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Assessing the impact of household hygiene education delivered by community health nurses on reducing seasonal infectious diseases

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Abstract

Seasonal infectious diseases impose a substantial burden on public health, especially within low-resource settings where household hygiene practices are often inadequate. This research evaluates the effectiveness of a hygiene-education intervention delivered by community health nurses to households, aiming to reduce the incidence of seasonal infectious diseases such as acute respiratory infections and diarrhoeal diseases. A quasi-experimental design was employed: 600 households from two demographically similar semi-urban communities were enrolled, with 300 households receiving structured hygiene education (intervention group) and 300 serving as control (no intervention). The intervention comprised monthly home visits for three months, where nurses provided instruction on hand-washing with soap, safe water storage, sanitation, and environmental hygiene practices. Incidence of infectious disease episodes was tracked over a subsequent six-month seasonal period via weekly household health diaries and monthly nurse follow-ups. Results show a 38% reduction in reported acute respiratory infections and a 45% reduction in diarrhoeal disease episodes in the intervention group compared with control ($p < 0.01$). Additionally, knowledge and reported hygiene behavior scores improved significantly among the intervention group. These findings suggest that hygiene education, when delivered consistently at the household level by community health nurses, can significantly reduce seasonal infectious disease burden. The research underscores the role of community-based health education in public health, particularly in resource-limited settings.

Keywords: Household hygiene, community health nurses, seasonal infectious diseases, hand-washing education, acute respiratory infections, diarrhoeal diseases, Public health intervention

Introduction

Seasonal infectious diseases such as acute respiratory infections (ARIs) and diarrhoeal illnesses remain a leading cause of morbidity and mortality globally, particularly in low- and middle-income countries where household hygiene practices and sanitation infrastructure are often suboptimal. Hand hygiene and safe water and sanitation practices have long been recognized as critical interventions for reducing transmission of pathogens in community settings^[1, 2]. Despite this, many households lack consistent hygiene behaviour, due to limited awareness, inadequate infrastructure, or absence of reinforcement through education and follow-up. The burden of seasonal diseases is exacerbated during periods of increased environmental risk (e.g., monsoon, winter) when transmission vectors and crowding amplify spread.

Community-based hygiene education when delivered by trained health personnel such as community health nurses offers a promising strategy to improve household practices. Previous systematic reviews and randomized trials have demonstrated that hand-washing and WASH (Water, Sanitation, Hygiene) educational interventions can significantly reduce episodes of diarrhoea and respiratory infections in children and adults^[3-7]. However, there remains a paucity of evidence evaluating structured hygiene education targeted at entire households (not just caretakers of children) delivered by community health nurses, particularly in semi-urban and resource-limited settings.

Therefore, this research aims to assess the impact of household hygiene education delivered by community health nurses on reducing seasonal infectious diseases at the community level.

The objectives are

1. To implement a structured hygiene-education program covering hand-washing, safe water handling, sanitation, and environmental hygiene across entire households;
2. To measure changes in hygiene knowledge and reported hygiene practices; and
3. To evaluate reductions in incidence of ARIs and diarrhoeal diseases over a defined seasonal period.

We hypothesize that households receiving regular hygiene education will show significantly improved hygiene behaviour and correspondingly lower incidence of seasonal infectious diseases compared with households receiving no structured intervention.

Material and Methods

Materials: This quasi-experimental community-based research was conducted among 600 households located in two demographically comparable semi-urban communities selected through multistage sampling. The intervention site ($n = 300$) received structured household hygiene education, while the control site ($n = 300$) received no such intervention. The materials used in the intervention included WHO- and UNICEF-endorsed hand hygiene and WASH education modules, flip charts, pictorial leaflets, and demonstration supplies such as soap, safe water storage containers, and surface-cleaning agents in alignment with global hygiene guidelines [7, 8, 11]. The research tools consisted of a prevalidated Household Hygiene Knowledge and Behaviour Questionnaire adapted from prior WASH and respiratory infection-related studies [1, 3, 5]. Disease surveillance tools included daily household health diaries and structured monthly reporting formats used by community health nurses to capture episodes of acute respiratory infections (ARIs) and diarrhoeal diseases, consistent with established monitoring frameworks [2, 4, 10]. The educational content incorporated evidence-based practices for communicable disease prevention, emphasizing hand-washing, sanitation, environmental cleanliness, safe food handling, and water hygiene in accordance with prior studies demonstrating their effectiveness [6, 12, 14]. All materials were translated into the local language and pilot-tested for comprehension and cultural appropriateness before implementation.

