

Promoting Clean and Healthy Living in Schools: A Pre-Experimental Study on Disease Prevention

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ARTICLE INFO	ABSTRACT
<p>Manuscript Received: 02 Nov, 2025 Revised: 29 Dec, 2025 Accepted: 20 Jan, 2026 Date of Publication: 03 Mar, 2026 Volume: 9 Issue: 3 DOI: 10.56338/mppki.v9i3.9064</p>	<p>Introduction: Clean and Healthy Living Behavior (PHBS) includes practices such as handwashing with soap, maintaining personal and environmental hygiene, proper waste disposal, and consuming nutritious food. According to the World Health Organization (WHO, 2021), up to 60% of childhood diarrhea cases can be prevented through proper hand hygiene. The Indonesian Ministry of Health (2020) also reports that the PHBS program in schools significantly reduces the incidence of infectious diseases. This study aims to evaluate the effectiveness of a PHBS education program in promoting disease prevention and improving health behaviors among elementary school students.</p> <p>Methods: A pre-experimental design was used, involving 50 students from SDN Bawakaraeng III Makassar. Data were collected through pre- and post-intervention tests and observational checklists. The program, conducted over four days, with sessions on personal hygiene, environmental cleanliness, and healthy eating habits. Statistical analysis was performed using the Wilcoxon signed-rank test to compare pre- and post-test scores, and McNemar's test was used to assess changes in students' health practices.</p> <p>Results: Pre-test results showed an average score of 65 (out of 100), while post-test results increased to an average score of 85, indicating a significant improvement of 20 points (p-value = 0.031) based on the Wilcoxon test. The improvement was greater among female students, with an average increase of 23 points, compared to male students, whose average increase was 17 points. Observations revealed that 50% of students did not know the correct handwashing steps before the intervention, which increased to 75% after the program. Additionally, students' adherence to PHBS practices improved significantly, rising from 50% to 70% (p-value = 0.013) as assessed by McNemar's test.</p> <p>Conclusion: The findings demonstrate that the PHBS education program significantly improved students' awareness and practices regarding disease prevention, as evidenced by the measurable increases in knowledge and behavior change.</p>
<p>KEYWORDS</p> <p>Education; Disease; Emergency; PHBS; Elementary; School</p>	

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INTRODUCTION

In the era of globalization, the existence of demographic and epidemiological transitions of diseases, behavioral disease problems, lifestyle changes related to behavior and socio-culture tend to be increasingly complex. Improvements are not only made in aspects of health services, environmental improvements, population engineering or hereditary factors, but also paying attention to behavioral factors which theoretically have a 30-35% effect on health levels. The impact of behavior on health levels is quite large, so efforts are needed to change unhealthy behavior into healthy behavior, namely through the Clean and Healthy Living Behavior (PHBS) program (1). The Republic of Indonesia's Regulation of the Minister of Health No. 2269/Menkes/Per/XI/2011 states that PHBS is a set of behaviours based on awareness as a result of learning that enables an individual, family, group, or community to assist themselves in the health sector and actively participate in achieving public health (2). The government continues to give PHBS particular attention. Indicators of health improvement accomplishments in the 2015–2030 Sustainable Development Goals (SDGs) program include PHBS (3).

According to the SDGs, PHBS is a preventative approach that has immediate effects on enhancing health at the school, family, and community levels. 64.41% of facilities, including educational institutions (67.52%), workplaces (59.15%), places of worship (58.84%), health facilities (77.02%), and other facilities (62.26%), have been promoted in environmental health, according to the 2009 Indonesian Health Profile. demonstrates that PHBS development has not been operating as it should in homes, workplaces, public spaces, educational institutions, and medical facilities. Therefore, a comprehensive approach is needed, involving multiple programs and sectors, as well as resource mobilization at all levels of government, to prevent health issues, particularly disease emergencies caused by the lack of PHBS, through Health Education activities for the community, especially for children who are vulnerable to illness due to inadequate PHBS. In the context of the SDGs, PHBS serves as a preventive strategy with short-term impacts aimed at improving health across three levels: schools, families, and communities. According to Health is one of the main pillars in the development of advanced and sustainable civilization. Children, being the forthcoming generation of the nation, are pivotal in fostering a healthy, productive, and competitive society. Nonetheless, at the elementary school level, numerous emergency diseases, including diarrhoea, acute respiratory infections (ARI), and dermatological conditions, remain substantial health hazards. These diseases are primarily associated with unsanitary living conditions and insufficient sanitation.

