



Interactive Hygiene Interventions: Preventing Respiratory Infections Through Student-Centered ENT Health Education

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Abstract:

This study aimed to improve students' knowledge of Clean and Healthy Living Behavior (PHBS), particularly related to ear, nose, and throat (ENT) hygiene, and to identify remaining knowledge gaps among students in an Islamic boarding school environment. The study used a descriptive community service approach on 23 May 2026, involving 29 male junior and senior high school students. The activities included a 10-item pre-test, interactive health education using PowerPoint presentations, small-group Focus Group Discussions (FGDs) supported by educational booklets, general health and ENT examinations, and a post-test. We analyzed the data descriptively using mean scores and narrative interpretations of FGD findings. The results showed the mean knowledge score increased from 70 to 90, indicating a 20-point improvement after the intervention. The FGDs revealed three remaining knowledge gaps: safe ear-cleaning practices, proper nasal hygiene, and dietary factors related to throat irritation. These findings suggest that interactive, contextually appropriate health education approaches can effectively improve health literacy among students in communal educational settings. Furthermore, health educators and Islamic boarding schools need to collaborate continuously to develop sustainable, targeted, preventive health promotion programs.

INTRODUCTION

Islamic boarding schools are residential educational environments where students live, study, worship, and carry out daily activities in shared spaces. This communal system provides important opportunities for social interaction, discipline, and character development, but it also creates health challenges that deserve broader community attention (Ilmi, 2024; Rudiana et al., 2026). Close interpersonal contact, shared facilities, and continuous interaction may facilitate the transmission of communicable diseases, particularly respiratory tract infections. Personal hygiene and environmental cleanliness therefore become essential components of maintaining students' health and ensuring a safe learning environment (Adzimah, 2024; Manshur, 2026). This issue matters not only for individual students but also for the wider school community because unhealthy behaviors can affect peers, educators, families, and surrounding communities. Strengthening health literacy and preventive practices can help students recognize health risks and adopt appropriate behaviors before illness occurs (Friska et al., 2022; Lyhne et al., 2025). Consequently, health promotion in

residential educational settings is an important community-based strategy for protecting adolescent health, supporting educational continuity, and building healthy habits that may persist beyond the boarding school environment.

A major problem in communal educational environments is the gap between knowing about healthy living and consistently applying it in daily activities. Adolescents may understand general concepts of cleanliness but still practice inappropriate behaviors related to personal hygiene, environmental sanitation, nutrition, and early recognition of illness (Khofsah & Rozi, 2025; Shoha & Rasyidah, 2026). This problem is particularly relevant to ear, nose, and throat (ENT) health because these organs are directly involved in hearing, communication, respiration, and swallowing. Incorrect ear-cleaning techniques, inadequate nasal hygiene, and throat-irritating dietary habits may increase the risk of discomfort and infection. Limited awareness may also cause students to ignore mild symptoms or delay appropriate preventive actions (Ivcevic et al., 2021; Tian & Guo, 2024). When these practices occur collectively in a residential environment, individual health problems can become community concerns. Therefore, health promotion should address not only general knowledge but also specific everyday practices that students can understand, discuss, and apply independently in their communal living environment.

The relevance of ENT health promotion becomes increasingly apparent when considering students' daily routines in residential educational settings. Students spend substantial amounts of time together in classrooms, dormitories, prayer areas, dining spaces, and other shared facilities (Hasanah et al., 2024; Ma et al., 2023; Qin et al., 2020). These routines require students to maintain personal hygiene and recognize behaviors that may contribute to health problems. Preliminary observations at the participating boarding school indicated that students' understanding of Clean and Healthy Living Behavior (PHBS), particularly regarding ENT hygiene, was not yet optimal. Some students still needed clearer information on safe ear cleaning, appropriate nasal hygiene, and dietary choices linked to throat irritation (Sulaiman et al., 2024; Mukdad & Shapiro, 2022). This situation shows that health promotion should adapt to the target community's actual needs and experiences rather than being delivered only as general health information. Addressing these knowledge gaps can provide immediate educational benefits while also encouraging students to take greater responsibility for their own health (Jourdan et al., 2021; Rizvi, 2022). In the longer term, improved health awareness may contribute to a cleaner, healthier, and more supportive communal environment.

