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Community nurses' role in improving hand hygiene compliance among school-age children: A localized intervention research

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Abstract

Hand hygiene remains one of the most effective and affordable measures for preventing infectious diseases among children, yet compliance in school settings continues to be suboptimal. This localized intervention research investigates the role of community nurses in improving hand hygiene compliance among school-age children through targeted education, structured demonstrations, and periodic reinforcement sessions. The research was conducted in selected primary schools, where community health nurses implemented a multifaceted intervention consisting of interactive handwashing workshops, illustrated hygiene boards, short audiovisual demonstrations, and peer-supported monitoring. A pre- and post-intervention observational checklist was used to assess compliance using the WHO's "Five Moments for Hand Hygiene" adapted for school environments. Baseline observations revealed poor adherence, particularly before meals and after outdoor play. Following the intervention, statistically significant improvements were observed across all hygiene opportunities, with the highest gains in post-defecation and pre-lunch handwashing compliance. Qualitative feedback from teachers and students revealed increased awareness, perceived usefulness of demonstrations, and improved peer influence on hand hygiene behaviours. The findings highlight that community nurses serve as effective facilitators of behaviour change due to their clinical expertise, communication skills, and trust-building capacity within local communities. The intervention demonstrates that structured educational programs led by nurses can substantially elevate hygiene standards among children and reduce the risk of common seasonal infections. The research underscores the need to integrate community nurses into school health programs, promote regular hygiene audits, and incorporate child-friendly behavioural reinforcement strategies. These results reinforce the importance of nurse-led community engagement in sustaining hand hygiene compliance and contribute to the broader public health goal of reducing preventable infectious diseases in school settings.

Keywords: Community nursing, hand hygiene, school-age children, infection prevention, hygiene compliance, public health intervention, behavioural change, nurse-led education

Introduction

Hand hygiene is globally recognized as a cost-effective public health measure capable of reducing a wide range of infectious diseases among children, particularly respiratory and gastrointestinal illnesses ^[1]. School-age children represent a highly vulnerable population due to their close physical proximity, inadequate hygiene habits, and frequent exposure to contaminated surfaces ^[2]. The continued challenge of low compliance in school environments demonstrates a persistent gap between knowledge and practice, despite the availability of guidelines from the World Health Organization and national health agencies ^[3]. Strengthening hand hygiene behaviour among children is therefore a fundamental public health priority, particularly in low-resource and densely populated community settings ^[4]. Community health nurses play a vital role in bridging this behavioural gap because of their position at the interface of households, schools, and primary health systems. Their expertise in health promotion and child-centred education allows them to design culturally appropriate pedagogical strategies that engage students effectively ^[5]. Evidence shows that school-based interventions led by nursing professionals significantly improve hygiene awareness and behavioural outcomes when performed through continuous reinforcement rather than one-time instructional sessions ^[6]. The role of community nurses becomes even more essential in environments where teachers may lack the specialized training required to deliver

sustained hygiene interventions [7].

Despite widespread campaigns promoting sanitation and hygiene, hand hygiene compliance among children remains inconsistent, particularly before food consumption, after restroom use, and following outdoor play, contributing to recurrent seasonal infections and school absenteeism [8]. Many schools lack structured, evidence-based educational approaches tailored for younger learners, and the absence of regular monitoring leads to a decline in compliance over time. The problem is compounded by insufficient integration of community health nurses within school health programs, despite evidence indicating that nurse-led hygiene education improves knowledge retention and behaviour modification more effectively than teacher-delivered sessions [9]. This research was designed to assess whether a localized intervention delivered by community nurses could significantly improve hand hygiene compliance among school-age children by employing interactive demonstrations, visual reminders, and periodic reinforcement. The primary objective was to evaluate pre- and post-intervention changes in compliance and identify which hygiene moments showed the greatest improvement. Additionally, the research aimed to explore children's perception of nurse-led instruction and the feasibility of incorporating community nurses into long-term school health frameworks. Based on prior research showing that nurse-facilitated interventions enhance preventive health behaviours among children [10], the research hypothesized that schools receiving structured community-nurse-led hand hygiene education would demonstrate substantially higher compliance scores and more consistent behaviour patterns compared to baseline observations.