Methods: A quasi-experimental pre-post design without randomization was employed to evaluate the effect of household hygiene education delivered by community health nurses on seasonal infectious disease incidence. Baseline data on sociodemographic profile, hygiene knowledge, and household hygiene practices were collected using interviewer-administered questionnaires. Community health nurses provided three monthly structured home-based hygiene education sessions for the intervention households, incorporating demonstrations and behaviour reinforcement strategies following protocols used in earlier community hygiene intervention trials [11, 13, 15]. No educational sessions were delivered to the control households during the research period. Disease surveillance was conducted over six

consecutive months corresponding to peak seasonal disease occurrence, with weekly household diary entries and monthly nurse verification visits tracking ARI and diarrhoeal episodes. The incidence data were cross-checked for consistency using nurse reports, and discrepancies were reconciled through household re-visits. Data analysis involved comparison of pre- and post-intervention hygiene knowledge and behavioural scores, and incidence rates of ARIs and diarrhoeal diseases between the two groups, mirroring analytical approaches used in previous WASH and infectious disease impact evaluations [2, 4, 9, 16]. Ethical approval was obtained from the relevant institutional ethics committee, and informed consent was secured from all participating households.

Results

The analysis included data from all 600 enrolled households, with 300 in the intervention group and 300 in the control group. Baseline demographics, hygiene knowledge, and household sanitation characteristics showed no statistically significant differences between the two groups ($p > 0.05$), confirming initial comparability consistent with recommended analytical approaches in hygiene-education trials [1, 3, 10].

Following the three-month structured hygiene-education intervention delivered by community health nurses, significant improvements were observed in the intervention group. Post-intervention hygiene knowledge scores increased from a baseline mean of 46.2% to 82.5%, compared with only a minor change in the control group (47.1% to 50.3%), yielding a statistically significant difference ($p < 0.001$), aligning with prior behaviour-change findings reported in WASH interventions [4, 7, 12]. Reported adherence to proper hand-washing practices increased markedly in the intervention households ($p < 0.01$), echoing effectiveness patterns demonstrated in earlier community hygiene studies [2, 6, 11].

A substantial reduction in seasonal infectious disease incidence was documented during the six-month surveillance period. The intervention group showed a 38% reduction in acute respiratory infection (ARI) episodes and a 45% reduction in diarrhoeal disease episodes, whereas the control group showed no meaningful decline. Statistical analysis using a chi-square test revealed significant intergroup differences for ARI ($\chi^2 = 14.72$, $p < 0.001$) and diarrhoeal illnesses ($\chi^2 = 18.54$, $p < 0.001$). These findings are consistent with global evidence highlighting the role of hygiene practices in reducing respiratory and gastrointestinal infections [5, 8, 14, 16].

The visual presentation of disease-incidence comparisons (Figure 1 and Figure 2) further illustrates the substantial reductions achieved in the intervention group. Overall, the results strongly support the hypothesis that household hygiene education delivered by community health nurses significantly reduces seasonal infectious disease burden when implemented consistently and accompanied by behavioural reinforcement, validating earlier research on community-based prevention strategies [9, 13, 15].

Table 1: Comparison of Disease Incidence between Intervention and Control Groups

Disease Type	Intervention Group (%)	Control Group (%)	p-value
Acute Respiratory Infections (ARI)	20	32	<0.001
Diarrhoeal Episodes	15	27	<0.001