Previous health promotion initiatives in educational and community settings have generally shown the value of providing adolescents with structured information on healthy living practices (Braun & Clarke, 2023; H. Tian & Liu, 2022). Educational interventions can increase knowledge by systematically introducing health concepts, preventive behaviors, and practical recommendations. However, conventional health education that relies primarily on one-way lectures may offer limited opportunities for students to share their experiences, clarify misconceptions, or discuss health problems they encounter in everyday life (Chen et al., 2024; Sanchez-Gomez et al., 2021). This program addresses this limitation by combining interactive presentations with educational booklets and small-group Focus Group Discussions (FGDs). This approach positions students as active participants in the learning process rather than passive recipients of information. Visual materials provide accessible explanations, while group discussions give students opportunities to ask questions and share experiences (Bungawati & Rahmadani, 2023; Kahadiah et al., 2023). This combination is particularly

relevant for adolescent learners because health literacy develops not only through receiving information but also through interaction, reflection, and relating information to personal practices.

Although previous educational interventions have established the importance of health education and active learning, several aspects remain insufficiently addressed in community-based health promotion within Islamic boarding schools. Many programs focus broadly on Clean and Healthy Living Behavior without specifically examining ENT-related hygiene practices and the particular knowledge gaps experienced by students. In addition, educational activities are often evaluated through general participation or knowledge outcomes without connecting the learning process to specific issues identified through direct discussion with participants (Harefa et al., 2025; Puspitarini et al., 2026). The present program addresses this gap by integrating pre-test and post-test assessment with interactive education, educational booklets, FGDs, and general health and ENT examinations. This combination enables the program to identify knowledge changes while also revealing areas that require further attention. It contributes to developing a more contextualized health promotion model in which educational content, participant discussion, and basic health assessment complement one another (Darimus & Hanif, 2023; Göçen & Döğler, 2025). Such an approach may provide a practical reference for similar community health initiatives in other residential educational settings.

Based on the conditions identified in the field, this community service program addresses insufficient understanding of appropriate ENT hygiene practices among boarding school students. The problem includes limited knowledge of safe ear-cleaning methods, proper nasal hygiene, and dietary factors that may contribute to throat irritation. Another concern is the limited opportunity for students to discuss personal health experiences and clarify misconceptions through interactive learning. Without adequate knowledge, students may continue inappropriate hygiene practices or fail to recognize preventive actions they can incorporate into their daily routines. The program therefore seeks to address the knowledge gap through an educational process that is participatory, accessible, and directly connected to students' living conditions. The problem is not simply a lack of health information but the need to turn information into practical understanding. By identifying specific areas of misunderstanding, the program can provide more targeted health education and lay the groundwork for continued health promotion within the boarding school community.

This community-based health promotion program aimed to improve students' knowledge of Clean and Healthy Living Behavior, with particular emphasis on ear, nose, and throat hygiene, while identifying specific areas of knowledge that require further reinforcement. The program involved male junior and senior high school students and combined several complementary activities, including pre- and post-test assessments, interactive health education using visual presentations and educational booklets, small-group Focus Group Discussions, and general health and ENT examinations. The program's scope therefore extended beyond knowledge delivery to include participant engagement, identification of health-related concerns, and basic assessment of ENT conditions. Through this integrated approach, the program was expected to strengthen students' understanding of practical preventive behaviors and encourage greater attention to personal hygiene in communal living environments. More broadly, the initiative supports the development of health-literate adolescents who can apply appropriate hygiene practices, recognize potential health risks, and contribute to a

healthier boarding school community. The program also provides a foundation for continuous and contextually relevant health promotion activities in similar settings.

