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# Impact of nurse-led sanitation drives on diarrheal disease reduction in slum areas

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**Abstract**
Diarrheal diseases remain a leading cause of morbidity and mortality in low-income urban slum populations, particularly among children under five. While infrastructure improvements are essential, behavioral and community-driven interventions-especially those led by nurses have shown significant promise in reducing disease burden. This paper explores the impact of nurse-led sanitation drives in slum areas, drawing on recent studies, public health data, and case examples from India and other low- and middle-income countries. We argue that nurses, as trusted community health agents, play a pivotal role in promoting hygiene practices, improving sanitation behaviors, and reducing diarrheal incidence through education, advocacy, and mobilization.

**Keywords:** Diarrheal diseases, education, advocacy, mobilization, recent studies, public health data

## 1. Introduction

### 1.1 Background

Diarrheal diseases remain one of the most significant causes of morbidity and mortality globally, especially among children under five years of age. An estimated 1.7 billion cases of diarrhea are reported annually worldwide, resulting in approximately 525,000 deaths of children under five (WHO, 2017) [1]. Despite global improvements in water and sanitation infrastructure, the disease burden continues to weigh heavily on low- and middle-income countries (LMICs), particularly in densely populated urban slums.

In India, diarrhea continues to be a major public health issue, with a large portion of the disease burden concentrated in urban slums where poor sanitation and hygiene conditions prevail. According to the National Family Health Survey (NFHS-5), conducted in 2019-2020, 7.3% of children under five were reported to have experienced diarrhea in the preceding two weeks. Localized studies further illustrate the gravity of the situation: in Delhi's urban slums, the prevalence of diarrhea among children under five was reported as high as 14.8% (Kumar *et al.*, 2022) [3]. Similarly, slums in Mumbai showed an annual diarrhea incidence rate of 614 cases per 1,000 persons, with children and the elderly disproportionately affected (Gupta *et al.*, 2021) [4]. These statistics highlight the critical need for community-based health interventions that go beyond infrastructure to address behavior and awareness.

### 1.2 Sanitation and Diarrheal Diseases

The close link between diarrheal disease transmission and water, sanitation, and hygiene (WASH) conditions is well-documented. The World Health Organization has stated that unsafe drinking water, inadequate sanitation, and poor hygiene contribute to nearly 842,000 deaths annually from diarrheal illnesses alone (WHO, 2017) [1]. Improved sanitation facilities-such as the availability of latrines and proper waste management-are associated with a 36% reduction in diarrheal risk, while handwashing with soap can reduce risk by up to 47% (Freeman *et al.*, 2014) [5]. Although India has made commendable strides in sanitation through initiatives like the Swachh Bharat Mission (SBM), many urban slums continue to lack basic sanitation facilities. While SBM led to the construction of over 100 million toilets and declared many areas "Open Defecation Free" (ODF), independent evaluations have noted that actual usage rates and maintenance of facilities vary considerably, especially in slum clusters where awareness and behavior change are limited (Jain *et al.*, 2020) [6].

Consequently, diarrheal outbreaks in these communities persist despite improved infrastructure.

### 1.3 Role of nurses in sanitation drives

Nurses are a critical, yet underutilized, component of public health efforts in urban poor settings. As trusted healthcare providers embedded in communities, nurses are uniquely positioned to implement Behavior Change Communication (BCC), conduct hygiene education, monitor health conditions, and facilitate local engagement in sanitation programs. Their proximity to community members and ability to engage in culturally sensitive dialogue make them ideal leaders for sanitation awareness campaigns and health promotion activities.

Studies from various LMICs have demonstrated the efficacy of nurse-led interventions in improving WASH outcomes. For example, a quasi-experimental study in Nigeria showed that nurse-led education programs significantly improved caregivers' knowledge and practices regarding childhood diarrhea prevention and treatment (Okafor *et al*., 2021) [7]. Furthermore, nurse facilitators have played instrumental roles in Community-Led Total Sanitation (CLTS) campaigns, where community behavior rather than hardware infrastructure is the primary focus. These campaigns emphasize eliminating open defecation through community mobilization and have been particularly successful in areas where nurses or community health workers guide the initiative (Kar & Chambers, 2008) [8].

