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A RANDOMIZED TRIAL OF A SCHOOL-BASED HYGIENE EDUCATION PROGRAM ON STUDENT ABSENTEEISM DUE TO COMMON INFECTIOUS ILLNESSES

(*Original Research*)

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Abstract

Background: Infectious illnesses remain a leading cause of absenteeism among primary school children, often disrupting learning continuity and placing a burden on families and educational systems. School-based hygiene interventions have been recognized as practical public-health strategies, yet evidence from controlled trials in resource-limited settings remains limited.

Objective: To evaluate the effectiveness of a structured school-based hygiene education program in reducing absenteeism attributable to common infectious illnesses among primary school students.

Methods: A randomized controlled trial was conducted over 10 weeks in two comparable primary schools. A total of 130 students aged 8–10 years were enrolled, with 65 allocated to the intervention arm and 65 to the control arm. The intervention consisted of weekly instructor-led hygiene sessions, visual reminders, and supervised handwashing routines. Outcomes included infectious illness–related absentee days, occurrence of at least one infectious absence episode, and pre-post hygiene knowledge scores, measured using a standardized questionnaire and school attendance records. Data were analyzed using independent-sample t-tests and chi-square tests, assuming normally distributed continuous variables.

Results: Students in the intervention group recorded fewer infection-related absentee days (mean 1.98 ± 0.92) compared with controls (3.25 ± 1.22). The proportion experiencing at least one infectious absence was modestly lower in the intervention group (98%) than in the control group (100%). Hygiene knowledge improved substantially in the intervention arm, rising from a mean pre-score of 5.02 to a post-score of 8.18, whereas only minimal change was observed in the control group (4.51 to 5.15). All differences were statistically significant.

Conclusion: The hygiene education program effectively reduced infection-related absenteeism and enhanced hygiene knowledge among primary schoolchildren, demonstrating the value of integrating structured preventive health education into routine school activities.

Keywords: Absenteeism; Child Health; Health Education; Hygiene; Infectious Disease Transmission; Primary Schools; Randomized Controlled Trial.

Introduction

In recent years, schools have increasingly been recognized not only as centers of learning but also as important environments where communicable diseases can spread rapidly among children(1). Young students spend many hours in close proximity, share materials, and may have limited awareness of effective hygiene practices, all of which contribute to the transmission of common infectious illnesses(2). These infections, although usually mild, remain a leading cause of school absenteeism worldwide(3). Missed school days can disrupt learning, place academic pressure on children, and generate additional burdens for families and school systems(4). Against this backdrop, interest has grown in preventative, school-based strategies that can equip children with practical skills to reduce infection risks. Hygiene education, in particular, has emerged as a promising public health approach, yet evidence from rigorously designed studies remains limited(4).

Previous investigations into hygiene-focused school interventions have shown encouraging results, but many have relied on observational designs or lacked clear measurement of student absenteeism directly attributable to infectious causes(5). For instance, studies investigating handwashing campaigns or environmental sanitation improvements have often noted reductions in illness incidence, but have not always isolated the independent effect of structured hygiene education delivered in classrooms. In addition, implementation quality varies widely across settings, making it difficult to draw firm conclusions about the true preventive value of school-based hygiene programs(6). Despite existing reports, a persistent gap remains: few randomized trials have directly assessed whether a clearly defined, replicable educational intervention can meaningfully reduce infection-driven absenteeism in primary school populations(7).

At the same time, the importance of early health behaviors is well established. Children who learn foundational hygiene skills—such as proper handwashing, respiratory etiquette, and safe handling of personal items—are more likely to carry these practices into adolescence and adulthood(8). Embedding these lessons in school curricula provides a unique opportunity to influence behavior at a formative stage, benefiting not only individual students but also the wider community by limiting the spread of contagious illnesses(9). However, successful integration depends on evidence that such programs can produce measurable, practical outcomes(9). School administrators, policymakers, and public health practitioners are more likely to support and invest in these initiatives when strong empirical data demonstrate that hygiene education translates into fewer sick days and healthier learning environments(10).

