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Research Article

An Impact Assessment of Water Supply, Sanitation and Hygiene at Ichchhakamana Rural Municipality, Chitwan, Nepal

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Abstract

Water Supply, Sanitation and Hygiene (WASH) is the part of every human being and it impacts in multi dimensions. Mixed approach employed both quantitative and qualitative study tools. WASH has impacted multi dimensions; improved WASH Situation (98.7%), increased access to water supply (96.5%), reduced in waterborne diseases (97%), enhanced knowledge of sanitation practices (98.7%), ownership built to take responsibility for the maintenance of services (97%), strengthened roles for women in leadership and management (85.3%), increased water availability also improved menstrual hygiene management (MHM), reduced uterus-related diseases, and enhanced the privacy and dignity of women, girls, and individuals with disabilities, ensured equitable access, reducing burdens on women and girls and promoting socially inclusive development. To ensure the long-term sustainability of these outcomes, the study recommends establishing self-sustaining operation and maintenance funds, integrating climate-resilient strategies, and implementing targeted campaigns.

Keywords: WASH; Improved; Increased; Accessed and Facilities

Introduction

Nepal is known as Mount Everest and naturally rich country. Constitution of Nepal [1] has established the federal system with seven provinces and 753 local governments within 77 districts. Out of 77 districts, it is one of the districts of Bagmati Province. Chitwan has 179,745 households with a population of 719,859 [2]. The district population is a mix of indigenous groups, such as the Tharu, Danuwar, and Darai, and a diverse social composition, with major ethnic groups including Brahmins, Chhetries, Newars, Magars, and Gurungs. Chitwan has seven local governments which encompasses one Metropolitan City, five Municipality and one Rural Municipality (Ichchhakamana). Ichchhakamana Rural Municipality has 6,185 households with a population of 27, 643 (NSO, 2021). The study area was Bhalumare Jhula Water Supply and Sanitation Project, Ichchhakamana Rural Municipality, Chitwan, Bagmati Province. The project was commenced in 2009 and completed in 2013 serving 565 households with a population of 2,525. It indicates that a single water supply and sanitation project has been serving 9.13% population of the rural municipality.

Water Supply, Sanitation and Hygiene (WASH) sector in Nepal has been improving and Nepal census report (NSO, 2021) shows that tap/piped water (inside and outside household premises combined) is the main source of drinking water for 68% of the total households. Other main sources of drinking water for households are tube well/hand pump 4.8%, jar/bottled water 16.9%, spout 4.0%, covered well/kuwa 2.3%, uncovered well/kuwa 2.7% and river/stream 0.2% of the total households. 98.8 percent of the households use one or other type of toilet facility, while 1.2 percent of them do not have access to any toilet facility. Similarly, 17.2 percent of the total households did not have access to any toilet facility.

Objectives

- To evaluate the impacts on Women, Dalit, Disabled, Marginalized Community, Backward and Distressed people's Education, Health
- To evaluate the sustainability of the outcomes of the projects and document the key learnings and recommendations

Literature Review

Poor WASH practices contribute to a substantial disease burden, which, in turn, has a detrimental effect on the socio-economic productivity of individuals [3]. Unsafe behaviors, including open

defecation and the consumption of unsafe drinking water, are leading causes of preventable mortality and morbidity [4,5]. The direct link between unhealthy WASH practices and the burden of infectious and parasitic diseases significantly impedes sustainable community development (Afzal., *et al*. 2022). Studies have revealed that interventions focused on behavior change in WASH are pivotal for fostering sustainable community development [6]. Integrated community-level interventions are crucial for improving individual knowledge and practices and for modifying long-held habits [7,8]. Without a thorough understanding of these determinants, efforts to implement and sustain effective behavior change initiatives are compromised, thereby hindering progress toward sustainable development goals.

In 1990, before Nepal introduced its National Sanitation Policy in 1994, access to basic services was very limited. At that time, only about 46% of the population could use improved water sources, and just 6% had access to sanitation facilities. By 2016, the situation had changed greatly. Census data showed that 87% of households had access to safe drinking water, while 87.3% had access to sanitation. This progress was mainly the result of continuous efforts by the Government of Nepal. Over the past two decades, the government has introduced and enforced various WASH (Water, Sanitation and Hygiene) policies, guidelines, and laws to improve the country's water supply and sanitation systems.

