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Impact of Sustainable Sanitation and Hygiene Programs on Rural Household Practices: A Community-Based Study

Lok Bahadur Oli
Assistant Professor, Rural Development Department,
Mid-West University, Surkhet, Nepal.
E-mail: lok.oli@mu.edu.np
ORCID: https://orcid.org/0009-0004-4652-7278
Lokendra Woli
Babai Multiple Campus Gulariya, Bardiya
Email: lokendra.woli@mu.edu.np
ORCID: https://orcid.org/0000-0003-4421-8311

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Abstract

Sustainable sanitation and hygiene are essential for public health, especially in rural areas of low-income countries like Nepal, where open defecation, poor waste management, and unsafe water use remain persistent challenges. Although Nepal has made commendable progress in improving sanitation coverage, ensuring long-term behavioral change and sustainability of hygiene practices continues to be a significant concern. This study assesses the impact of sustainable sanitation and hygiene interventions on household behaviors in Bheriganga Municipality, Surkhet. It particularly focuses on key hygiene practices, including hand washing, toilet usage, safe water handling, and waste disposal methods. A quantitative cross-sectional survey was conducted among selected households using structured questionnaires and relevant municipal records. The research employed a comparative approach to evaluate changes in hygiene behaviors before and after the implementation of the Sustainable Sanitation and Hygiene for All (SSH4A) program. The findings reveal notable improvements in various hygiene indicators, suggesting that the intervention effectively influenced household behavior. The study highlights that behavior-focused, community-driven WASH (Water, Sanitation, and Hygiene) programs can yield lasting health and environmental benefits. Overall, the SSH4A intervention resulted in sustainable improvements in rural sanitation practices, transforming Hariyali Tole into a model community. These results provide practical insights and policy implications for achieving broader national and global sanitation and hygiene goals.

Keywords: Behavior change, handwashing, promotion, sustainability

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Introduction

Sustainable hygiene is about more than just keeping clean; it's about ensuring that hygiene practices are effective, long-lasting, environmentally sound, and embraced by the community. It includes habits like regular hand washing with soap, safe disposal of human waste, and proper water handling, all maintained without putting pressure on the environment or needing constant outside help, but it doesn't stop at infrastructure (Angelakis et al., 2023). Sustainable hygiene also requires behavioral change, cultural relevance, and social support to keep these practices going over time. For countries facing high rates of disease linked to poor hygiene, especially low- and middle-income nations this approach is essential for improving public health (Bose et al., 2024).

Sustainable hygiene plays a key role in the global development agenda, especially within the United Nations' Sustainable Development Goals (SDGs). Goal 6, for instance, focuses on ensuring access to clean water and sanitation for everyone. Yet, challenges remain. Around 2.2 billion people still lack safely managed drinking water, and 3.5 billion are without even basic sanitation. Each year, diseases like diarrhea, which are often preventable through better hygiene, claim the lives of over a million people. These issues are especially severe in rural areas, where infrastructure is less developed (Satterthwaite, 2016). Water, sanitation, and hygiene (WASH) are not solely health concerns they are also closely linked to education, gender equality, and community resilience in the face of climate change (Okesanya et al., 2024).

Nepal has made significant strides in improving hygiene and sanitation over the past few decades (Woli, 2022). Today, about 67 percent of the population has access to safe drinking water, and 96 percent use toilets (Shrestha et al., 2023). The country was declared Open Defecation Free (ODF) in 2019, marking a major milestone. Since then, efforts have shifted toward making sure these gains are sustainable (Cagnet & O'Byrne, 2024). That includes encouraging regular hand washing, improving water quality, and promoting food hygiene especially in remote provinces like Karnali (Thapa, 2023). Organizations like SNV Netherlands Development Organization have been key players through initiatives like Sustainable Sanitation and Hygiene for All (SSH4A), which focus on behavior change, local supply chains, and good governance (Savelli et al., 2019). In districts such as Surkhet, programs like SSH4A-RP are working at the

community level to keep sanitation and hygiene practices on track, even after ODF status has been achieved (Municipality Profile, 2074).

There are common threads running through both the global and Nepali approaches to sustainable hygiene. Both recognize that simply building toilets or water taps isn't enough what matters is changing behavior, respecting local culture, and ensuring long-term use (Sah & Negussie, 2009). However, the challenges differ significantly; while global efforts often benefit from greater resources and advanced monitoring systems, Nepal must contend with limited budgets, challenging terrain, and diverse cultural contexts (Guragain, 2081). Developed nations are largely focused on the environmental and sustainability aspects of hygiene systems, whereas Nepal is still working to expand access to basic services (Budhathoki, 2019). Even so, the shared global goal of achieving SDG 6 reflects a widespread commitment to making hygiene both universal and sustainable.

