2%

Primary	64	31.5%
Secondary	62	30.5%
Higher	14	6.9%
Modified B.G. Prasad's SES Scale (2024)		
Lower class	24	11.8%
Lower middle class	75	36.9%
Middle class	51	25.1%
Upper middle class	36	17.7%
Upper class	17	8.4%
Total	**203**	**100%**

5.1 Water Sources, Accessibility, and Treatment Practices

Primary water supply counted in wells (47.3%), hand pumps (32.0%), tap/supply water (13.3%), bore wells (6.9%), and river/pond water (0.5%). The primary source of water for the majority of participants was on-premises; 63.1 % of households had access to on-premises water, and the remaining 36.9 % had access to off-premises water. The transportation of water intensifies the risk of infection during collection and transport. Among the houses assessed, 81.3% covered their drinking water, reducing contamination risk, while 18.7% left it uncovered. Seasonal water scarcity was reported by 76.5% of respondents throughout the summer and 23.5% during the monsoon season. Water purification practices were bothering. Only 46.3% of households boiled water for purification, 21.7% used filtration, 16.3% relied on chlorination or bleaching methods to clean water, despite the fact that 18.2% use no water treatment method. This shows a notable gap in water safety practices among the people. Hence, this indicates that, despite everything, significant breaches in responsiveness and the implementation of water safety practices were found in the economically vulnerable respondents' households.

Table 3: Access to Drinking Water Sources and Treatment Practices

VARIABLES	No. of Households(n)	Percentage (%)
Drinking Water Coverage		
Water covered	165	81.3
Water uncovered	38	18.7
Source of Drinking Water		
Well	96	47.3
Hand pump	65	32.0
Tap/supply water	27	13.3
Bore well	14	6.9
River/pond	1	0.5
Distance to Water Source		
Within premises	128	63.1
Outside premises	75	36.9
Water Purification Method		
Boiling	94	46.3
Filtration	44	21.7

Chlorination/bleaching	33	16.3
No treatment	37	18.2
	Is there any water problem in your village?	
	Season	
Summer	130	76.5%
Monsoon	40	23.5%

5.2 Availability of Toilet Facilities, Sanitation Types, and Open Defecation Frequency

Sanitation access coverage showed a mixed picture, with 68.5% of respondents having toilet facilities on their property, suggesting progress towards infrastructural development. However, there is a persisting gap of 22.7**%** of the women who still continue to practice open defecation,6.4% uses neighbours' toilets, and 2.5% relies on community toilets. When households don't have their own toilet, reliance on neighbours or community toilets creates greater uncertainty about sanitation. Such shared facilities discourage consistent use due to their dependency on cleanliness, distance, and social permission. As a result, people may revert to open defecation, specifically during mornings or emergencies.

There are two-pit latrines, mainly found in most of the houses of the respondent (82.3%), simply addressing that they depend on affordable, and commonly used, sanitation systems, flush toilets (0.7%), suggesting modern, more hygienic sanitation infrastructure, which is a rare sight owing to the pricing.

Table 4: Sanitation Facility Distribution Among Respondents

Sanitation Facility Type	**No. of Households (n)**	**Percentage (%)**
Toilet within premises	139	68.5
Open defecation	46	22.7
Neighbours' toilet	13	6.4
Community toilet	5	2.5
Household Latrine Type	**No. of Households (n)**	**Percentage (%)**
One-pit latrine	25	17.0
Two-pit latrine	121	82.3
Flush toilet	1	0.7

Table 5: Open Defecation Frequency by Employment

Employment Status	**Total Respondents (n)**	**Open Defecation**	**Percentage (%)**
Non-working	147	63	42.9
Working	56	34	60.7
Total	203	97	47.8

Comfort with open defecation remained high among the study population, at 47.8% overall, including 42.9% of non-working and 60.7% of working respondents. This sheds light on the inadequacy of workplace sanitation facilities. The higher rate among workers highlights the poor workplace sanitation and limited awareness of hygiene risks. The income stratum showed that 52.3% of women earning below

₹5,000 practised workplace open defecation, compared with 22.7% earning ₹5,001–10,000 and 25.0% earning above ₹10,000.