The United Nations estimates that over 844 million people globally still lack access to basic drinking water, and more than 2.3 billion people are without basic sanitation services. Each year, millions of girls are forced to drop out of school due to menstrual hygiene issues. Furthermore, hygiene-related diseases, such as diarrhea and pneumonia, remain the leading cause of death for children under five years old. In fact, more children die from WASH-related causes than from malaria, AIDS, and tuberculosis combined.

The need for universal access to WASH services is undeniable. Research has shown that access to safe drinking water can decrease childhood illnesses by up to 40% or more, while practicing proper handwashing can cut child mortality rates by over 50%. School-based WASH initiatives can also boost attendance by more than 60%. Additionally, for every $1 invested in WASH programs, up to $46 generated in economic benefits through enhanced productivity and greater workforce participation [9].

World community signed in September 2015 ('Agenda 2030'), they agreed a specific commitment to "Ensure availability and sustainable management of water and sanitation for all". SDG 6 calls for a worldwide commitment to ensure universal access to safe, equitable, and affordable drinking water and sanitation by the year 2030.

SDG 6: Indicators	Description
6.1 Safely Managed Drinking Water	Facilities that are situated on-site, accessible when required, and protected from contamination.
6.2 Safely Managed Sanitation	A private, improved facility where fecal waste is either safely managed on-site or transported for off-site treatment, along with a handwashing station equipped with soap and water.

Table 1

Source: (WHO/UNICEF, 2015).

To Achieve the SDG Goals: 6, member countries have set own target and periodic progress has been updating. According to GLAAS 2021/2022 country survey, Out of 73 countries 33 countries (on track), 8 countries (almost on track) and 32 countries (acceleration needed) are classified on drinking water targets. Similarly, out of 64 countries, 16 countries (on track), 8 countries (almost on track) and 40 countries (acceleration needed) are classified on sanitation targets. The target vs progress on drinking water seems less than 50% is on track and progress on Sanitation seems 25% on track. This reflects the challenges to achieve the SDG Goal 6.

The success of Water, Sanitation, and Hygiene (WASH) initiatives is profoundly influenced by behavioral determinants, rather than being solely dependent on the provision of infrastructure. Research has demonstrated that a significant portion of households may be unaware of their water quality, but those who understand the link between contaminated water and potential health and economic consequences are considerably more inclined to invest in water treatment solutions and seek out safer water sources (UNICEF, 2022). This finding highlights the critical importance of public education and awareness campaigns in fostering behavioral change [10]. Ultimately, the willingness of urban populations to demand, acquire, and pay for quality WASH services—including safe drinking water, managed sanitation, and proper solid waste disposal is a key factor for long-term sustainability and effectiveness of these programmes, leading to substantial improvements in public health and environmental outcomes.

Several researches confirm a strong link between poor WASH and the transmission of infectious diseases, notably diarrheal diseases. Improved WASH, especially handwashing with soap, can significantly reduce the incidence of diarrhea, a leading cause of child mortality [11]. Safe water and effective sanitation interrupt the fecal-oral disease transmission pathway (WHO, 2019). The benefits also extend to other diseases, including soil-transmitted helminths and trachoma, with WASH being a vital component of long-term control strategies [12].

Pride in one's community or household status can also be a powerful incentive for adopting new practices. The desire for social acceptance and the influence of community-wide social norms are often stronger drivers of change than individual health benefits alone (Ulster University, 2019). Successful behavior change is often a collective process. Community-based approaches that foster a sense of shared ownership and collaboration have been shown to be more effective and sustainable than top-down interventions (IWA Publishing, 2021). When communities are involved in the planning, implementation, and maintenance of WASH facilities, they take collective responsibility for their use and upkeep.

Human behavior is heavily influenced by social norms what people perceive as acceptable or expected behavior within their community. The desire for social status, respect, or acceptance from peers can be a strong incentive to adopt new practices. For instance, some studies have shown that the use of a latrine is associated with social prestige and a sign of modernity, which can be a more compelling motivator than health benefits (Ulster University, 2019). Conversely, exclusionary social norms can be a major barrier, preventing marginalized groups from accessing and using WASH [13].

Methods and Materials

The methodology comprised a 'mixed method' approach that draws on both quantitative and qualitative methods [14]. The study used document review, household survey, key information interviews, focus group discussions followed by observations.

Study tools and techniques

The quantitative and qualitative data collection tools and techniques used so that comprehensive information is collected and verified with triangulation.