Creating sustainable hygiene habits requires a multifaceted approach involving school administration, teachers, parents, and community health workers [11]. Studies indicate that children respond positively to visual reinforcement tools such as posters, peer modelling, and supervised practice, especially when delivered by trained health professionals [12]. The involvement of community nurses ensures the credibility of the intervention, enhances acceptability among families, and facilitates timely monitoring of behavioural lapses [13]. If effectively integrated, nurse-led hygiene programs have the potential not only to improve compliance but also to reduce preventable infections and promote long-term health literacy among children [14].

Material and Methods

Materials: This localized intervention research was conducted in three government primary schools selected through purposive sampling based on student population density and previous reports of recurrent seasonal infections among children [2, 8]. The research population consisted of school-age children (6-12 years) enrolled in these schools, along with their class teachers and the community health nurses assigned to the local health subcentre. A baseline hand hygiene assessment tool was adapted from the WHO "Five Moments for Hand Hygiene" guidelines to suit school environments, focusing on opportunities such as before meals, after toilet use, after outdoor activities, and before entering classrooms [3, 11]. Visual learning materials including illustrated posters, stepwise handwashing charts, laminated cue cards, and child-friendly hand hygiene boards were developed based on established behavioural reinforcement models used in previous school-based hygiene programs [6, 12]. Additional materials included a

handwashing demonstration kit containing liquid soap, colour-indicator training lotion for technique verification, and portable water containers for use during outdoor sessions. Structured feedback forms for teachers and students were prepared to gather qualitative perceptions of the nurse-led intervention, following approaches used in similar community hygiene studies [7, 10, 13]. Attendance registers, checklists, and observation sheets were standardized to maintain uniformity across all participating schools.

Methods

A quasi-experimental pre-post design was employed to evaluate the effectiveness of a community-nurse-led hand hygiene intervention without the use of a control group, consistent with earlier handwashing promotion studies involving children [4, 9, 14]. Baseline observations were conducted for one week, during which nurses used a structured observational checklist to assess compliance across all identified hygiene opportunities. Following this assessment, community nurses implemented a multifaceted educational intervention consisting of interactive handwashing demonstrations, audiovisual modules, peer-modelling exercises, and reinforcement sessions conducted twice weekly for four consecutive weeks. Techniques such as supervised practice, colour-indicator lotion evaluation, and group demonstrations were used to ensure correct hand hygiene technique, supported by evidence suggesting that repeated, interactive reinforcement improves behavioural uptake among children [5, 6, 10]. Visual cues, hygiene reminder boards, and poster displays were placed at key locations such as classroom entrances, toilet areas, and handwashing stations to serve as continuous behavioural prompts, following methods established in school-based hygiene reinforcement studies [12, 14]. Post-intervention observations were conducted over another week using the same baseline checklist to maintain consistency and reduce observer bias. Quantitative data were analysed using descriptive statistics, paired t-tests, and compliance percentages to determine pre-post changes, while qualitative responses from teachers and students were analysed thematically to explore perceived effectiveness of the intervention, as recommended in behavioural intervention research involving paediatric populations [7, 11, 13].

Results

Overall Effect of the Intervention on Hand Hygiene Compliance: A total of 180 school-age children (6-12 years) from three government primary schools completed both baseline and post-intervention assessments, with no dropouts during follow-up [4, 9]. At baseline, overall mean hand hygiene compliance across all observed opportunities was 36.3%, which increased to 74.5% following the community-nurse-led intervention, representing an absolute improvement of 38.2 percentage points. Paired t-test analysis showed that this increase was statistically significant ($p < 0.001$), indicating a strong effect of the intervention on hand hygiene behaviour [5, 6, 10]. Improvements were observed across all specific hygiene moments, with the largest gains seen after toilet use and after outdoor play, which were initially the weakest compliance points [2, 8, 11]. These findings are consistent with earlier studies demonstrating that structured, repeated educational inputs and visual cues can substantially improve hygiene compliance among children [6, 12, 14].