RESEARCH METHODS

This community service program employed a participatory and descriptive approach to strengthen students' knowledge of Clean and Healthy Living Behavior (PHBS), particularly regarding ear, nose, and throat (ENT) hygiene and respiratory infection prevention. The program was conducted on 23 May 2026 and involved 29 male students from junior and senior high school levels. The implementation was organized into several sequential activities, beginning with participant registration and a baseline knowledge assessment using a 10-item questionnaire. This was followed by interactive health education delivered through PowerPoint presentations covering appropriate ear cleaning, nasal hygiene, throat care, cough and sneeze etiquette, hand hygiene, and respiratory infection prevention. Participants were then divided into three small groups for Focus Group Discussions (FGDs) and provided with educational booklets. The discussions encouraged active participation, clarified misconceptions, and identified students' experiences and learning needs related to ENT hygiene (Cornish et al., 2023; De Oliveira, 2023). The program also included general health and ENT examinations, including height, weight, and blood pressure measurements, followed by basic ear, nose, and throat examinations. The program provided vitamin supplementation after the examination as part of the health promotion activity.

The program evaluation focused on changes in participants' knowledge and identifying remaining health education needs. The same 10-item questionnaire was administered before and after the educational intervention, and we analyzed the results descriptively by comparing mean pre-test and post-test scores. We documented and summarized FGD findings narratively to identify recurring questions, misconceptions, and specific knowledge gaps about ENT hygiene and respiratory infection prevention. The study also summarized results from general health and ENT examinations to provide an overview of participants' basic health conditions and identify those who might require further medical attention. The combination of pre- and post-test assessments, interactive education, group discussion, and basic health examinations enabled the program to assess immediate changes in health knowledge while identifying areas that required continued reinforcement. This participatory method ensured that activities were not limited to one-way information delivery; it also encouraged students to actively engage with health information and apply it to their daily practices in the boarding school environment.

RESULTS AND DISCUSSION

Results

Participant Characteristics

The community-based health promotion program involved 29 male students from junior and senior high school levels in an Islamic boarding school. Participants were students in Grades VII, VIII, and X. Grade VII and Grade VIII students each accounted for 20.7% of participants. In comparison, Grade X students made up the largest proportion at 58.6%. The participant composition reflected different stages of adolescence, allowing the health education activities to engage students with varying levels of educational experience and daily routines within the boarding school environment.

Table 2 presents the distribution of participants' educational levels. The relatively larger proportion of senior high school students provided a substantial group of older adolescents who could participate actively in the educational and discussion sessions. At the same time, including junior high school students ensured the program addressed health literacy among younger adolescents who also experienced the communal living conditions of the boarding school.

Table 1. Characteristics of Participants' Educational Level

Grade Level	Number of Participants	Percentage
Grade VII	6	20.7%
Grade VIII	6	20.7%
Grade X	17	58.6%
Total	29	100%

Table 1 shows that participants were predominantly Grade X students, accounting for more than half of the total, while Grade VII and Grade VIII students contributed equally. This distribution matters when interpreting program outcomes because differences in age and educational experience may affect students' ability to understand and discuss health information. Nevertheless, students from multiple educational levels participated, showing that the program reached adolescents with different learning backgrounds within the same community.

Implementation of the Community-Based Health Education Program

The program was implemented through a sequence of complementary health promotion activities, beginning with participant registration and baseline knowledge assessment, followed by interactive health education, focus group discussions (FGD), general health and ENT examinations, and post-intervention evaluation. The educational session used PowerPoint presentations covering Clean and Healthy Living Behavior (PHBS), ear hygiene, nasal hygiene, throat care, cough and sneeze etiquette, hand hygiene, and respiratory infection prevention. The FGD also provided educational booklets to reinforce the information presented and give participants material to review after the activity.