The secondary information was gathered and analyzed reviewing relevant literature, all the project documents, and policy and program documents issued by governments. The data and information collected through survey questionnaire/checklists as well as gleaned from project database, document, monitoring reports, and annual reports, however the primary data was collected through following tools & techniques;

The sample household was selected by statistical sample size determination formula for the representation from heterogeneous population. Focus Group Discussion participants were ensured from men and women where comprehensive and extensive information are collected to measure the impacts of the project intervention. Key Informant Interview (KII) participants were represented from Physical Infrastructure Ministry and its Offices, Ministry of Water Supply, Energy and Irrigation and its Divisions, Local Government/ Municipal Authorities, Water User Committee and relevant stakeholders. Observation tool was used to collect the information by observing at communities where project interventions are in place. Similarly, behaviour change related information was collected through direct observation.

Estimation of sample size

Stratified sampling method was used to collect the quantitative information from the households. The sample size for quantitative survey was determined by using Cochran (1977) formula for finite population. This is expressed as;

$$n = \frac{N.n_0}{N + (n_0 - 1)}$$

Where,

(n) = the required sample size for the finite population

(N) = the population size (565 HHs)

(n_0) = the sample size calculated for an infinite population or initial sample size

(Z) = the Z-score corresponding to the desired confidence level (e.g., 1.96 for 95% confidence)

(p) = the estimated proportion of the population that has the characteristic of interest (50%)

(e) = the desired margin of error (5%)

$$n_0 = \frac{z^2\, p\, (1-p)}{e^2}$$

$$n_0 = \frac{(1.96)^2\, 0.5\, (1-0.5)}{(0.05)^2}$$

$$n_0 = 384.16$$

Substituting the value of n_0

$n = \frac{565 \times 384.16}{565 + (384.16 - 1)}$ $n = 229$ OR 230

A total of 230 household sample size was determined for the quantitative survey. A qualitative sample size was determined adopting the theory of saturation. Hence, KII (6), FGD (3) and Observation (1) were included in the qualitative survey.

Data analysis

The qualitative data was analyzed using transcription analysis, coding, text interpretation, recursive abstraction, content analysis, and discourse analysis, all facilitated by qualitative analysis software. The quantitative data was analyzed for quantifying the qualitative information, measuring the status (value, percentage, count etc.) and projections by using statistical software; SPSS.

Results and Discussions

The majority, 98.7**%** of respondents reported that their overall WASH situation improved as a result of the project. This near-universal positive response affirms that the intervention was not only well-targeted but also effective in enhancing access, usability, and quality of WASH services.

Figure 1

A 97% reduction in waterborne diseases demonstrates the project's significant public health impact. This dramatic improvement validates the focus on water quality and sanitation access. The remaining 3% persistence of diseases may indicate areas needing additional hygiene promotion.

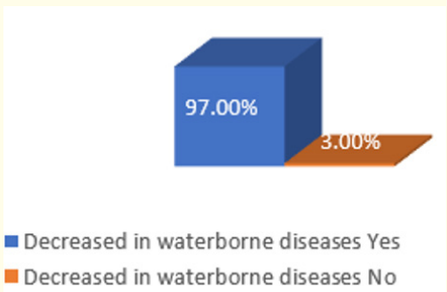

Figure 2

96.5% of respondents stated that access to water supply for their household had improved due to the project. This indicates that the project successfully addressed one of the most basic and critical needs—access to safe and sufficient water. Improved access likely translated into reduced water-fetching time, particularly for women and children, and better hygiene practices within homes. A significant 97% of participants observed a reduction in waterborne diseases in their community following the implementation of the project. This is a strong indicator of the public health impact of the intervention, reflecting not only improved infrastructure and water quality but also better hygiene behavior and disease prevention measures.

The project has also greatly contributed to increasing awareness and knowledge, with 98.7% of respondents reporting an improvement in their understanding of sanitation practices. This reflects the effectiveness of hygiene education and awareness-raising components of the intervention. The 98.7% improvement in sanitation knowledge reflects effective behavior change communication. This remarkable awareness shift creates a strong foundation for sustained good practices.

Questions	Response	(n)	Percent (%)
Has your knowledge of sanitation practices improved?	Yes	228	98.7%
	No	3	1.3%
Have there been improvements in community sanitation infrastructure?	Yes	230	99.6%
	No	1	0.4%

Table 2

Interestingly, 85.3% of respondents noted that women's roles were strengthened as a result of the project. This indicates that the intervention successfully created opportunities for women to participate in leadership, decision-making, and technical aspects of water and sanitation management. Such empowerment contributes to gender equity, enhances sustainability, and strengthens community resilience.