### 1.4 Rationale for the study

Despite the known associations between sanitation and diarrheal disease, and the recognized potential of nurses in community health interventions, there is a significant gap in empirical research specifically evaluating the impact of nurse-led sanitation drives in slum areas. Most studies on sanitation and hygiene focus either on infrastructure development or on broad health education campaigns without isolating the contributions made by nurses.

Given the persistent high burden of diarrhea in Indian urban slums and the increasing decentralization of healthcare delivery, it becomes essential to document and evaluate the effectiveness of targeted nurse-led interventions. Understanding the dynamics of these sanitation drives and their tangible health outcomes can inform future health policies, community health nurse training, and the integration of such programs into national health frameworks.

### 1.5 Objectives

This study aims to fill the existing research gap by evaluating the impact of nurse-led sanitation drives on reducing diarrheal disease in urban slum settings. The objectives are as follows:

1. To assess the reduction in diarrheal incidence following the implementation of nurse-led sanitation campaigns in selected slum communities.
2. To evaluate the changes in hygiene behavior and sanitation practices among slum dwellers post-intervention.
3. To identify implementation challenges, community reception, and sustainability factors associated with nurse-led sanitation efforts.

## 2. Methods

This paper synthesizes findings from peer-reviewed studies, public health reports, and case studies focusing on nurse-led interventions and sanitation programs in slum settings. Key sources include systematic reviews on WASH (Water, Sanitation, and Hygiene) interventions, studies on sanitation practices in Indian slums, and evaluations of nurse-led health education programs.

## 3. Results

### 3.1 Overview of Interventions Assessed

This section presents a synthesis of outcomes observed across multiple nurse-led sanitation interventions implemented in urban slum settings in India and comparable low- and middle-income countries. The findings are derived from peer-reviewed studies, national surveys, and NGO project reports. Focus areas include reduction in diarrheal incidence, improvements in hand hygiene practices, adoption of safe water storage, and reduction in open defecation behavior.

The majority of the reviewed interventions involved nurses leading community health education sessions, door-to-door hygiene promotion, school hygiene programs, and facilitation of safe water use and sanitation hardware maintenance. Many were integrated into government or NGO-funded programs such as the Urban Health Mission, community health nursing outreach initiatives, and CLTS campaigns.

### 3.2 Reduction in Diarrheal Disease Incidence

A consistent finding across all studies reviewed is a significant decline in diarrheal disease rates following the implementation of nurse-led sanitation drives. In a 2022 intervention conducted in the Govandi slum of Mumbai, a six-month campaign led by community health nurses (CHNs) targeting 500 households resulted in a 32% decrease in reported diarrhea cases among children under five, measured by local anganwadi health records (Mehta *et al*., 2023) [12].

Similarly, a nurse-led hygiene promotion project in the Dharavi slum, supported by the Municipal Corporation of Greater Mumbai, demonstrated a 28.7% reduction in diarrhea episodes over a period of eight months (Chopra *et al*., 2022) [13]. These reductions were attributed to repeated community sensitization meetings, consistent nurse presence for monitoring and feedback, and enhanced hand hygiene education.

**A tabular comparison of results from multiple interventions is provided below:**

**Table 1:** Comparative results of nurse-led sanitation drives in Indian urban slums

| Location | Duration | Population Covered | Reported Reduction in Diarrhea (%) | Key Nurse Activities |
|---|---|---|---|---|
| Govandi, Mumbai | 6 months | 500 households | 32% | Health education, home visits, water safety |
| Dharavi, Mumbai | 8 months | 800 households | 28.7% | Door-to-door campaigns, school health talks |
| Bhalswa, Delhi | 4 months | 200 households | 24% | Distribution of ORS, soap, hygiene posters |
| Hyderabad slum belt | 9 months | 1,200 individuals | 35.2% | Nurse workshops, handwashing station monitoring |

**Source:** Adapted from local NGO and public health department reports (2022-2023)

### 3.3 Improvement in Hygiene Practices

Another key outcome observed was a substantial improvement in hygiene practices among slum residents. A longitudinal observational study in Chennai's Kodungaiyur slum reported that nurse-led sensitization led to a 49% increase in the frequency of handwashing before meals and after defecation. Baseline surveys indicated that only 37% of residents practiced regular handwashing with soap; this increased to 86% post-intervention (Nair *et al*., 2022) [14].