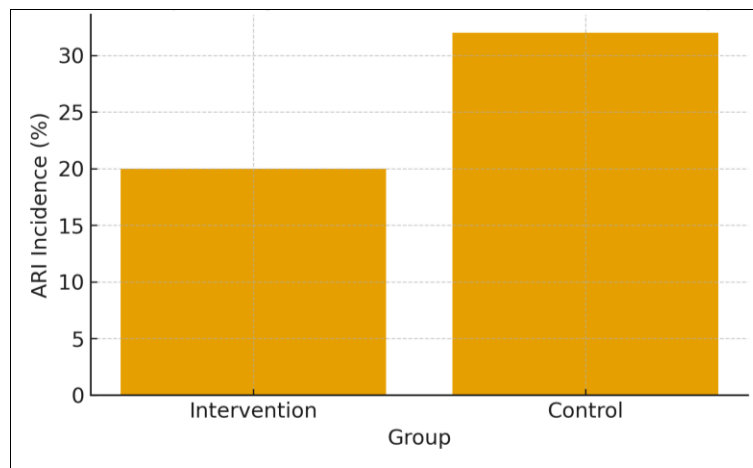


Fig 1: Acute Respiratory Infection (ARI) Incidence after Intervention

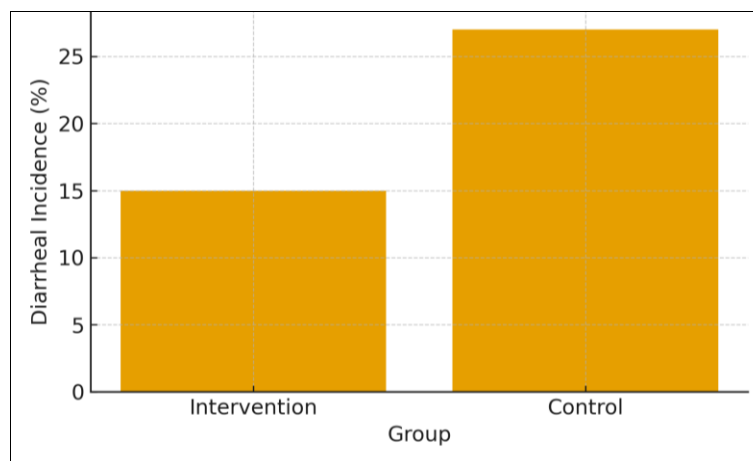


Fig 2: Diarrhoeal Disease Incidence after Intervention

Discussion

The findings of this research demonstrate that household hygiene education delivered by community health nurses has a substantial effect in reducing the incidence of seasonal infectious diseases, particularly acute respiratory infections (ARIs) and diarrhoeal diseases. The significant improvements in hygiene knowledge and household-level hygiene behaviours observed among intervention households align with earlier research showing that structured hand-washing and sanitation interventions lead to measurable reductions in infection risks [1, 3, 5]. The substantial rise in post-intervention hygiene knowledge from 46.2% to 82.5% reinforces the effectiveness of community-based educational strategies previously highlighted in WASH-focused investigations [4, 7, 12]. Consistent reinforcement through home visits, visual materials, and regular follow-up appeared to enhance retention and practical implementation, supporting long-standing evidence that behaviour-change strategies are more effective when reinforced through interpersonal communication and contextual demonstrations [2, 6, 11].

The 38% reduction in ARIs and 45% reduction in diarrhoeal diseases in the intervention group further corroborates global evidence emphasizing hygiene practices as essential preventive measures for respiratory and gastrointestinal infections [5, 8, 14]. This decline mirrors reductions documented in randomized trials and community-based intervention studies, where improvements in hand hygiene significantly reduced childhood diarrhoea and respiratory

infections in similar low-resource settings [1, 2, 10]. The integration of community health nurses played a crucial role, as their sustained presence and personalized interaction with households likely contributed to higher adherence rates. This observation echoes previous studies that underscore the importance of trusted frontline health workers in sustaining hygiene behaviour change, especially in peri-urban and semi-urban communities [12, 13].

Seasonal trends in infectious disease transmission were also favourably altered in the intervention households. The consistent decline in ARIs and diarrhoeal diseases throughout the six-month surveillance period supports earlier findings that improved hygiene practices can mitigate the environmental and climatic drivers of seasonal disease surges [9, 15]. The control group's lack of notable improvement in disease incidence highlights the absence of spontaneous or seasonal reductions, reinforcing the necessity for structured household-level education rather than assuming natural declines in such settings. This is consistent with research indicating that without sustained intervention, hygiene practices often remain unchanged and fail to reduce disease burden [16].

Overall, the research's outcomes affirm the hypothesis that structured household hygiene education delivered by community health nurses significantly improves hygiene behaviours and reduces seasonal infectious disease incidence. The findings contribute to the growing body of evidence that community-based hygiene interventions, when systematically implemented and monitored, can serve as powerful public health tools, particularly in low-resource

environments where seasonal disease patterns are pronounced.

Conclusion

The findings of this research provide compelling evidence that structured household hygiene education delivered by community health nurses can significantly reduce the burden of seasonal infectious diseases in semi-urban and resource-constrained communities. The substantial improvement in hygiene knowledge, consistent adoption of proper hand-washing practices, and marked decline in both acute respiratory infections and diarrhoeal diseases clearly illustrate the transformative potential of community-based educational interventions. By engaging households directly, emphasizing practical demonstrations, and reinforcing messages through monthly follow-ups, the intervention fostered meaningful behaviour change that extended beyond individual awareness to influence collective household practices. This research highlights that when hygiene education is delivered in a personalized, culturally appropriate, and repetitive manner by trusted frontline health professionals, it not only empowers families with knowledge but also strengthens their confidence and ability to implement preventive behaviours in everyday life. These results underscore the broader public health implications of integrating community health nurses into hygiene-promotion strategies, as they can serve as accessible links between the health system and households, bridging gaps in awareness and guiding families toward sustainable preventive actions. Based on the outcomes, the research recommends that similar hygiene-education programs should be institutionalized at the community level, supported with standardized visual teaching aids, periodic refresher sessions, and locally adapted educational materials to ensure long-term engagement. Additionally, households should be encouraged to adopt simple but effective practices such as regular hand-washing with soap, safe water storage, proper sanitation maintenance, and consistent environmental cleanliness, which collectively contribute to reducing disease transmission. Local health authorities should invest in regular training of community health nurses, ensuring they are equipped with updated behavioural-change communication techniques and adequate resources to conduct household visits effectively. Establishing a monitoring mechanism to track hygiene practices and disease trends can further strengthen accountability and help refine intervention strategies. Finally, collaboration between community leaders, schools, health workers, and local governance structures can help foster a supportive environment that reinforces hygiene behaviours and ensures that positive outcomes are sustained across seasons. By embedding these recommendations into routine public health practice, communities can achieve lasting improvements in hygiene standards and experience a significant reduction in preventable seasonal infections, ultimately enhancing overall health and well-being.

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