5.3 Hygiene Practices: Handwashing and Footwear Use

Hand cleanness does were chiefly favourable among respondents. A total of 80.3% washed their hands with soap and water after using the toilet, indicating that women are aware of faecal-oral disease transmission. whereas 14.8% used only water and 4.9% depend on ash or mud, indicating adoption of hygiene practices. Footwear habit during toilet visits was also high, with 90.6% habitually wearing footwear and only 9.4% not using it. This high level of adherence to protective footwear practices fosters awareness of contamination and a readiness to engage in protective behaviours.

Table 6: Distribution of Handwashing Methods and Footwear Use During Toilet Among Study Participants

Hygiene Practice	No. of Respondents (n)	Percentage (%)
Handwashing Method After Toilet		
Soap and water	163	80.3
Water only	30	14.8
Ash or mud	10	4.9
Footwear Use During Toilet		
Yes	184	90.6
No	19	9.4
Total	**203**	**100**

5.4Comparison of Sanitation Conditions between Government-built vs. Privately-owned Toilet Facilities

Chi-square tests show associations between facility type and all assessed environmental problems. Government facilities showed markedly higher prevalence of water logging, inadequate air/light, odour, and space constraints (all $p<0.001$), while fear of insects/pests was also higher in government facilities but remained common in private facilities ($p=0.027$) (Table 5). The magnitude and consistency of these differences suggest substantial infrastructure and maintenance gaps in government facilities.

Table 7: Toilet Facility Problems Among Govt And Private Toilets

Variable	Govt Toilet % with problem	Private Toilet % with problem	χ^2 Statistic	p-value
Waterlogging problem	60.6%	8.3%	30.262	<0.001
Air & light problem	69.7%	13.5%	37.265	<0.001
Insect/pest fear	76.4%	56.8%	4.916	0.027
Fetor/smell problem	74.5%	24.3%	31.481	<0.001
Space problem	72.1%	18.9%	34.22	<0.001

5.6 Household Size and Number of Toilets

We used Pearson's correlation to test the relationship between household size and the availability of a toilet at home and found a weak, insignificant correlation ($r = -0.017$, $p = 0.808$), suggesting that larger

households do not have more toilets. This implies that government sanitation initiatives have primarily followed a "one toilet per family" approach in order to cover all households. With 26.6% of households in the study area having seven or more people, providing only a single toilet could lead to overuse and premature deterioration of the toilet facility, ultimately resulting in open defecation. This study suggests that toilet facilities should be provided based on per-capita or family size rather than households alone as the sole indicator of toilet availability.

Table 8: Pearson Correlation Between Household Size and Toilet Availability Among Study Participants

		Household size (Number of family members)	No of toilets at home
Household size (Number of family members)	Pearson Correlation	1	-.017
	Sig. (2-tailed)		.808
	N	203	203
No of toilets at home	Pearson Correlation	-.017	1
	Sig. (2-tailed)	.808	
	N	203	203

6 Discussion

6.1 Source, access and quality of water

The study on water access demonstrates a scenario of scarcity and behavioural deficits that threaten the quality of drinking water. The source of water supply is, in general, open wells (47.3%) and hand pumps (32.0%), and adequate piped supply (tap water) is lacking (Bain et al., 2012). While 63.1% of households have water sources on the premises, reliance on off-premises water sources (36.9%) is a concern, as transport and storage without closed vessels increase the risk of waterborne infection at the point of use (Wolf et al., 2023).The practice of covering household drinking water by 81.3% of women is a good sign of household awareness, which minimises infection risk. The study reports that the treatment level is below the WHO-recommended level for rural areas (WHO, 2004). Limited use of chemical treatment (e.g. chlorination) is associated with the financial crisis.Water scarcity was observed in summer (76.5%), indicating the vulnerability of open well sources to perennial water scarcity. The promotion of solar bore wells has been successful in Jharkhand.But if women are not empowered through education, decision-making, and leadership, they lack the knowledge and capacity to understand and advocate for the SDG 6 goals. Lacking empowerment, women become caught in a poverty trap with limited power to press for better water and sanitation facilities or adopt new practices. R. Saha (2024)