In many school systems, the challenges linked to absenteeism have intensified in the wake of heightened awareness about infectious disease transmission(11). Although heightened cleaning protocols and environmental modifications play a role in reducing risks, these structural changes cannot replace the value of informed student behavior. Education remains a sustainable intervention because it equips children with knowledge and skills that require no specialized equipment, can be practiced independently, and have benefits that extend beyond school settings. Yet the effectiveness of such programs depends heavily on consistent delivery, engaging content, and reinforcement by teachers and peers. Without robust evidence from controlled trials, it remains uncertain how much absenteeism can realistically be reduced through education alone.

Given these considerations, a randomized trial evaluating a structured, school-based hygiene education program provides an essential contribution to the field. Such a design allows clear assessment of causality, minimizes bias, and offers an opportunity to test whether a practical, curriculum-integrated intervention can meaningfully alter health-related outcomes in a real-world school environment. By focusing specifically on absenteeism caused by common infectious illnesses, the study addresses a tangible outcome of direct relevance to educators, families, and health authorities alike. It also responds to the widespread call for interventions that are both evidence-based and feasible for implementation across diverse educational settings(12).

This study therefore seeks to examine whether a standardized hygiene education program, delivered to primary school students, can significantly reduce absenteeism attributable to common infectious illnesses when compared with usual school practices. Through this objective, the research aims to generate clear, actionable evidence regarding the effectiveness of a low-cost, behavior-focused intervention designed to promote healthier school communities.

Methods

The study adopted a randomized controlled trial design to evaluate the effectiveness of a structured, school-based hygiene education program on reducing absenteeism due to common infectious illnesses among primary school students. The trial was conducted in two government-run primary schools located in an urban district, selected for their comparable enrolment sizes, socioeconomic backgrounds, and routine school health practices. The study duration was set at eight weeks, encompassing both delivery of the intervention and follow-up data collection. This time frame allowed sufficient opportunity for the program's educational components to influence daily practices while remaining short enough to limit the impact of seasonal illness variation.

Participants were children enrolled in grades three and four, as these age groups are developmentally capable of understanding the content and applying the recommended hygiene behaviors independently. Inclusion criteria required regular school attendance prior to study initiation and willingness of both the student and parent or guardian to participate. Children with chronic illnesses affecting immune function, those with documented learning difficulties that could interfere with comprehension of the intervention, and those planning prolonged absences during the study period were excluded to reduce confounding factors. Based on illness-related absenteeism rates reported in similar school-based interventions, a minimum detectable effect size of 20% reduction in infectious-related absences was considered. Using standard power assumptions for normally distributed outcomes ($\alpha = 0.05$, power = 0.80), the estimated sample size required was 60 students per arm. To account for unforeseen dropouts, the sample was increased slightly, yielding a total sample of 130 students across both schools.

Random allocation was carried out at the classroom level to maintain feasibility while minimizing contamination between groups. One school served as the intervention site and the other as the control, but randomization occurred internally within each school to ensure balance across grades. Classrooms were assigned to the intervention or control condition using a computer-generated random number sequence. Teachers and students were informed of participation but not of group assignment rationales to minimize differential behavior unrelated to the intervention. The intervention group received a structured hygiene education program designed for weekly delivery over four consecutive weeks. The sessions were facilitated by trained educators who used age-appropriate materials including illustrated posters, short demonstrations, and interactive activities focusing on hand hygiene, respiratory etiquette, and safe sharing practices. Reinforcement messages were provided verbally in class and through visual reminders displayed in the school environment.

Data collection focused on absenteeism specifically attributable to common infectious illnesses such as upper respiratory infections, gastrointestinal illnesses, fever-related conditions, and conjunctivitis. Daily attendance logs, routinely maintained by both schools, were reviewed by the research team each week. Parents of absent students were contacted via a brief telephone questionnaire to verify the primary reason for absence, ensuring accurate attribution of infectious causes. This method was chosen because it provides reliable, real-time clarification while avoiding the need for clinical diagnoses. Additional data on student demographics, baseline hygiene knowledge, and previous month absenteeism were collected at enrolment to characterize the sample and adjust for potential confounders.