The interactive format encouraged active participation. During the FGD, participants were divided into three small groups and were encouraged to ask questions and share their experiences concerning daily ENT hygiene. This activity revealed that participants were particularly interested in practical issues, including the appropriate use of cotton buds, methods of maintaining nasal hygiene, and dietary factors associated with throat irritation. The discussion therefore served not only as an educational activity but also as a way to identify specific concerns that might not have emerged from the questionnaire alone.

A physician complemented the program with general health and ENT examinations. The examination included measurements of height, weight, and blood pressure, followed by a basic ear, nose, and throat examination. After the examination, the physician provided vitamin supplementation as part of the health promotion activities. The integration of education, discussion, and basic health assessment allowed the program to address health promotion from several complementary dimensions, combining knowledge development with opportunities for participants to receive basic health information based on their conditions.



Figure 1. Community-Based Health Education and Health Examination Activities.

Figure 1 illustrates the main stages of the community-based health promotion program. The documentation captures the delivery of interactive educational material, participant involvement, and the implementation of general health and ENT examinations. Together, these activities show that the program was designed as an integrated community intervention rather than a single lecture. The visual evidence also reflects direct interaction between facilitators, health professionals, and students throughout the program.

Knowledge Assessment Before and After the Intervention

Participants' knowledge regarding Clean and Healthy Living Behavior (PHBS), particularly related to ENT hygiene and respiratory infection prevention, was assessed using a 10-item questionnaire administered before and after the educational intervention. The mean pre-test score was 70, indicating that participants entered the program with moderate baseline knowledge. Following the educational activities, the mean post-test score increased to 90. The 20-point difference indicates an improvement in participants' average knowledge scores after participating in the program.

Table 2. Knowledge Assessment Before and After the Educational Intervention

Activity	Description
Pre-test	A 10-item questionnaire was administered to assess participants' initial knowledge.
Health Education	Interactive health education was delivered using PowerPoint presentations.
Focus Group Discussion	Participants were divided into small groups and engaged in discussions supported by educational booklets.
General Health and ENT Examination	Participants received general health and ear, nose, and throat examinations conducted by a physician.
Vitamin Supplementation	Vitamins were provided as part of the health promotion activity.
Post-test	The same questionnaire was administered after the intervention to assess changes in knowledge.

Table 2 demonstrates the change in the participants' mean knowledge scores between the two assessments. The increase from 70 to 90 represents a 20-point difference, suggesting that participants demonstrated greater understanding after completing the educational activities. Because the evaluation was descriptive and did not include inferential statistical testing or a comparison group, the finding should be interpreted as an observed change in knowledge rather than definitive evidence of a

causal intervention effect. Nevertheless, the result indicates that the educational approach was associated with an immediate improvement in participants' understanding of the topics presented.

The improvement may reflect the combination of interactive presentations, visual learning materials, educational booklets, and group discussion. Rather than receiving information through a one-way lecture, participants could ask questions, discuss practical situations, and connect the material to their daily experiences. This approach is particularly relevant in a boarding school environment, where students regularly encounter shared facilities and communal activities that require consistent personal hygiene practices. The results therefore suggest that health promotion activities may be more meaningful when opportunities for interaction and practical clarification accompany educational information.

Participants' Knowledge Gaps Identified Through Focus Group Discussion

Although the post-test results showed a higher mean knowledge score, the FGD revealed several practical knowledge gaps. Participants generally understood the importance of personal hygiene but demonstrated uncertainty when discussing specific ENT hygiene practices. The discussion highlighted three major areas: ear hygiene, nasal hygiene, and throat health. These findings show the value of combining quantitative knowledge assessment with qualitative discussion because an overall knowledge score may not fully capture specific misconceptions or areas of uncertainty participants experience.

The first knowledge gap concerned ear hygiene, particularly the safe use of cotton buds. Participants asked how deeply they could insert cotton buds into the ear and which parts of the ear were safe to clean. These questions indicated that general awareness of ear cleanliness did not necessarily translate into accurate knowledge of safe cleaning practices. The second gap involved nasal hygiene, with participants asking when to clean the nose and how to incorporate this practice into their daily routines, including during ablution. The third gap concerned throat health, particularly the relationship between spicy foods, chili sauce, and throat irritation. Participants' questions suggested that they needed clearer explanations about dietary factors that may be associated with throat discomfort.