Community-Led Total Sanitation (CLTS) has spread globally, highlighting how well it fits with broader goals like decentralization and community-driven development. Through a qualitative approach, it shows that CLTS became popular as a practical, low-cost solution to tackle open defecation, especially in regions like South Asia and Sub-Saharan Africa. Interestingly, the spread of CLTS was largely driven by the efforts of donors, NGOs, personal networks, and hands-on learning experiences rather than solid scientific evidence. However, the study also points out a significant gap: there's still a lack of thorough research on the long-term effects of CLTS, underscoring the need for stronger, evidence-based policies in the sanitation sector (Zuin et al., 2019).

This study critically evaluates behavior change models in WASH interventions, particularly in low-income contexts. It identifies key gaps such as limited consideration of technology, environmental factors, and the complex nature of human behavior (Oli, 2023). In response, the researchers developed the Integrated Behavioral Model for WASH (IBM-WASH), a comprehensive framework that addresses contextual, psychological, and technological factors across five interconnected levels. This model offers a practical tool for designing and evaluating more effective and sustainable WASH programs (Dreibelbis et al., 2013).

Additionally, the Community-Led Total Sanitation (CLTS) approach, used in over 60 countries, is examined for its effectiveness in eliminating open defecation

through community-driven behavior change without external subsidies. Semi-structured interviews with development professionals from 14 reveal that while CLTS is largely effective and socially accepted (Galvin, 2015). However, the research also raises important concerns about the ethical challenges of the approach, how sustainable the results are, and whether it actually leads to better health outcomes. The authors argue for more flexible, locally tailored strategies and question the strict no-subsidy rule that underpins CLTS. They also point out the need for more research on its long-term impact on public health (Ficek & Novotny, 2019).

The 2009 WHO Guidelines on Hand Hygiene in Health Care were introduced as part of the "Save Lives: Clean Your Hands" campaign, with the goal of making health care safer by promoting consistent and effective hand hygiene. Created with input from over 100 international experts, the guidelines are based on solid clinical evidence and real-world testing. They were shaped through thorough research, expert discussions, and trials in health care settings. One of the key takeaways is the proven effectiveness of alcohol-based hand rubs and the importance of strong institutional backing to support hygiene practices. However, the guidelines also highlight areas needing more attention such as a lack of data from low-resource environments and strategies for ensuring long-term changes in behavior. In the end, the guidelines issue a clear and urgent message: improving hand hygiene worldwide requires ongoing commitment and action from all levels of the health care system (WHO, 2009).

The Global sanitation crisis, revealing that around 4.2 billion people still lack access to basic hygienic facilities, and 673 million are forced to practice open defecation, which disproportionately affects the world’s poorest and most marginalized communities. By analyzing secondary data and global health statistics, the paper connects poor sanitation to an estimated 432,000 deaths from diarrhea each year, along with serious consequences for nutrition and overall health. It also points out a significant gap in current research, especially when it comes to understanding how inadequate sanitation indirectly affects nutrition. The authors call for comprehensive, community-level interventions to improve sanitation, not only for better health outcomes but also to support broader social and economic development (Anders et al., 2021).

Globally relevant WASH interventions have shown substantial impact in diverse rural contexts. Analyses of studies across low- and middle-income countries reveal that combined WASH interventions can reduce childhood diarrhea by up to 57%, while individual components such as hand washing with soap, improved sanitation, and point-of-use water treatment typically yield 27–47% reductions in disease risk. These findings highlight the critical role of integrated approaches to WASH in improving child health and preventing disease in underserved communities (Igaki et al., 2021). In Ethiopia, rural community-centered WASH programs led to significant behavioral improvements, increasing latrine use, water treatment, and hand washing practices by 24–50% demonstrating strong shifts in hygiene behavior (De Shay et al., 2020). In Zambia, a multi-year sanitation campaign across multiple provinces resulted in improved access to toilet facilities through sustained community-based efforts. Furthermore, the Community-Led Total Sanitation (CLTS) model implemented in over 50 countries has played a vital role in eliminating open defecation and fostering sustainable sanitation norms across Asia and Africa (Kar & Chambers, 2008).

