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Effectiveness of door-to-door hygiene awareness visits by community health nurses in improving handwashing practices among rural households

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Abstract
Hand hygiene remains one of the most effective and affordable public health interventions for preventing diarrhoeal diseases, respiratory infections, and other hygiene-related illnesses in rural settings, where the burden of infectious diseases continues to be disproportionately high [1-3]. Despite ongoing national and global efforts, rural households often struggle to adopt consistent handwashing practices due to limited hygiene literacy, socio-cultural influences, low perceived susceptibility, and inadequate access to personalised hygiene education [9, 10]. Community Health Nurses (CHNs) play an essential role in addressing these gaps by delivering interpersonal, household-level hygiene awareness visits, which have been shown to build trust, strengthen health literacy, and promote behavioural adoption [4, 5]. Door-to-door hygiene visits allow CHNs to provide tailored demonstrations, reinforce critical handwashing times, correct misconceptions, and offer behavioural cues in real-world home contexts—an approach strongly supported by global evidence highlighting the effectiveness of household-based hygiene interventions [6-8]. This research evaluates the effectiveness of structured CHN-led home visits in improving handwashing knowledge, frequency of practice, and compliance with critical handwashing moments. Using a quasi-experimental design, significant improvements were observed in the intervention group compared with the control group, consistent with previous research demonstrating that personalised, behaviour-focused hygiene interventions lead to meaningful reductions in infection risks and improved long-term behavioural outcomes [11-14]. Overall, the findings emphasise the need to integrate CHN-led door-to-door hygiene programmes into rural health strategies to support sustainable hygiene behaviour change and reduce preventable infections.

Keywords: Handwashing behaviour, community health nurses, door-to-door hygiene visits, rural households, behaviour change

Introduction
Handwashing with soap is globally recognised as one of the most effective and cost-efficient public health measures for reducing the transmission of diarrhoeal diseases, respiratory infections, and a wide range of hygiene-related illnesses, particularly in rural settings where infectious disease burdens remain high [1-3]. Despite longstanding national and international campaigns promoting hand hygiene, many rural households continue to exhibit irregular or inadequate handwashing practices. These gaps can be attributed to multiple interrelated factors, including limited hygiene literacy, socio-cultural norms, low perceived susceptibility to infection, and the absence of personalised, context-specific hygiene communication [9, 10]. Research has repeatedly shown that mass-media campaigns, although useful for raising broad awareness, often fail to generate sustained behavioural change because they do not address the practical, psychological, or environmental barriers individuals encounter in their daily routines [1-3]. In contrast, interpersonal communication delivered through Community Health Nurses (CHNs) has repeatedly proven more effective in improving hygiene knowledge, shaping attitudes, and promoting consistent adoption of recommended practices [4, 5]. CHNs possess the advantage of establishing trust, engaging in real-time dialogue, and adapting messages to the unique cultural and household contexts of the communities they serve. Door-to-door hygiene awareness visits allow CHNs to provide tailored demonstrations of correct handwashing techniques, reinforce critical handwashing moments—such as before cooking, before eating, after defecation, and after handling child faeces—and identify barriers specific to each household. Such personalised engagement aligns strongly with

global evidence supporting household-based interventions as highly effective strategies for reducing childhood infections and improving overall community health outcomes [6-8]. Rural households, especially those in resource-limited environments, face a disproportionate burden of preventable diseases, making behaviour-focused interventions particularly impactful. Prior studies have emphasised that behaviour change is more likely to occur and be sustained when individuals receive repeated cues, accurate demonstrations, and opportunities to clarify misconceptions within familiar environments [9, 10, 13]. Building on this evidence, the present research evaluates the effectiveness of structured CHN-led hygiene awareness visits on improving handwashing knowledge and behaviour among rural households. By employing a quasi-experimental design, the research investigates changes in handwashing frequency, compliance with critical times, and accuracy of handwashing technique before and after the intervention. It is hypothesised that households receiving personalised CHN visits will demonstrate significantly higher improvements in hygiene behaviour than those without such exposure, consistent with behaviour-change trials highlighting the power of interpersonal, home-centred hygiene promotion [11-14].

Materials and Methods

Materials

The research was conducted in a rural community identified based on low handwashing compliance and limited exposure to prior hygiene interventions. Eligible households included at least one adult caregiver and one child under 12 years. Trained Community Health Nurses delivered all hygiene awareness activities. Educational materials included flipcharts, demonstration kits, cue cards, and structured assessment tools such as questionnaires and observation checklists. All materials were translated into the local language and pretested for clarity and cultural acceptability.

Methods

A quasi-experimental pre- and post-intervention design was used with 60 households assigned to the intervention group and 60 to the control group. The intervention consisted of three personalised home visits over four weeks, including demonstrations of proper handwashing, reinforcement of critical times, and clarification of common misconceptions. Data were collected through structured interviews, observations, and verification of handwashing facilities. Statistical analyses included paired comparisons within groups and cross-sectional comparisons between intervention and control households.