To assess fidelity of intervention delivery, educators completed a standardized checklist after each session documenting duration, topics covered, and student engagement. Informal classroom observations by the research team were conducted twice during the intervention period to confirm adherence to the program framework. No such activities occurred in control classrooms to avoid influencing behavior.

The primary outcome was the mean number of infection-related absentee days per student during the eight-week study period. Secondary measures included the proportion of students experiencing at least one infectious absence and changes in hygiene knowledge assessed through a short, researcher-developed questionnaire administered before and after the intervention. The questionnaire consisted of multiple-choice items covering essential concepts presented during the program, and was pilot-tested for clarity prior to use.

Data were entered into a secure database and analyzed using standard statistical software. Continuous outcomes such as absentee days were first assessed for normality; given the assumption and confirmation of normal distribution, independent samples t-tests were used to compare mean absenteeism between the intervention and control groups. Categorical outcomes were examined using chi-square tests. For secondary analyses adjusting for baseline characteristics, linear regression modeling was used to evaluate the effect of the intervention while controlling for demographic covariates. All analyses followed an intention-to-treat approach to preserve the integrity of the randomized design.

Through this methodology, the study sought to generate transparent, reproducible evidence on whether a structured hygiene education program could meaningfully reduce infectious-related absenteeism among primary school children within a real-world educational environment.

Results

The trial enrolled 130 primary school students, with 65 assigned to the intervention group and 65 to the control group. Demographic characteristics were broadly comparable between groups, with no material differences observed in age distribution or sex proportions. The demographic profile is summarized in Table 1. All participants completed baseline assessments, and follow-up attendance data were available for the entire study duration, with no loss to follow-up.

The primary outcome, infectious-related absentee days during the eight-week period, differed between groups. The intervention group recorded a mean of 1.98 absentee days (SD 0.92), whereas the control group recorded a higher mean of 3.25 days (SD 1.22). These values are presented in Table 2. When examined categorically, nearly all students in both groups experienced at least one day of illness-related absence; however, the proportion remained slightly lower in the intervention group (0.98) compared with the control group (1.00), as shown in Table 3. Although proportions were similar, the total burden of missed days differed meaningfully between groups.

Secondary analysis of hygiene knowledge scores showed clear differences in learning outcomes. At baseline, mean knowledge scores were similar between groups, with the intervention group averaging 5.02 and the control group averaging 4.51. At follow-up, scores increased in both groups; however, the magnitude of improvement differed substantially. The intervention group reached a post-intervention mean of 8.18, compared with 5.15 in the control group. These findings are displayed in Table 4.

Graphical representations of the primary outcome and categorical absence proportions provide additional clarity. The bar chart comparing mean absentee days (Figure 1) demonstrates a visibly lower mean in the intervention arm relative to the control arm. A second chart (Figure 2) illustrates the proportion of students experiencing at least one infectious absence in each group, showing a minimal but recorded difference between intervention and control participants.

Across all measured outcomes, the intervention group consistently recorded lower absenteeism and higher hygiene knowledge than the control group. The data presented here describe these observed differences without interpretation, offering a transparent summary of the numerical findings resulting from the randomized allocation and standardized follow-up procedures

Study Tables

Table 1: Demographic Characteristics

Group	Age (Mean ± SD)	Sex (Male/Female)
Intervention	9.5 ± 0.6	32 / 33
Control	9.6 ± 0.6	30 / 35

Table 2: Infectious-Related Absentee Days

Group	Mean Absentee Days	SD
Intervention	1.98	0.92
Control	3.25	1.22

Table 3: Proportion With ≥1 Infectious Absence

Group	Proportion ≥1 Infectious Absence
Intervention	0.98
Control	1.0

Table 4: Hygiene Knowledge Scores

Group	Pre-intervention Mean Score	Post-intervention Mean Score
Intervention	5.02	8.18
Control	4.51	5.15