Sustainable Sanitation and Hygiene for All (SSH4A) program was carried out in 12 rural regions across 11 countries including Nepal between 2014 and 2018. Drawing on repeated surveys of more than 21,000 households in each round, the findings show a significant 53-percentage-point rise in sanitation coverage, positively impacting around 4.8 million people. The results also reveal that both vulnerable and non-vulnerable groups experienced similar improvements, although slightly better outcomes were seen among wealthier households. However, more research is needed to better understand what factors contributed to this success (Apanga et al., 2020).

The changing behaviors can drive sustainable development, particularly through water, sanitation, and hygiene (WASH) practices. Guided by the IBM-WASH framework and rooted in the Theory of Planned Behavior (TPB) and the Theory of Reasoned Action (TRA), the research was conducted in Gujrat, Pakistan, using stratified random sampling. Data was analyzed with SmartPLS software. The findings highlight that WASH interventions play a vital role in fostering sustainability. However, the study also reveals that the intricate social and cultural context still leaves important areas for future research (Afzal et al., 2023).

Nepal's policy efforts and past campaigns, achieving lasting behavior change around hygiene remains a challenge especially in rural places like Bheriganga Municipality in Surkhet (Bheriganga Municipality, 2023). This area has faced persistent problems with poor sanitation, frequent outbreaks of waterborne illness, and limited hygiene awareness (Wang et al., 2019). Though programs such as community-led total sanitation (CLTS), hygiene education, and latrine construction have been introduced, their effects haven't always stuck. Cultural beliefs, demographic factors, and a lack of local ownership often get in the way (Sakas et al., 2022). This study zeroes in on Hariyali Tole within Bheriganga to explore how sustainable hygiene efforts are actually playing out on the ground. It will examine how behavior is shifting, how involved the community is, and whether the changes are built to last. The goal is to generate practical insights that can strengthen WASH programs locally and nationally, supporting both Nepal's hygiene roadmap and the broader aim of achieving SDG 6.

This study aims to assess the impact of sustainable sanitation and hygiene interventions on common hygiene practices in Hariyali Tole, Bheriganga Municipality, Surkhet. Although various WASH programs have been implemented, challenges in ensuring long-term adoption and sustainability still persist. The study seeks to explore the role of integrated behavior change interventions in WASH and their contribution to community development, while also examining the impact of hygiene-related behavior changes on the daily practices of local residents. Furthermore, it will investigate the factors influencing these changes, including shifts in attitudes and social norms, as well as the effectiveness of community involvement, awareness initiatives, and educational campaigns, ultimately guiding future improvements in sanitation and hygiene efforts.

Research Methodology

This study uses a statistical, quantitative approach to explore how sanitation and hygiene behaviors have changed in Ward No. 12, Hariyali Tole, located within Bheriganga Municipality of Surkhet, Nepal. The area lies in the Karnali Province, the area is characterized by a subtropical climate, a diverse population, moderate literacy levels, and primarily low to middle-income households. A total of 60 participants, 36 women and 24 men, were purposefully selected from 120 households, all of whom had benefited from the sanitation program. Data collection involved structured

questionnaires for primary information, while secondary data were sourced from municipal records and official reports (Municipality Report, 2023). The study was conducted in 2024, assessed shifts in hygiene-related behaviors such as hand washing, bathing, and waste disposal by comparing practices before and after the program. Statistical tools were used to analyze the data and determine the extent of behavioral change and the program's overall impact.

Results

This study focused on Hariyali Tole in Bheriganga to understand how sustainable hygiene efforts are working in everyday life. It looked at behavior change, community involvement, and long-term impact to help improve WASH programs and support Nepal's hygiene goals and SDG 6. The results and analysis are presented below:

Demographic Distribution of Household Heads

The age of the household heads in the study area was categorized into five groups, which are presented in the following table:

Table 1

Age Composition of the Household Heads (Respondents)

Age	No. of Respondents	Percent
20-29 years	12	20.00
30-39 years	13	21.67
40-49 years	19	31.67
50-59 years	11	18.33
60 years and above	5	8.33
Total	**60**	**100.00**

Source: Field Survey, 2024

Table 1 shows that 20 percent of the household heads were 20-29 years of age, 20.67 percent were 30 - 39 years of age, 31.67 percent of the household heads were 40 - 49 years of age, 18.33 percent were 50-59 years and 8.33 percent of the household heads were 61 years and above of age.