Table 3. Knowledge Gaps Identified During the Focus Group Discussion

Knowledge Area	Knowledge Gap Identified
Ear Hygiene	Participants had limited understanding of safe ear-cleaning practices, particularly regarding the appropriate use of cotton buds.
Nasal Hygiene	Participants required further clarification regarding proper nasal hygiene practices, including hygiene practices related to ablution (wudu).
Throat Health and Diet	Participants had questions about dietary factors that may contribute to throat irritation and discomfort.

Table 3 summarizes the specific issues identified during the FGD and shows that participants' educational needs focused on practical application rather than a complete lack of general health knowledge. The questions participants raised provide useful information for designing subsequent health promotion activities because they identify topics that require more detailed explanation. The findings also show that FGD can complement pre-test and post-test assessments by revealing misconceptions and uncertainties that may remain even when overall knowledge scores improve.

Together, the quantitative and qualitative findings provide a more comprehensive picture of the program's immediate outcomes. The 20-point increase in the mean knowledge score indicates an observable improvement following the educational activities, while the FGD findings demonstrate that some practical aspects of ENT hygiene still require reinforcement. This distinction matters for community service programs because increased knowledge does not automatically mean participants have adopted appropriate health behaviors. Therefore, continued education, repeated practice, and follow-up monitoring are needed to determine whether the knowledge gained through the program translates into sustained daily practices.

Overall, the program demonstrates the practical value of integrating interactive health education with FGD and basic health examinations in a communal educational setting. The activities gave students opportunities to learn about health, discuss their concerns, and receive basic health services within a single community-based intervention. The findings also suggest that future health promotion should focus more strongly on practical self-care behaviors, particularly safe ear cleaning, appropriate nasal hygiene, and healthy practices for maintaining throat health. Continued, contextually relevant health promotion may reinforce these practices and support a healthier boarding school environment.

Discussion

The findings of this community-based health promotion program show an increase in participants' mean knowledge scores from 70 on the pre-test to 90 on the post-test, along with several specific knowledge gaps identified through Focus Group Discussions (FGDs). This finding aligns with previous literature emphasizing the role of health education in strengthening health literacy and supporting students' understanding of healthy living practices (Gülşen et al., 2025; Leonita et al., 2025). Health education provides individuals with relevant knowledge that can guide their awareness and decision-making regarding personal and environmental health. The observed increase in knowledge therefore supports the view that structured educational interventions can provide an important foundation for improving health-related understanding among students living in communal environments. However, the present finding should be interpreted as a descriptive change in knowledge rather than evidence of a causal effect, because the program did not employ a control group or inferential statistical testing.

The use of interactive health education through PowerPoint presentations and small-group FGDs, supported by educational booklets, also aligns with literature highlighting the value of participatory, learner-centered approaches in health promotion. Conventional one-way health education may deliver information efficiently, but interactive approaches give participants opportunities to ask questions, share personal experiences, and clarify misconceptions. The FGD findings in this program demonstrate this function particularly clearly, as participants raised questions concerning safe ear cleaning, nasal hygiene, and dietary factors associated with throat irritation. These findings are consistent with the broader concept of health literacy, in which knowledge is not limited to receiving information but also involves understanding and interpreting health information in everyday contexts (Osborne et al., 2022; Rosário et al., 2024; Van Kessel et al., 2022). However, the specific knowledge gaps identified in this program suggest that general health education may not sufficiently address practical ENT-related concerns students encounter in daily life.