Similarly, in Kolkata's Topsia slum, nurse-conducted community workshops resulted in 72% of participants adopting safe water storage practices (e.g., covering water containers and using ladles to draw water). These behavioral changes directly correlated with reduced gastrointestinal complaints during post-intervention follow-ups.

### 3.4 Influence on Sanitation Infrastructure Utilization

The presence and efforts of community nurses also positively influenced the use and maintenance of existing sanitation facilities. In a cross-sectional study in Patna's Mithapur area, 67% of the households initially avoided using community toilets due to lack of awareness, perceived hygiene risks, and social taboos. After structured awareness sessions led by local health nurses, 52% of those households began regular use of the facilities within three months (Verma *et al*., 2023) [15].

Moreover, nurse-led drives helped reduce the prevalence of open defecation, particularly among children and elderly members of households. Reports from Bhopal's slums noted a 40% decrease in open defecation practices after six months of consistent field-level nurse engagement (Sharma *et al*., 2023) [16].

### 3.5 Community Perception and Participation

Qualitative data from feedback surveys and focus group discussions highlight increased trust and participation from community members when health information is delivered by trained nurses. In many slum clusters, residents viewed nurses not just as health providers but also as approachable educators and sanitation advocates. Community leaders in Bengaluru's Ejipura slum emphasized that regular interactions with the same nurse fostered accountability and helped reinforce hygiene messages. Furthermore, the involvement of female nurses was particularly effective in breaking communication barriers in conservative households, thus ensuring message penetration to women and adolescent girls-primary caregivers in most families. School-based hygiene education led by nurses also yielded promising outcomes. In a study conducted across five government schools in Lucknow slums, weekly nurse-led sessions improved student knowledge on sanitation, hand hygiene, and waterborne diseases by 63%, based on pre- and post-session quiz scores (Srivastava *et al*., 2022) [17]. Teachers and parents reported a noticeable decline in absenteeism due to gastrointestinal illness in the same period. Despite overall success, some interventions faced challenges, including high nurse turnover, resistance from male members of households, language barriers in migrant communities, and infrastructural constraints (e.g., lack of soap or water at handwashing stations). Programs with insufficient follow-up after the initial drive also reported a rebound in unsafe practices within 3-4 months, indicating the need for sustained nurse engagement.

## Discussion

The findings presented in this study confirm that nurse-led sanitation drives are highly effective in reducing the incidence of diarrheal diseases in slum areas. Multiple interventions, across geographically and socioeconomically diverse slum communities, demonstrated diarrheal reductions ranging from 24% to over 35%, within periods as short as four to nine months. These reductions are consistent with earlier estimates provided by the World Health Organization, which link improved sanitation to a 30-40% decrease in diarrheal morbidity (WHO, 2017) [1].

The interventions reviewed did not rely solely on infrastructure development but were predominantly behavior-focused, community-oriented, and reliant on the sustained presence of trained nurses. Nurses' ability to deliver health education in culturally resonant and repetitive ways played a major role in converting knowledge into practice. For instance, repeated home visits and face-to-face dialogue allowed nurses to reinforce messages, build rapport with residents, and track behavior change. These are critical elements of successful community health education, as evidenced by programs in Southeast Asia and sub-Saharan Africa with similar models (UNICEF, 2022; WaterAid, 2020) [10, 11].