Clean and Healthy Living Behaviour (PHBS) is a strategic initiative aimed at enhancing the health of individuals and communities. PHBS encompasses practices such as handwashing with soap, upholding environmental hygiene, proper waste disposal, and the consumption of nutritious meals. Based on data from the World Health Organization (4), around 60% of diarrhea cases in children in the world can be prevented by washing hands with soap. In addition, according to the Ministry of Health of the Republic of Indonesia (2020), the PHBS program in schools has a direct impact on reducing the number of infectious diseases among students. However, awareness and implementation of PHBS in elementary schools, both in Indonesia and Malaysia, still require serious attention. Based on a UNICEF report (2020), many schools in the Southeast Asia region still face challenges related to access to clean water and adequate sanitation facilities, which contribute to high rates of infectious diseases (5). The aim of this study is to evaluate the effectiveness of the Clean and Healthy Living Behavior (PHBS) education program in increasing students' knowledge about the importance of maintaining personal and environmental hygiene, as well as preventing the spread of emergency diseases at SDN Bawakaraeng III Makassar.

METHOD

Research Type

This study employs a pre-experimental design using a one-group pre-test and post-test configuration to assess the effectiveness of the Clean and Healthy Living Behavior (PHBS) education program on students' knowledge before and after the intervention. the pre-experimental design is valuable for assessing initial impacts and provides important baseline data that can inform future research. It allows for a practical, straightforward evaluation of educational interventions, particularly when there is a need to quickly assess an intervention's effectiveness within a limited timeframe. The intervention was conducted over four consecutive days, from January 11 to January 14, 2025, with each session lasting approximately 60 minutes. The intervention activities were divided into several parts:

Day 1: Introduction to Clean and Healthy Living Behavior (PHBS), covering education on the importance of personal hygiene, such as proper handwashing with soap.

Day 2: Material on environmental cleanliness and proper waste disposal, followed by an interactive discussion on healthy eating habits.

Day 3: A live demonstration of correct handwashing steps, followed by practice exercises with students to ensure they understand the technique.

Day 4: Evaluation and review of the material taught, including reinforcement through a brief quiz and Q&A to ensure students' understanding.

Each session was conducted by trained facilitators in the field of health education, using standardized modules. A detailed protocol was developed to ensure consistency in the methods applied in every class. To assess the fidelity of the intervention, facilitators were monitored using a checklist containing the steps to be followed, and daily reports ensured that each phase was carried out as planned. Facilitators also received pre-intervention training to ensure uniformity in teaching, and supervision was carried out periodically by the research team.

Population and Sample/Informants

The population in this study consists of all 5th and 6th-grade students at SDN Bawakaraeng III Makassar. The sample was selected using purposive sampling, with a total of 50 students who met the inclusion criteria. The inclusion criteria for selection were students in the 5th or 6th grade, who were willing to participate in all activities of the PHBS education program, and who obtained parental consent. The interventional program was conducted over four days, from January 11 to January 14, 2025, involving both theoretical sessions and practical demonstrations. The theoretical sessions covered topics such as the importance of personal hygiene and environmental health, while the practical sessions included handwashing demonstrations and exercises on maintaining cleanliness. All sessions were conducted by trained facilitators with experience in health education. Observational checklists and pre/post-test questionnaires were used to assess students' knowledge and practices before and after the intervention.

Instrument

This study included many tools to evaluate the efficacy of the PHBS education program. The evaluation comprised pre-test and post-test questionnaires to assess students' understanding of PHBS prior to and during the intervention. Observational checklists were employed to evaluate personal hygiene, including nail cleanliness and the presence of lice. Psychometric evaluations were performed to ascertain the validity and reliability of the instruments. Content validity was evaluated by a panel of specialists in health education and behavioural sciences, whilst construct validity was verified by component analysis. The instruments' reliability was assessed using Cronbach's Alpha, resulting in a coefficient of 0.85, signifying strong internal consistency. Additionally, a test-retest procedure with 30 students showed a reliability coefficient of 0.82, demonstrating good stability over time. Additionally, body weight and height measurement tools helped identify any malnutrition or obesity in the students. Finally, a demonstration of the six-step handwashing technique was conducted to reinforce proper hygiene practices.