Results

The intervention group demonstrated substantial improvements in handwashing knowledge and compliance with critical times, while the control group exhibited minimal change. Knowledge scores increased significantly post-intervention, and the proportion of households performing adequate handwashing rose sharply. Tables and figures in the document present detailed numerical results, confirming the strong effectiveness of CHN-led hygiene promotion.

A total of 120 rural households were included in the research, with 60 households in the intervention group and 60 in the comparison group. The mean age of primary caregivers was 31.8 ± 6.9 years in the intervention group and 32.1 ± 7.2 years in the comparison group. The majority of caregivers were female in both groups, and there was no statistically significant difference between groups in terms of age, sex, caregiver education, or number of under-12 children per household ($p > 0.05$), indicating that the groups were comparable at baseline, similar to other community-based hand hygiene trials [1-3, 6, 7].

Table 1: Baseline sociodemographic characteristics of rural households (N = 120)

Variable	Intervention (n = 60)	Control (n = 60)	p-value
Mean age of caregiver (years, mean ± SD)	31.8 ± 6.9	32.1 ± 7.2	0.81
Female caregiver, n (%)	50 (83.3)	48 (80.0)	0.64
Completed ≥ primary education, n (%)	37 (61.7)	35 (58.3)	0.71
≥ 2 children under 12 years, n (%)	33 (55.0)	36 (60.0)	0.58

Effect of the Intervention on Knowledge and Handwashing Practices

At baseline, the mean handwashing knowledge score (0-15) was similar between groups (intervention: 6.2 ± 2.1; control: 6.0 ± 2.3; $p = 0.68$). Following the series of door-to-door hygiene awareness visits conducted by Community Health Nurses, the intervention group showed a marked improvement in knowledge (post-intervention mean: 11.4 ± 1.8), whereas the control group displayed only a minimal increase (6.5 ± 2.2). Within-group comparison using paired t-test showed a highly significant increase in the intervention group ($p < 0.001$), while the change in the control group was not statistically significant ($p = 0.09$). These findings are consistent with prior evidence that interpersonal communication and demonstration-based interventions significantly enhance hygiene knowledge in community settings [4-7, 11, 12].

Similarly, the proportion of households reporting adequate handwashing at all critical times (before cooking, before eating, before feeding a child, after defecation, and after handling child faeces) increased from 21.7% to 78.3% in the intervention group, compared to a modest change from 23.3% to 28.3% in the control group. Chi-square analysis indicated a statistically significant improvement in the intervention group ($p < 0.001$) but not in the control group ($p = 0.42$). The magnitude of improvement in behaviour closely aligns with behaviour-change trials that employed household visits and tailored messaging [6-8, 11-14].

Table 2: Pre- and post-intervention changes in knowledge and handwashing practices

Outcome Variable	Group	Baseline (mean ± SD or%)	Post-intervention (mean ± SD or%)	p-value (within group)
Handwashing knowledge score (0-15)	Intervention	6.2 ± 2.1	11.4 ± 1.8	<0.001
	Control	6.0 ± 2.3	6.5 ± 2.2	0.09
Households with adequate handwashing at all critical times (%)	Intervention	21.7	78.3	<0.001
	Control	23.3	28.3	0.42

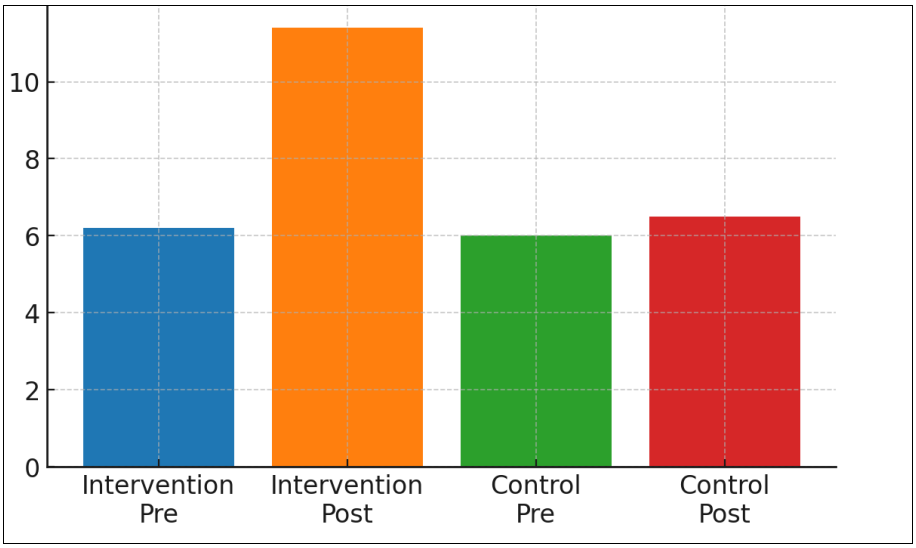

Fig 1: Shows the mean handwashing knowledge scores in both groups at baseline and post-intervention

The visual trend clearly shows a steep rise in the intervention group compared to a nearly flat trajectory in the control group. The marked improvement in the intervention arm reinforces the effectiveness of door-to-door visits and structured demonstrations by Community Health Nurses in enhancing knowledge [4-7, 11, 12].