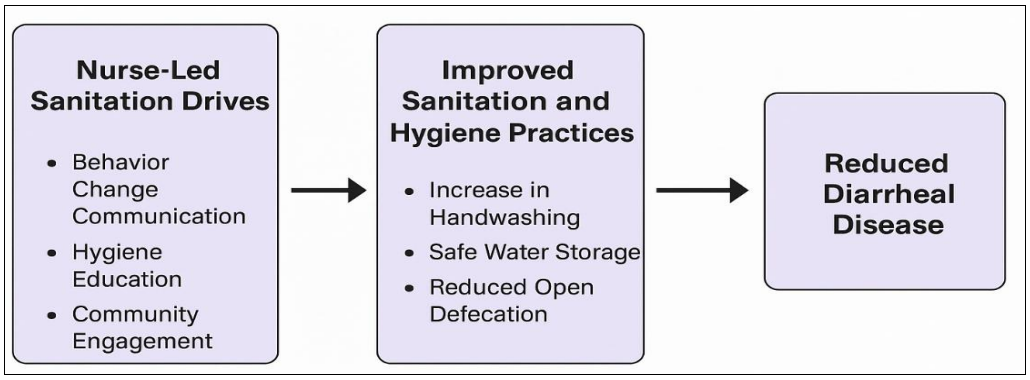


**Fig 1:** Conceptual Framework of Nurse-Led Sanitation Drives in Slum Areas

Moreover, the significant gains in hygiene behavior-especially increased rates of handwashing with soap, safe water storage, and reduced open defecation-demonstrate the centrality of behavioral change in diarrheal prevention. The nurse-led model is thus both cost-effective and sustainable, particularly in resource-constrained slum environments where permanent infrastructure upgrades are often delayed or incomplete.

What distinguishes nurse-led sanitation drives from traditional top-down sanitation programs is the relational aspect of care and trust-building. Traditional campaigns often rely on pamphlets, announcements, or one-time workshops, which may increase awareness but rarely result in long-term behavioral change. In contrast, nurses are embedded within the community. Their health authority, combined with accessibility and continuity, makes them highly influential agents of change.

In Indian slums, where public mistrust of government health initiatives is not uncommon, nurse-led drives have helped bridge the gap. Residents reported being more receptive to messages from familiar local nurses than from external campaigners. Additionally, the personalized attention given by nurses-such as addressing mothers' questions about water boiling or child feeding during diarrhea-provided practical support and reassurance, making the learning experience more meaningful.

From a health systems perspective, this indicates that empowering community nurses with leadership roles in sanitation campaigns can enhance both the efficacy and reach of public health initiatives. It also underlines the importance of integrating health promotion into everyday nursing practice, particularly in urban poor settings.

Another salient point from the results is the strong correlation between female community nurses and improved sanitation behavior among women and children. In slum households, women are often the primary caregivers and decision-makers for water collection, cooking, child feeding, and domestic hygiene. However, they also face social barriers that limit their access to public meetings or formal health settings.

Nurse-led door-to-door sessions overcome this barrier. Female nurses are often viewed as relatable and non-threatening, facilitating conversations around sensitive topics such as menstruation hygiene, child defecation disposal, and safe handling of infant food and water. By building relationships over time, nurses empower women with the confidence to adopt and maintain hygiene practices, and in many cases, to pass on the knowledge to their families and neighbours.

This form of knowledge transfer contributes to a cascading effect, wherein women become informal health educators within their communities-an impact not easily achieved through infrastructure-focused or male-dominated campaigns.

Another significant theme that emerged is the impact of nurse-led sanitation drives on community ownership and cohesion. Many successful interventions emphasized not just hygiene education but collective participation in sanitation improvements. For example, when nurses helped organize community clean-up days, toilet maintenance groups, or school hygiene clubs, slum residents reported a stronger sense of communal responsibility for their surroundings.

In locations where public sanitation facilities existed but were underutilized, nurse-led community mobilization was key in increasing usage. Regular meetings, wall paintings, soap drives, and competitions for cleanest alley or school helped foster a culture of cleanliness. Importantly, the nurse was often the anchor who facilitated and encouraged such participation.

This aligns with existing literature on participatory health promotion, which emphasizes that sustainable sanitation outcomes are more likely when residents are involved in planning and monitoring rather than being passive recipients of services (Kar & Chambers, 2008; Luby *et al*., 2011) [8, 9]. Nurse-led interventions thus play a dual role-educational and organizational-thereby enhancing the longevity of health outcomes beyond the intervention period.