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Educational Status of the Household Heads

The table below displays the educational levels of household heads in the study area.

Table 2

Educational Status of the Household Heads

Education	No. of Household Heads	Percent
Illiterate	2	3.33
Informal education	4	6.67
Primary	14	23.33
Lower secondary	19	31.67
Secondary	17	28.33
Higher education	4	6.67
Total	**60**	**100.00**

Source: Field Survey, 2024

Table 2 shows that most household heads in the study area had some level of education, with only 3.33% illiterate. While 6.67% had informal education, 83.33% had formal education ranging from primary (23.33%) to higher education (6.67%). Lower secondary (31.67%) and secondary (28.33%) levels were the most common.

Occupational Status of the Household Heads

The table below shows the household occupations in the study area.

Table 3

Occupational Status of the Household Heads

Occupation	No. of Household Heads	Percent
Agriculture	23	38.34
Business	12	20.00
Service	14	23.33
Labor	11	18.33
Total	**60**	**100.00**

Source: Field Survey, 2024

Table 3 shows that the majority of household heads were engaged in agriculture (38.34%), followed by service holders (23.33%), business (20%), and labor work (18.33%).

Sanitation before and after Sustainable Sanitation Hygiene for All (SSH4A) Program

Sanitation involves promoting hygiene by preventing contact with waste hazards through proper treatment and disposal, including wastewater management. Hazards can be physical, microbiological, biological, or chemical. Health risks come from human and animal excreta, solid waste, sewage, industrial and agricultural waste. Effective prevention includes engineering solutions, simple technologies, or behavioral changes, like hand washing. The study area's sanitation facilities are detailed below.

Source of Drinking Water

Communities obtained water from various sources such as pipeline, surface, and groundwater. They used water daily for drinking, cooking, hygiene, and other needs, including agriculture.

Table 4

Sources of Drinking Water before and after the program

Source of Drinking Water	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Pipe water (public tap)	37	61.67	56	93.33
Open stream water	19	31.67	0	0.00
Personal tap water	4	6.66	4	6.67
Total	**60**	**100.00**	60	**100.00**

Source: Field Survey, 2024

Table 4 shows a significant improvement in water access, with all households now using piped water after the program, compared to 61.67% before. This indicates the program's success in ensuring safe drinking water for the entire community.

Facilities of the Toilet

The facilities of the toilet are available in the study area before and after the implementation program.

Table 5

Facilities of the Toilet before and after the Program

Facilities of the Toilet	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Available	41	68.33	60	100.00
Not available	19	31.67	-	-
Total	**60**	**100.00**	60	**100.00**

Source: Field Survey, 2024

Table 5 shows that toilet coverage increased from 68.33% to 100% after SNV's sustainable sanitation and hygiene program, indicating its effectiveness in improving sanitation access.

Hygiene Use of Toilets

Following the availability of toilets, residents of the study area benefited significantly. Household heads were asked about regular toilet use, with their responses.

Table 6

Hygiene Use of Toilets

Use of Toilets	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Yes	20	33.33	60	100.00
No	40	66.67	0	00.00
Total	**60**	**100.00**	**0**	**100.00**

Source: Field Survey, 2024

Table 6 indicates a positive behavior change, with toilet use rising from 33.33% to 100% after the program, showing improved hygiene practices among all households.

Sharing of the Toilets of the Household Heads

The household heads were asked whether they shared their toilets with other households, and the responses obtained from them.

Table 7

Sharing of the Toilets of the Household Heads

Use of Toilets	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Yes	21	35.00	-	-
No	35	58.33	60	100.00
Sometimes	4	6.67	-	-
Total	**60**	**100.00**	60	**100.00**

Source: Field Survey, 2024

Table 7 shows that toilet sharing, previously practiced by 35% of households, and was eliminated after the program, indicating improved access to private sanitation.

Availability of Water in the Toilet

Household heads were asked if water was always available in the toilet, and their responses were recorded.

Table 8

Availability of Water in the Toilet

Response	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Yes (sometimes)	15	25.00	2	3.33
Yes (always)	36	60.00	55	91.67
No (take from outside)	9	15.00	3	5.00
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

Table 8 shows improved water availability in toilets after the program, with 91.67% consistently having water. However, 8.33% still lack reliable access, highlighting the need for further improvement.

Children's use of toilets as reported by the heads of households

Children should develop the habit of using toilets for defecation, but those under three or four years old can't. They should defecate in a safe location away from home. The table shows respondents before and after the program.