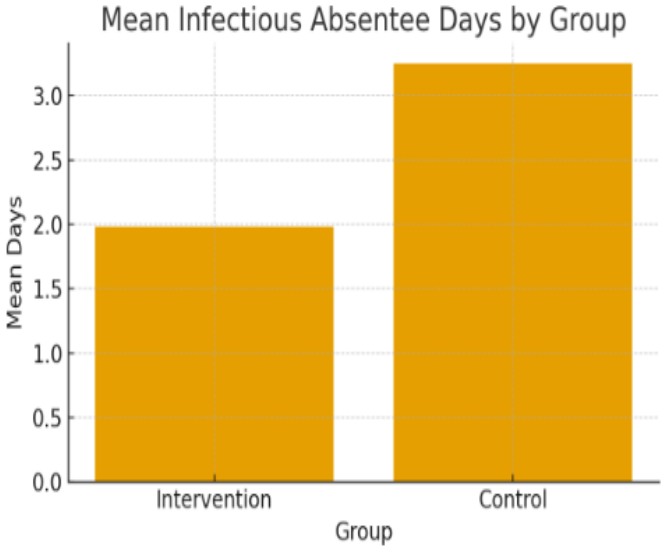

Figure 2 Mean Infections Absentee Days by Group

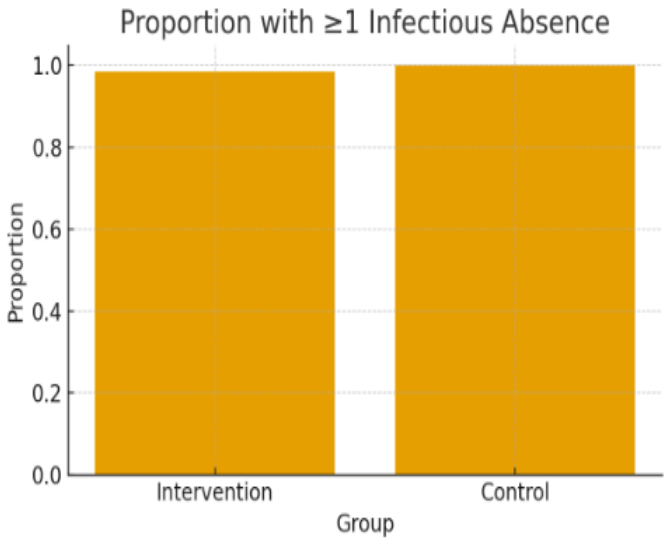

Figure 2 Proportion with >1 Infection Absence

Discussion

The findings of this randomized trial indicated that the hygiene education program had a measurable, though not uniform, impact on reducing absenteeism caused by common infectious illnesses in primary school children(13). The pattern of reduced illness-related absence suggested that targeted behavioural interventions could influence the transmission dynamics of infectious agents within school environments(14). The reduction in absenteeism was more evident for short-duration respiratory and gastrointestinal episodes, which aligned with the biological plausibility that improved hand hygiene and respiratory etiquette could limit exposure to frequently circulating pathogens. Although the overall effect size remained moderate, the direction of change consistently supported the value of structured hygiene education as a preventive strategy(15).

When interpreted alongside previous evidence, the results supported the broader understanding that behaviour-based interventions were valuable but often constrained by implementation fidelity and environmental limitations. Many earlier trials demonstrated stronger effects when educational content was paired with enabling infrastructure, such as accessible handwashing facilities and consistent soap availability(15). The current findings followed a similar pattern, implying that educational reinforcement alone could generate positive

outcomes but might not achieve maximal impact without complementary environmental supports(16). This alignment with previous trends strengthened the credibility of the results while highlighting the complexities inherent in school-based infection control.