The findings have several theoretical implications for community health promotion. First, they reinforce the importance of health literacy as a component of preventive health education, particularly in communal educational settings where

students share living spaces and daily routines. Second, combining quantitative assessment with qualitative exploration shows that changes in knowledge scores alone may not fully capture participants' learning needs (Liu et al., 2026; Nelson et al., 2022; Tavakoli et al., 2022). Although the post-test mean score was higher, the FGDs revealed specific topics that participants still found unclear. This suggests that health promotion can benefit from an integrated perspective in which measurable knowledge changes are complemented by qualitative identification of misconceptions, questions, and contextual needs. Theoretically, the program therefore supports viewing health education as an interactive process of knowledge development rather than merely transferring health information.

Practically, the findings suggest that health promotion activities for students should combine structured health education with opportunities for direct interaction and clarification. Educational materials such as booklets can serve as supporting resources that let participants revisit information beyond the education session, while FGDs can help facilitators identify topics that need further explanation. Identifying questions about cotton-bud use, nasal hygiene, and dietary factors also provides practical guidance for designing subsequent educational materials. Rather than relying exclusively on broad PHBS messages, future sessions can incorporate specific demonstrations and examples related to ENT hygiene and other health concerns that are relevant to students' routines. General health and ENT examinations further provide an opportunity to connect educational messages with participants' actual health conditions. However, examination findings in this program should be understood as descriptive rather than diagnostic evidence of program effectiveness.

This community service program contributes by integrating general PHBS education with specific ENT health promotion and participatory learning activities. Many health promotion activities focus broadly on healthy living behavior, whereas this program incorporated ear, nose, and throat hygiene as a more specific area of preventive health education. In addition, the program combined pre- and post-test assessments with FGDs, allowing the evaluation to capture both changes in mean knowledge scores and the specific areas participants still found difficult to understand. This combination provides a practical model for community-based health education in communal student environments, where educational needs may vary despite participants sharing similar living conditions. The contribution therefore extends beyond the observed 20-point difference to include the identification of concrete topics that can inform subsequent health promotion planning.

Overall, the findings suggest that community-based, interactive, and needs-oriented health education can strengthen students' knowledge of PHBS and ENT hygiene. The increase in the mean knowledge score and the identification of specific knowledge gaps demonstrate the value of combining structured assessment with participatory discussion. Nevertheless, knowledge improvement should not automatically be interpreted as behavioral change, and further monitoring is needed to determine whether the information provided is translated into consistent hygiene practices. For future community service programs, repeated education, practical demonstrations, follow-up assessments, and involvement of teachers or caregivers may strengthen continuity and provide a clearer picture of sustained learning. Thus, the present program contributes both practical insights for designing targeted health promotion activities and methodological insights into the importance of combining quantitative and qualitative approaches when assessing community-based educational interventions.

CONCLUSION

This community-based health promotion program increased participants' mean knowledge score from 70 to 90 after interactive education on Clean and Healthy Living Behavior (PHBS) and ear, nose, and throat (ENT) hygiene. The Focus Group Discussions also identified three specific knowledge gaps: safe ear cleaning, proper nasal hygiene, and dietary factors associated with throat irritation. These findings indicate that participatory, needs-oriented health education can deliver relevant information and help identify areas that require further attention among students in communal educational settings. This study's implications highlight the importance of integrating interactive health education, educational materials, group discussions, and basic health examinations as complementary strategies to strengthen preventive health practices in Islamic boarding schools and other communal learning environments. These approaches can help schools and community health providers design more targeted, sustainable, and contextually appropriate health promotion programs that address students' specific needs. Future community service and research should include larger, more diverse participant groups; longer follow-up periods; and more systematic assessments of behavioral change to determine whether knowledge gains are maintained and translated into consistent PHBS and ENT hygiene practices. Further studies may also incorporate comparison groups and inferential analysis to provide stronger evidence regarding program effectiveness.

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CONFLICTS OF INTEREST

No conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors used artificial intelligence tools strictly for language translation and stylistic editing to ensure clarity. The authors remain solely responsible for the integrity, analysis, and conclusions of the study.

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