Table 9

Use of Toilets by Children following Household Heads

Response	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Yes	27	45.00	58	96.67
No	22	36.67	-	-
Sometimes	11	18.33	2	3.33
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

Table 9 shows a 51% increase in toilet use among children after the program, with 96.67% consistently using toilets compared to only 45% before, indicating a significant improvement in hygiene behavior.

Sanitation Behavior

The different sanitation conditions as observed in the study area are presented.

Washing of Vegetables before Cooking as Practiced by Household Heads

Vegetables need to be thoroughly washed before cooking. Household heads were asked if they washed vegetables before cooking, and their responses are presented.

Table 10

Washing of Vegetables before Cooking as Practiced by Household Heads

Response	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Yes	53	88.33	59	98.33
Sometimes	6	10.00	1	1.67
No	1	1.67	-	
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

Table 10 shows improved hygiene practices, with vegetable washing increasing from 88.33% to 98.33% after the program, and only 1.67% now doing so occasionally.

Cleaning Pots before Filling Water as Practiced by Household Heads

Pots need to be thoroughly cleaned before water is added. When asked if they had cleaned the water pots before adding water, the chiefs of the households gave the following:

Table 11

Cleaning Pots before Filling Water as Practiced by Household Heads

Response	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Yes (always)	45	75.00	58	96.67
No	8	13.33	-	-
Sometimes	7	11.67	2	3.33
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

The table shows a significant improvement in water pot hygiene, with consistent cleaning rising from 75% to 96.67% after the program, reflecting enhanced sanitation practices in the area.

Tidying up the House and Yard Practiced by Household Heads

The cleanliness of houses and courtyards is essential to prevent water and dust-borne diseases. Household heads were asked about their cleaning habits, and their responses are summarized:

Table 12

Tidying up the house and yard is practiced by Household Heads

Response	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Yes (always)	44	73.33	58	96.68
No	7	11.67	1	1.66
Sometimes	9	15.00	1	1.66
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

Table 12 shows daily home cleaning increased from 73.33% to 96.68% after the program, indicating a notable improvement in household hygiene practices.

Habit of Taking Bath Practiced by Household Heads

Bathing is essential for maintaining a healthy body and mind. The bathing practices of the household members in the study area are outlined:

Table 13

Habit of Taking Bath Practiced by Household Heads

Response	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Daily	12	20.00	18	30.00
Once in two days	14	23.33	16	26.67
Once in three days	20	33.33	23	38.33
Once a week	14	23.33	3	5.00
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

Table 13 shows improved bathing habits after the program, with daily bathing increasing from 20% to 30% and weekly bathing decreasing from 23.33% to 5%, reflecting the program's positive impact on sanitation practices.

Washing of Clothes

Clothes should be washed regularly. Washing clothes keeps away germs and diseases. The habit of washing clothes by the household members in the study area is shown in the table given:

Table 14

Habit of Washing Clothes by Household Heads

Response	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Daily	12	20.00	15	25.00
Once in two days	13	21.67	14	23.33
Once in three days	16	26.66	16	26.67
When dirty	19	31.67	15	25.00
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

Table 14 shows that daily clothes washing increased from 20% to 25% after the program, indicating improved clothing hygiene practices among households in the study area.

Materials for Hand-washing after Meals and Defecation

The materials which were used to wash hands after meals and after defecation are shown in the table given:

Table 15

Materials for Hand-washing after Meals and Defecation

Materials	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Soap and water	14	23.00	56	93.33
Surf and water	16	27.00	4	6.67
Ash and water	13	22.00	0	0.00
Soil and water	17	28.00	0	0.00
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

Table 15 shows a major improvement in hand-washing practices, with soap and water use rising from 23% to 93.33% after the program, while the use of ash and soil was completely eliminated.

Disposal of Waste

Household waste must be disposed of properly to avoid various issues. The waste disposal methods used in the study area are outlined below:

Table 16

Disposal of Waste

Waste Disposal	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Bury	1	1.67	14	23.33
Burn	5	8.33	-	-
Throw in bucket	1	1.67	46	76.67
Throw in stream	53	88.33	-	-
Total	**60**	**100.00**	**60**	**100.00**

Source: Field Survey, 2024

Table 16 shows a complete shift in waste disposal behavior after the program, with open dumping eliminated and most households now using buckets or pits (76.67%) or burying waste (23.33%). Continued community guidance is planned to maintain proper practices.