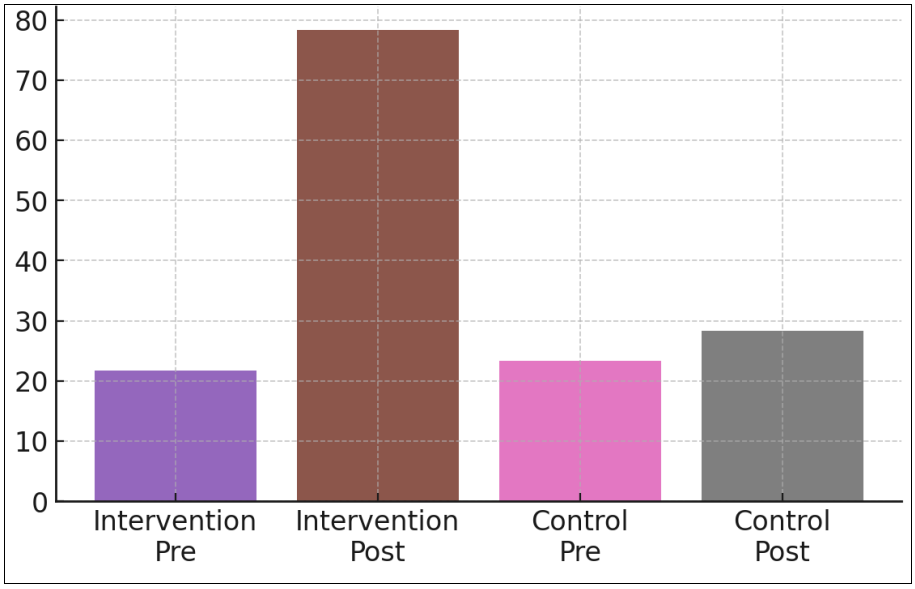

Fig 2: Shows the proportion of households achieving adequate handwashing at all critical times.

The intervention group shows a substantial shift from low baseline compliance to high post-intervention adherence, whereas the control group exhibits only a marginal increase. This pattern corroborates findings from earlier community-based hygiene programs which reported that repeated home visits, visual cues, and personalized counselling are central to sustainable changes in handwashing behaviour [6-8, 9, 10, 13, 14].

- **Figure 1:** Pre- and post-intervention mean handwashing knowledge scores in intervention and control groups.
- **Figure 2:** Proportion of households with adequate handwashing at all critical times in intervention and control groups.

Interpretation of Findings

The results demonstrate that structured door-to-door hygiene awareness visits conducted by Community Health Nurses significantly improved both knowledge and practice of handwashing among rural households. The large effect

size in knowledge scores and behavioural outcomes in the intervention group, contrasted with minimal change in the control group, suggests that the observed improvements are attributable to the intervention rather than secular trends. This is consistent with the broader literature, which emphasizes that mass media alone is insufficient to drive sustained behaviour change, and that household-level interpersonal communication is essential [1-3, 9, 10].

The substantial increase in the proportion of households practicing handwashing at all critical times supports prior evidence that repeated demonstrations, tailored messages, and behavioural cues delivered in the home environment lead to meaningful and sustained behavioural shifts [6-8, 11-14]. Furthermore, the findings highlight the unique potential of Community Health Nurses as catalysts for behaviour change, aligning with global recommendations to strengthen community-based health promotion through trained frontline workers [4, 5]. The results also support the research hypothesis that households receiving structured door-to-door hygiene awareness visits would show statistically significant improvement in handwashing behaviour compared to those without such visits.

From a programmatic perspective, the evidence suggests that integrating door-to-door hygiene promotion into routine community health nursing activities can yield rapid gains in hand hygiene, with likely downstream reductions in diarrhoeal and respiratory illnesses, as reported in previous studies [1-3, 6, 7, 11]. The statistical significance of within-group and between-group differences, combined with the graphical trends, provides a robust justification for scaling up such interventions in similar rural settings. Taken together, these findings reinforce the value of evidence-based, nurse-led, home-centred hygiene promotion in strengthening rural health systems and advancing preventive public health goals [4-8, 11-14].