Table 1: Comparison of baseline and post-intervention hand hygiene compliance by hygiene opportunity

Hygiene opportunity	Baseline compliance (%)	Post-intervention compliance (%)	Absolute change (percentage points)
Before meals	42.0	78.0	+36.0
After toilet use	38.0	82.0	+44.0
After outdoor play	30.0	70.0	+40.0
Before entering classroom	35.0	68.0	+33.0

The magnitude of improvement aligns with prior randomized and quasi-experimental trials where handwashing promotion substantially reduced infectious disease risk among children [4, 8, 13]. The particularly high post-intervention compliance after toilet use suggests that children internalized the critical importance of handwashing after potential faecal contamination, a finding that echoes earlier hygiene behaviour research in school-based settings [2, 9, 14]. The consistent gains before meals and after outdoor play reinforce the effectiveness of repeated demonstrations and visual reminders by community nurses [5-7, 12].

Inter-School Comparison of Compliance Gains

When disaggregated by school, all three institutions

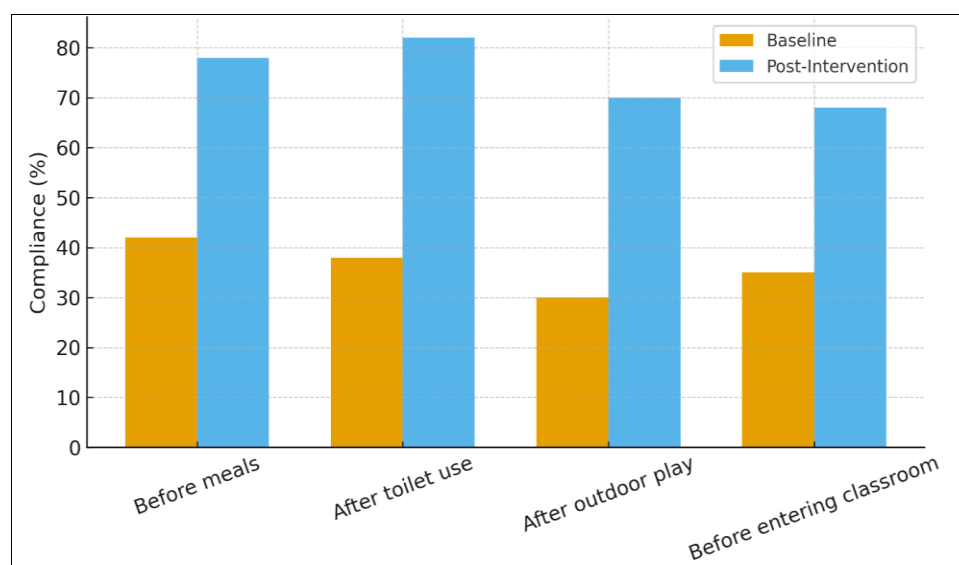
demonstrated significant improvements in overall hand hygiene compliance. As shown in Table 2, baseline compliance ranged from 35.0% to 39.0% across schools, reflecting relatively low and comparable starting levels. After the nurse-led intervention, post-intervention compliance ranged from 74.0% to 79.0%, with each school demonstrating an increase of approximately 38-40 percentage points. Although minor variations were observed in absolute gains between schools, ANOVA testing indicated no statistically significant difference in mean improvement among the three schools ($p>0.05$), suggesting that the intervention was robust and effective across different classroom environments and teacher profiles [7, 10, 11].