6.2 Sanitation Facility and Open Defecation

The simultaneous presence of 68.5% toilet facilities and 22.7% open access to toilet facilities does not ensure behavioural change to stop open defecation, particularly when the toilet is Subpar and occupational history denies access to the toilet during working hours, thereby allowing open defecation to continue. There is a higher rate of open defecation among working respondents (60.7%) than among non-working respondents (42.9%), highlighting that working without workplace sanitation may paradoxically increase insanitary exposure.There is a negative correlation between education and open defecation, as the greatest

rate is among the illiterate (45.5%). This highlights the protective role of education and literacy, which enable people to understand and respond to health issues. The durability of the two-pit latrine (82.3%) indicates that government construction schemes have advocated this type due to its ease of operation. However, the high maintenance issues associated with government-built toilets indicate that the design and quality of materials have been compromised, leading people to avoid them rather than adopt them.

6.3 Hygiene indicators: Washing hands and using footwear

The study revealed high levels of adherence to hygiene indicators (80.3% of respondents reported washing their hands with soap and water after using the toilet, and 90.6% used footwear when using the toilet), suggesting that hygiene promotion messages have reached the grassroots level in Simdega's tribal areas. The high rate of footwear use suggests awareness of contamination, possibly due to a community health worker's intervention.However, the 14.8% of respondents who reported washing their hands with water and the 4.9% who used ash or mud indicate behavioural challenges that may be explained by the unavailability of soap, affordability, or habit.

6.4 Comparison of government and privately-owned toilet facilities

The chi-square test analysis of government-built and privately owned toilets revealed that across the five parameters assessed (waterlogging, insufficient ventilation, odour, pests, and lack of space), government-built latrines had more problems, with four of the five parameters showing statistically significant differences ($p < 0.001$). The fact that 74.5% of government-constructed toilet facilities complained of odour problems, while 24.3% of private toilet facilities did, and that 69.7% complained of ventilation problems (13.5% in private toilet facilities), suggests basic problems in the quality of construction, the adequacy of design, and the failure of post-construction maintenance systems.

7. Conclusion

The Infrastructure Paradox of 68.5% toilet coverage and 22.7% open defecation suggests that unaided facilities do not lead to behavioural change. 60.7% of workers practice open defecation, revealing exclusion of the working class from access to sanitation. Education and income gradients indicate that social stratification and inequity disproportionately impact advantaged households, while the reality is that the deprivation of the disadvantaged is being prolonged. Government-provided toilets with problems such as waterlogging, smell, poor ventilation and pests discourage use. 80.3% soap-based hand-washing suggests a high level of awareness and willingness to take measures to protect themselves. WASH improvement is not achieved by counting facilities but requires systems-level actions for maintenance, occupational equity, and behaviour change. Through collective efforts to promote hygiene and invest in infrastructure and sanitation services, countries can build healthy, inclusive, and sustainable communities. Through innovation, governance and collective effort, we can create a future where everyone has access to water, sanitation and hygiene - it's not only possible, but also essential for global prosperity, social equity and environmental sustainability.

8. Recommendations

These findings underscore the urgent need for targeted interventions, such as improving access to sanitation facilities in households and workplaces and increasing awareness of the health risks associated with open defecation. Addressing these gaps is key to improving inclusive hygiene and public health standards. Overall, while a significant segment of respondents practised good hygiene and sanitation, severe deficiencies remain in water purification, toilet accessibility, and hand hygiene. These results

emphasise the need for targeted public health interventions and awareness programs to improve sanitation infrastructure and promote better hygiene practices. There should be construction standards and material specifications for government latrines under the Swachh Bharat Mission, and, notwithstanding, a Post-Construction Maintenance Fund should be established with local gram panchayats. There is a need for awareness campaigns on the link between waterborne disease and uncovered water storage, as research shows that uncovered water storage is directly associated with diarrhoea. Cohesive WASH education in the school curriculum will create a generational shift by educating the new generation, and along with that, these young minds will encourage hygiene practice. Policymakers ought to shift to outcome-based WASH monitoring and measure open defecation behaviour, point-of-use water quality, and actual toilet usability rather than merely toilet construction numbers.

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