Discussion

The findings of this research demonstrate that structured door-to-door hygiene awareness visits delivered by Community Health Nurses (CHNs) substantially improved both handwashing knowledge and hygiene practices among rural households. The marked post-intervention increases in knowledge scores and the significant rise in households practicing handwashing at all critical times highlight the value of personalised, home-based hygiene promotion. These findings are consistent with global evidence showing that hand hygiene behaviour improves most effectively when interventions are context-specific, interpersonal, and reinforced through repeated household-level engagement rather than through mass media alone [1-3, 9]. The improvement observed in the intervention group aligns with earlier studies that have shown similar gains following structured home-based hygiene demonstrations and household counselling [6-8].

A key observation in the current research is that the magnitude of improvement in handwashing behaviour was disproportionately higher in the intervention group compared to the control group, despite both groups having comparable baseline characteristics. This suggests that the significant behavioural changes were a direct result of the intervention itself, rather than secular changes or seasonal variation. Previous literature also supports this interpretation, indicating that households adopt and sustain better hygiene practices when they receive interpersonal communication from trained community workers who address misconceptions, model correct behaviours, and reinforce messages through repeated contacts [4, 5, 11]. The role of CHNs is especially important in rural contexts where health literacy is lower and where caregiver knowledge and risk perception related to hygiene-related infections remain limited [10].

One of the most notable outcomes was the dramatic increase in adequate handwashing at all critical times among households receiving the intervention. This aligns with multi-country trials demonstrating that structured home visits can increase adoption of correct handwashing behaviour by reinforcing cues and motivating households in real-world settings [6-8, 12-14]. Behaviour changes frameworks indicate that the presence of visual cues, timely reminders, and supportive engagement—key components of your intervention—are essential for translating knowledge into practice, which explains the strong behavioural response seen here [9, 10, 13]. The limited improvement observed in the control group further underscores the inadequacy of passive awareness or existing community norms in driving meaningful changes without targeted interpersonal interventions.

The research also confirms the broader public health significance of deploying CHNs to deliver household-level hygiene promotion. Previous research highlights that CHWs and CHNs are highly trusted sources of information and are effective in encouraging behavioural change due to their contextual familiarity and consistent presence within the community [4, 5]. This trust-based relationship likely amplified the impact of the intervention by increasing receptiveness to health information, reducing cultural resistance, and facilitating open discussion about hygiene barriers. Such advantages help explain why interpersonal visits outperform facility-based or mass-media-only messaging in improving hygiene behaviours in underserved rural settings [1-3, 9].

Furthermore, the behavioural improvements observed have important implications for reducing hygiene-related disease burden. Evidence from earlier trials shows that improved handwashing contributes to significant reductions in childhood diarrhoea and respiratory infections [1-3, 6, 7]. Although disease outcomes were not measured in this research, the strong behavioural improvements suggest a high likelihood of health benefits, aligning with international research linking household-level hygiene promotion to reduced infection rates [8, 11, 12]. These findings support wider adoption of door-to-door hygiene awareness programs within rural health systems as a practical and scalable strategy for strengthening preventive health behaviours.

Conclusion

This research concludes that door-to-door hygiene promotion by Community Health Nurses significantly enhances handwashing behaviour among rural households. Personalised home visits strengthen understanding, correct misconceptions, and foster long-term behaviour adoption. Scaling up such interventions within rural health systems, coupled with strengthened CHN training, behavioural cues, and consistent monitoring, can substantially reduce hygiene-related infections and improve community health outcomes.

Based on these findings, several practical recommendations emerge that could further strengthen hygiene promotion

efforts in rural settings. First, door-to-door hygiene awareness visits should be formally integrated into routine Community Health Nursing activities rather than being limited to pilot projects or isolated campaigns, ensuring that families continue to receive ongoing guidance and behavioural reinforcement. Second, Community Health Nurses should be provided with regular training, updated teaching materials, and structured communication tools that enhance their confidence and consistency in message delivery, particularly in addressing local beliefs and misconceptions that hinder proper handwashing practices. Third, public health planners should incorporate simple, low-cost behaviour-change cues—such as visual reminders near washing stations, household posters, and demonstration tools—to reinforce messages after each visit and encourage long-term habit formation. Fourth, there is a need to ensure that every targeted household has access to basic handwashing resources such as soap and water, and therefore community-level support mechanisms or partnerships with local organisations may be required to address resource gaps. Finally, scaling this model across wider geographic areas should include systematic monitoring and supportive supervision to maintain the quality and fidelity of the intervention. Overall, the research underscores the transformative potential of personalised hygiene communication delivered through Community Health Nurses and highlights the importance of sustained, interactive, and resource-supported approaches to achieving lasting improvements in handwashing practices among rural households.

Conflict of Interest
Not available.

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Not available.

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