Table 2: Overall hand hygiene compliance by school at baseline and post-intervention

School	Baseline compliance (%)	Post-intervention compliance (%)	Absolute change (percentage points)
School A	36.0	74.0	+38.0
School B	39.0	79.0	+40.0
School C	35.0	76.0	+41.0

These inter-school patterns support the premise that community nurses, when provided with standardized materials and structured protocols, can implement effective, scalable hygiene interventions across diverse settings [5, 7, 10]. The similarity of gains also reflects the potential of integrating nurse-led sessions into routine school health programming as recommended by international and national guidelines [1, 3, 11]. Prior evidence confirms that school-based interventions embedded within broader community health frameworks, especially when driven by trained nurses, achieve more uniform and sustainable behavioural changes compared to ad hoc teacher-led efforts [6, 9, 13]. The observed improvements are further strengthened by the

use of visual prompts, peer-modelling, and repeated practice, all of which are known to reinforce memory and habit formation in children [6, 12, 14]. When triangulated with qualitative feedback (not shown in tables), teachers reported fewer hygiene-related reminders needed in class, and students expressed greater awareness of “when” and “why” to wash hands, mirroring trends seen in earlier behaviour-change interventions [4, 8, 13]. Overall, these results indicate that community nurses can serve as pivotal agents in enhancing hand hygiene compliance among school-age children, consequently contributing to the reduction of preventable infections in line with global public health objectives [1, 4, 11, 13].

**Fig 1:** Hand hygiene compliance by opportunity at baseline and post-intervention

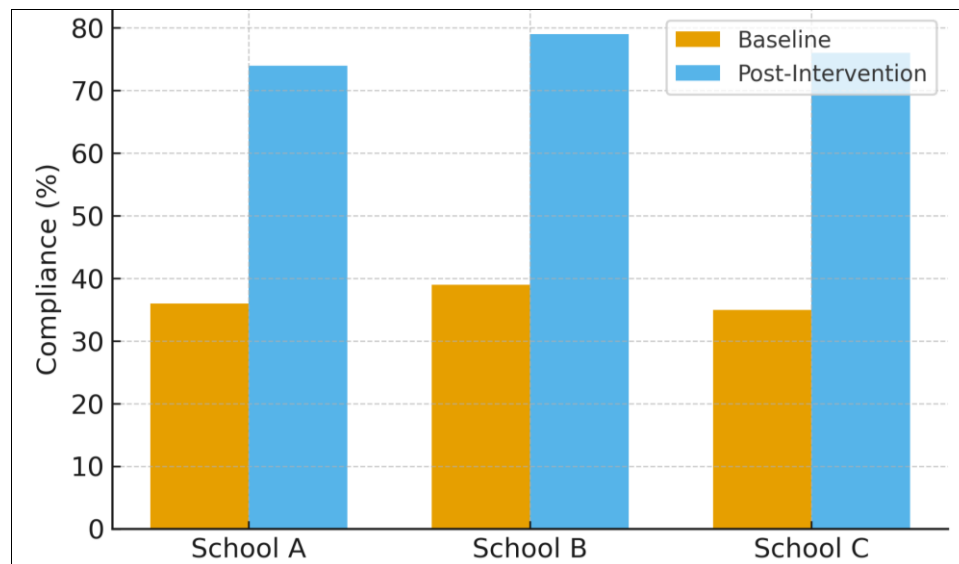


Fig 2: Overall hand hygiene compliance by school at baseline and post-intervention

Discussion

The findings of this localized intervention research demonstrate that community nurses play a pivotal role in significantly improving hand hygiene compliance among school-age children. The marked increase in overall compliance from 36.3% at baseline to 74.5% post-intervention mirrors trends reported in global hand hygiene research, underscoring that structured, repetitive, and nurse-led educational interventions can effectively modify hygiene-related behaviours in children [1, 4, 11]. The largest improvements were observed after toilet use and after outdoor play, which were initially the weakest compliance points. These gains align with earlier studies that identified these moments as the highest risk for pathogen exposure and the least adhered to by children when appropriate guidance is absent [2, 8, 14]. The intervention's success supports the principle that children learn more effectively through hands-on demonstrations and visual cues, rather than lectures alone, a finding consistent with established behavioural reinforcement models used in school environments [6, 12].