Evaluation Question	Response	(n)	Percent (%)
Were you aware of the potential benefits of the project?	Yes	214	92.6%
	No	17	7.4%
How has the project impacted women's roles in WASH management?	Empowered	197	85.3%
	No changes	34	14.7%

Table 3

A total of 97.0% of respondents stated that beneficiaries and communities have taken responsibility for running and maintaining the WASH services. The strong sense of ownership is realized for sustainability. Only a small minority (3.0%) reported not unaware on their responsibility for sustained WASH.

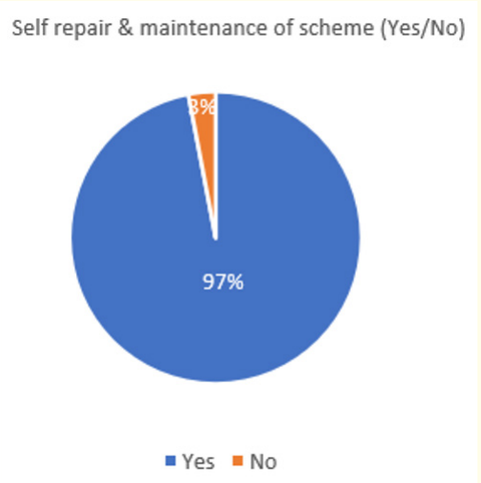

Figure 3

For women and girls, the provision of private, clean, and functional latrines, coupled with increased water availability, has significantly improved Menstrual Hygiene Management (MHM). This direct impact on gender equality ensures more hygienic and dignified menstrual practices, fostering greater comfort, confidence, and ability to participate fully in daily life without interruption or shame, particularly benefiting adolescent girls and women from marginalized communities who previously lacked such facilities.

The enhanced sanitation and hygiene environment has contributed to a perceived reduction in uterus-related diseases among women, as reported in FGDs. By minimizing exposure to pathogens through improved latrines and consistent handwashing, the project has directly improved reproductive health outcomes. This impact is crucial for gender equality, as healthier women are better positioned to engage in productive activities and improve their overall well-being, especially benefiting those from socially disadvantaged backgrounds who have limited access to preventative healthcare.

A paramount outcome emphasized in FGDs is the increased privacy and dignity for all community members, particularly for women, girls, and individuals with disabilities. The shift from open defecation to private household latrines has provided secure spaces for intimate needs, reducing vulnerability, shame, and the risk of harassment. For persons with disabilities, while specific accessibility features for all latrines were not detailed, the mere provision of a dedicated, private space significantly enhances their dignity and independence in managing personal hygiene, fostering greater social inclusion.

The project has significantly reduced the daily burden on women and girls, traditionally bear the primary responsibility for water collection and caring for the sick. It was found the reduced health anxiety contribute directly to enhanced well-being and create opportunities for socially inclusive development, allowing individuals from all backgrounds, including the poor and marginalized, to pursue education, economic activities, or community participation, thereby improving their overall quality of life.

The project actively promoted social inclusion by implementing strategies, such as subsidies for vulnerable households, to ensure equitable access to sanitation facilities. This deliberate approach addressed financial barriers that might otherwise have excluded the economically disadvantaged and marginalized groups, thereby ensuring that the benefits of improved privacy, dignity, and reduced health burdens extended to the entire community, upholding the principles of GEDSI.

Conclusions

The WASH project has been highly effective, with a majority of respondents reporting an improved overall WASH situation (98.7%), increased access to water supply (96.5%), and enhanced knowledge of sanitation practices (98.7%). The intervention also had a significant public health impact, with a 97% reduction in waterborne diseases. Beyond infrastructure and health, the project fostered increased community ownership (97.0%), with beneficiaries taking responsibility for maintaining services. Furthermore, the project empowered women, as 85.3% of respondents noted strengthened roles for women in leadership and management. The improved sanitation environment also led to a reduction in uterus-related diseases among women and enhanced menstrual hygiene management (MHM). Overall, the project successfully reduced the daily burden on women and girls, freeing up valuable time and contributing to their well-being.

To ensure the long-term success of WASH services, it is essential to establish self-sustaining operation and maintenance (O&M) funds through appropriate tariff structures and comprehensive financial training for water user committees. Furthermore, strategies should be developed to foster deeper community ownership, empowering water user committees with the authority and resources needed for O&M.

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