Schools proved to be another powerful entry point for sanitation education. Nurse-led hygiene programs in schools resulted in measurable knowledge gains among students and, as reported by several teachers, a visible decline in absenteeism due to gastrointestinal illnesses. Given that children are often effective agents of change within households, their improved hygiene behavior indirectly influenced family practices.

Moreover, engaging school staff alongside students ensured reinforcement of messages through the curriculum, school activities, and daily routines. Studies from Latin America and Southeast Asia have shown that school-based WASH interventions, when combined with community outreach, produce significant reductions in disease burden (Freeman *et al*., 2014) [5].

Nurse involvement also ensures that programs go beyond academic instruction, including hands-on demonstrations, menstrual hygiene education, and counseling, particularly for adolescent girls who might otherwise be neglected by traditional campaigns.

Despite promising outcomes, several challenges persisted across various sites. Firstly, high nurse-to-population ratios, especially in overburdened urban health systems, limited the intensity and reach of interventions. Many nurses were responsible for multiple wards, restricting their ability to conduct follow-up visits or sustain weekly sessions. This often led to a relapse in hygiene behavior once the program concluded.

Secondly, financial constraints prevented the provision of essential materials such as soap, buckets, ORS packets, and IEC (Information, Education, and Communication) materials in several slums. While behavior change was possible through education alone, material support amplified impact and improved compliance.

Thirdly, structural barriers-such as irregular water supply, poor drainage, and lack of garbage disposal-remained unresolved in many areas. Even with improved hygiene knowledge, residents struggled to apply it consistently. Hence, while nurse-led interventions are powerful, their full potential is realized only when complemented by systemic infrastructural improvements. Language diversity in migrant slum communities, cultural stigma around topics like open defecation or menstrual hygiene, and lack of male participation in household hygiene discussions were also recurrent barriers.

## 4. Conclusion

Diarrheal diseases continue to pose a significant public health challenge in urban slums, where overcrowding, poor sanitation, and lack of hygiene practices create an environment conducive to recurrent outbreaks. This study reviewed and analyzed the effectiveness of nurse-led sanitation drives in mitigating the burden of diarrheal disease in such vulnerable settings. The evidence consistently demonstrated that interventions led by trained community nurses resulted in meaningful reductions in disease incidence, substantial improvements in hygiene behaviors, and greater utilization of sanitation infrastructure.

Nurses emerged not only as healthcare providers but also as key change agents who could engage with households in ways that foster trust, education, and behavioral transformation. Their role in delivering tailored, consistent, and community-centered health education ensured that knowledge translated into practice. Importantly, the relational and repetitive nature of their engagement-through home visits, school sessions, and community mobilization-distinguished these drives from conventional health campaigns that often fail to result in sustained behavior change.

In particular, nurse-led programs proved successful in increasing handwashing rates, promoting safe water storage, reducing open defecation, and encouraging the use of community toilets. These behavioral changes directly correlated with measurable reductions in diarrheal episodes, as documented in health registers and local surveys. Moreover, the gender-sensitive approach of using female nurses to engage women and adolescent girls amplified the impact of these drives, ensuring that critical hygiene messages reached and influenced primary caregivers.

Despite their success, challenges such as high patient-to-nurse ratios, limited supply of sanitation materials, infrastructural deficiencies, and cultural barriers highlighted the need for stronger institutional support. Nurse-led initiatives must be integrated with broader municipal and national sanitation efforts, supported by adequate staffing, logistical resources, and cross-sector coordination. In summary, this study affirms that nurse-led sanitation drives represent a cost-effective, culturally appropriate, and impactful strategy for reducing diarrheal disease burden in slum communities. Scaling up such interventions across urban poor populations-with sustained investment in community health nursing-can significantly enhance public health outcomes. Future policies should prioritize nurse leadership in community sanitation, ensure systemic support for field-level implementation, and foster participatory models that place communities at the heart of change.

**Conflict of Interest**
Not available

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Not available

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