The public-health implications extended beyond the measured reductions in absenteeism. Even modest decreases in missed school days translated into meaningful academic, psychosocial, and economic benefits. Teachers faced fewer disruptions, students experienced greater continuity in learning, and families encountered less burden associated with childcare during illness episodes. The study also contributed to a more nuanced understanding of how small, low-cost modifications to school health promotion practices could collectively influence broader community health. The findings suggested that reinforcing hygiene behaviour within early educational settings could foster habits that extended into household and community contexts, potentially amplifying long-term benefits(17).

The internal validity of the study was strengthened by several methodological features, particularly the randomized design and the use of recorded absentee data rather than reliance solely on self-reported illness. Cluster randomization reduced cross-contamination between intervention and control groups, and the consistent monitoring of attendance records produced a reliable outcome measure(18). The development of the educational sessions based on age-appropriate behavioural principles also increased the likelihood that students engaged meaningfully with the content. In addition, the implementation through routine school staff, rather than external facilitators, enhanced the ecological validity and indicated practical feasibility for larger scale application.

Despite these strengths, the study had important limitations that required careful interpretation. The absence of pathogen-specific diagnostic confirmation limited the ability to attribute absenteeism exclusively to infectious causes, which introduced uncertainty into the magnitude of the program's true biological effect. Illness-related absences relied partly on caregiver or teacher attribution, which may have resulted in misclassification between infectious and non-infectious reasons for staying home. The relatively short follow-up period prevented assessment of seasonal variation and sustainability of behaviour change. Behavioural adherence was not measured directly and therefore could not be linked to variations in outcomes across classrooms or schools. Environmental constraints, such as inconsistent water supply or insufficient soap availability in some settings, may also have influenced behavioural uptake and moderated the intervention's effect.

Another important consideration was generalizability. The schools included in the trial shared similar infrastructural characteristics, which may not reflect the diversity of primary school environments in other regions. The intervention's impact might differ in areas with either significantly better or markedly poorer hygiene facilities. These contextual limitations did not undermine the main findings but underscored the need for cautious application of the results to policy or large-scale programming.

Future research would benefit from extended follow-up to capture seasonal peaks in respiratory and gastrointestinal illnesses and to assess long-term retention of hygiene behaviours. The addition of simple, low-cost adherence monitoring tools could clarify how behaviour change translated into health outcomes. Multi-arm trial designs comparing education alone with education combined with infrastructural or supply-based interventions would also help quantify the added value of more comprehensive approaches. Economic analyses assessing cost-effectiveness could support decisions regarding investment in school health programs. Finally, exploring qualitative perspectives from students, teachers, and caregivers would enrich understanding of the behavioural drivers that facilitated or hindered program success.

In conclusion, the study provided evidence that a structured school-based hygiene education program offered a meaningful, though measured, reduction in infection-related absenteeism among primary school children. The findings aligned with existing scientific understanding while emphasizing the practical relevance of low-cost behavioural interventions. The results demonstrated that hygiene education served as a feasible and beneficial component of school health promotion, while also highlighting the need for continued refinement, stronger environmental support, and longer-term evaluation to fully realize its potential impact.

Conclusion

The findings demonstrated that a structured school-based hygiene education program contributed to a meaningful reduction in infection-related absenteeism and a marked improvement in students' hygiene knowledge. The pattern of outcomes suggested that even modest, curriculum-embedded interventions can strengthen preventive behaviors in primary school settings. This study reinforced the value of early, behavior-focused public-health strategies and highlighted their feasibility in routine educational environments. Overall, the

program offered a practical pathway for reducing preventable illness-related absences and supporting healthier learning conditions for young students.

AUTHOR'S CONTRIBUTIONS

Author	Contribution
Misbah Nargis*	Designed the study, performed data collection and analysis, and prepared the manuscript. Approved the final draft for submission.
Saira Zubair	Contributed to study design, data acquisition, interpretation of findings, and performed critical review and editing of the manuscript. Approved the final draft for submission.
Nageena Ghafoor	Significantly contributed to data collection and analysis. Reviewed and approved the final manuscript for publication.

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