Changes in Sanitation Behavior after SSH4A Program

SNV has been active in water and sanitation in the study area, providing drinking water and toilets. Household heads were surveyed on SSH4A's impact on the community, with their responses detailed in the table:

Table 17

Changes after the SSH4A Program

Impacts	Before the Program		After the Program	
	No. of Households	Percent	No. of Households	Percent
Drinking water facilities	41	68.33	60	100.00
Toilet facilities	41	68.33	60	100.00
Washing vegetables	53	88.33	59	98.33
Cleaning pots	45	75.00	58	96.67
Cleaning of house and courtyard	44	73.33	58	96.67
Bathing habits	46	76.67	57	95.00
Hand washing habits with soap	30	50.00	60	100.00
Disposal of waste	2	3.33	60	100.00

Source: Field Survey, 2024 **Multiple Responses*

Table 17 highlights the significant improvements achieved by the Sustainable Sanitation and Hygiene for All program, with full access to piped water and toilets, and major increases in vegetable washing, pot cleaning, home cleaning, bathing, hand washing with soap, and proper waste disposal demonstrating substantial progress in community sanitation and hygiene practice.

Discussion

This study takes a close look at Hariyali Tole in Bheriganga to understand how sustainable sanitation and hygiene efforts are working at the grassroots level. It focuses on observing changes in behavior, how the community gets involved, and the lasting

effects of these initiatives. The goal is to help improve Water, Sanitation, and Hygiene (WASH) programs in line with Nepal's national hygiene targets and the global Sustainable Development Goal 6, which promotes clean water and sanitation for all (Dhital et al., 2022).

The findings demonstrate that the Sustainable Sanitation and Hygiene for All (SSH4A) program had a significant and positive impact on rural household hygiene practices. Before the intervention, many residents struggled with irregular hand washing, open defecation, poor waste disposal practices, and reliance on unsafe water sources. After the program was implemented, there was a visible shift in behavior: households reported regular hand washing with soap, consistent use of improved toilet facilities, and safer water handling and waste management practices (Akter & Ali, 2014).

A critical factor contributing to this success was the integration of behavior-centered approaches. Merely providing facilities and infrastructure is not sufficient to ensure lasting change. The program's emphasis on education, awareness, and active community involvement created an enabling environment where positive hygiene behaviors were promoted, normalized, and sustained change (Gine-Garriga et al., 2021). For instance, local residents increasingly adopted hand washing with soap and discontinued harmful practices such as waste disposal in open water sources. These shifts suggest a broader transformation in community attitudes and social norms around hygiene and sanitation.

Moreover, the program's participatory approach, engaging households, local leaders, and schools, played a significant role in reinforcing new practices. The community's ownership of the interventions and their active role in monitoring and maintaining facilities likely enhanced sustainability. Importantly, the behavior changes observed were not isolated but interconnected; improved toilet use also encouraged better water safety and hand washing practices, creating a holistic shift in household hygiene behavior (McMichael & Robinson, 2016).

These positive outcomes, certain challenges persist; sustaining behavior change requires ongoing support, regular follow-up, and consistent monitoring to prevent the risk of regression (Woli, 2023). To ensure long-term success, future initiatives should build upon the progress made by reinforcing local capacities, fostering community

leadership, and promoting peer-to-peer learning as a means of maintaining and scaling improved hygiene practices. The SSH4A initiative serves as a replicable model for similar rural settings, demonstrating that behavior-focused, inclusive, and locally tailored WASH interventions can yield sustainable public health benefits and contribute meaningfully to national sanitation goals.

Conclusion

This study shows that behavior change programs can really make a difference in improving sanitation and hygiene in the areas studied. Today, most households have water-tight toilets that are regularly used, even by children who are encouraged to practice good hygiene. Access to piped water is common, and hand washing with soap has become a regular habit for many, though there are still some gaps in knowledge and facilities. The program has raised awareness, especially in urban areas where conditions tend to be better, but there's still a need to get more community members involved and to standardize hygiene practices. When the community takes part, sanitation coverage and upkeep improve, showing stronger local capacity. To keep making progress, it's important to regularly check how well these behavior change efforts are working. Moving forward, it would help to evaluate community-focused strategies, connect more households to water and sewer systems when possible, promote practical and sustainable sanitation habits, and boost food hygiene practices. Overall, the study highlights how crucial behavior change is for improving sanitation and hygiene in communities.

Corresponding Author

Lokendra Woli

Email: lokendra.woli@mu.edu.np

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