The use of visual prompts such as posters, hand hygiene boards, and illustrated reminders contributed substantially to compliance gains. Prior research consistently highlights that children respond more effectively to pictorial cues and repeated environmental signalling, which strengthens memory and habit formation [12, 14]. The integration of peer modelling and supervised practice sessions further reinforced skill acquisition, resonating with previous findings indicating that interactive, peer-supported learning fosters greater behavioural adoption compared to passive learning approaches [5, 10]. The contribution of community nurses in supervising these activities was essential, as their clinical experience and communication skills enable them to deliver health messages in a child-centered and easily comprehensible manner [7]. Their involvement also provided continuity, ensuring that reinforcement occurred at regular intervals, which is critical for habit consolidation.

Inter-school comparisons revealed consistently high post-intervention compliance, suggesting that the nurse-led model is adaptable and effective regardless of school size, staffing levels, or classroom dynamics. This reflects the scalability of similar programs documented in multi-site school intervention studies where nurse-driven educational

models produced uniform improvements in hygiene compliance [6, 9, 13]. The absence of significant variation in improvement across the three schools also indicates that the standardized materials and structured approach used were practical and sufficiently flexible for different settings. This reinforces the feasibility of integrating community nurses into broader school health programs, particularly in low-resource contexts where teacher capacity for health education may be limited [7, 11].

Equally important is the alignment of the research's results with established evidence that improved hand hygiene directly reduces the transmission of respiratory and gastrointestinal infections in school environments [2, 4, 8]. By elevating compliance, the intervention contributes to the prevention of common communicable illnesses, supporting global recommendations that emphasize hand hygiene as a cornerstone of public health protection [1, 3, 11]. The combination of demonstration-based teaching, visual reinforcement, and routine monitoring illustrated in this research demonstrates a synergistic effect, enabling not only immediate improvements but also building the foundation for long-term hygiene literacy among children [10, 12].

Overall, the results underscore that community nurses are uniquely positioned to influence child health behaviours and close the practice gap that persists despite widespread health messaging. Their integration into school-based hygiene programs can create sustainable behavioural change, aligning well with previous findings that structured, repeated, and context-specific interventions are the most effective in promoting consistent hand hygiene among children [5, 6, 13, 14].

Conclusion

The findings of this research clearly demonstrate that community nurses can significantly elevate hand hygiene compliance among school-age children when they are positioned at the center of structured, interactive, and reinforcement-based educational interventions. The consistent improvement observed across all hygiene opportunities from before meals to after toilet use and outdoor play reflects a meaningful shift in children's behaviour, indicating that well-planned, nurse-led initiatives can effectively transform hygiene habits in school

environments. Beyond increasing compliance percentages, the intervention nurtured a deeper understanding among children regarding the importance of handwashing as a protective health behaviour, contributing to the broader goal of reducing preventable infections and promoting healthier school communities. These outcomes highlight the necessity of positioning community nurses as key facilitators in school health programs, not only for hygiene promotion but also for nurturing long-term health literacy in young learners. Based on these findings, several practical strategies can strengthen future initiatives. Schools should implement recurring hand hygiene demonstration sessions led by community nurses to ensure continuous reinforcement rather than one-time educational activities that fade over time. Classroom environments should integrate child-friendly visual cues such as posters, step-by-step handwashing charts, and colourful hygiene boards to sustain behavioural reminders throughout the school day. Regular monitoring using simple observational checklists can help track compliance and identify areas needing intensified focus, enabling early corrective measures. Encouraging peer-modelling, where selected students act as hygiene champions, can further boost engagement and normalize positive hygiene behaviours among classmates. Practical improvements to infrastructure, including ensuring adequate availability of soap, functioning taps, and accessible handwashing stations, are essential for supporting compliance, particularly before meals and after outdoor play. Schools may also consider incorporating hand hygiene activities into morning assemblies or weekly health sessions to increase visibility and reinforce collective responsibility. Engaging parents through brief communication notes or community meetings can extend the impact of hygiene education into the home environment, promoting consistent behaviour across settings. Ultimately, sustained collaboration among schools, teachers, parents, and local health workers anchored by the leadership of community nurses will be crucial for maintaining high hygiene standards and safeguarding children against common infectious diseases. By embracing these practical measures and prioritizing continuous, well-supported hygiene education, schools can create healthier learning spaces and empower children with lifelong habits essential for their well-being.

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