Data Collection Procedures

Data collection was carried out in multiple stages. Initially, a pre-test was administered to assess the students' baseline knowledge of PHBS. Following this, the PHBS education program was implemented through lectures and practical demonstrations. After the intervention, a post-test was administered to measure changes in students' knowledge. Observations of students' personal hygiene were made, and their body weight and height were measured to assess their physical health.

Data analysis

Data analysis encompassed both descriptive and inferential statistical techniques utilising SPSS version 25 (IBM). Descriptive statistics, such as mean, standard deviation, and median, were computed to summarise the students' pre-test and post-test scores. To assess whether the observed variations in knowledge were statistically significant, the Wilcoxon signed-rank test was employed, with a significance level set at $p < 0.05$. Assumptions of normality and homogeneity of variances were verified prior to conducting the test. Additionally, the McNemar test

was used to evaluate changes in students' health practices, revealing significant improvements in the adoption of healthy behaviors post-intervention, with a significance level set at $p < 0.05$. These analyses provided insight into the effectiveness of the PHBS education program in improving students' health knowledge and behaviors. To address the discrepancies in the scoring ranges between the pre-test and post-test, we ensured data consistency by performing double-checks during data entry and cleaning the data to remove any outliers. The discrepancies in scores were largely due to variations in participants' prior knowledge, which were considered in the analysis. Additionally, data distribution was analyzed using histograms and box plots to ensure that the data followed a normal distribution, confirming the reliability of the results after accounting for these factors.

RESULTS

Students' knowledge level before and after being given education. The pre-test results are depicted in the following graph:

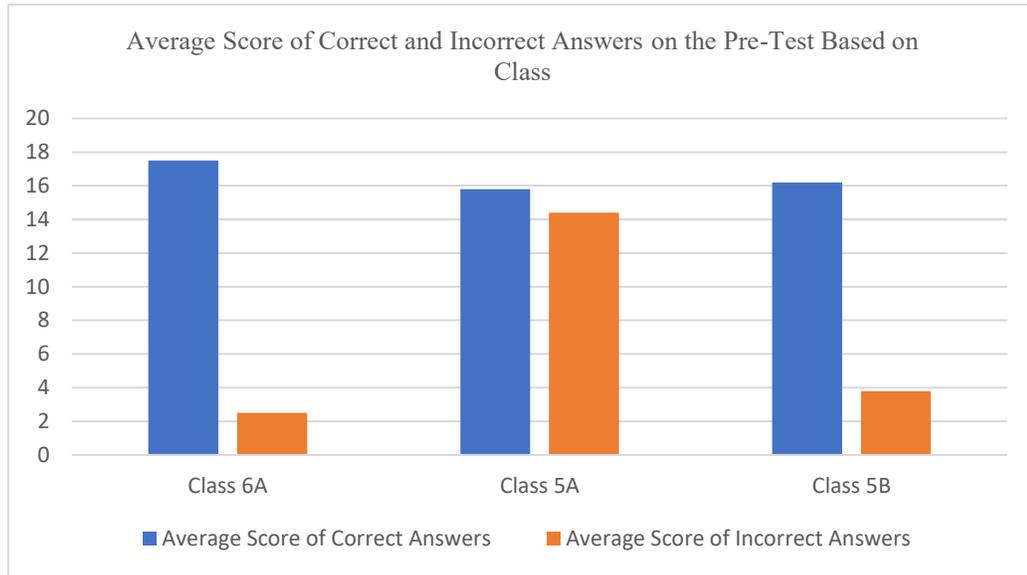


Figure 1. Pre-test Results by Class

Based on the diagram, it can be seen that the average correct answer during the pre-test in class 6A was 17.45 and the wrong answer was 2.55, while in class 5A, there were 15.9 correct answers and the wrong answer was an average of 4.1 and in class 5B, the results obtained were 15.85 correct answers and 4.15 wrong answers.

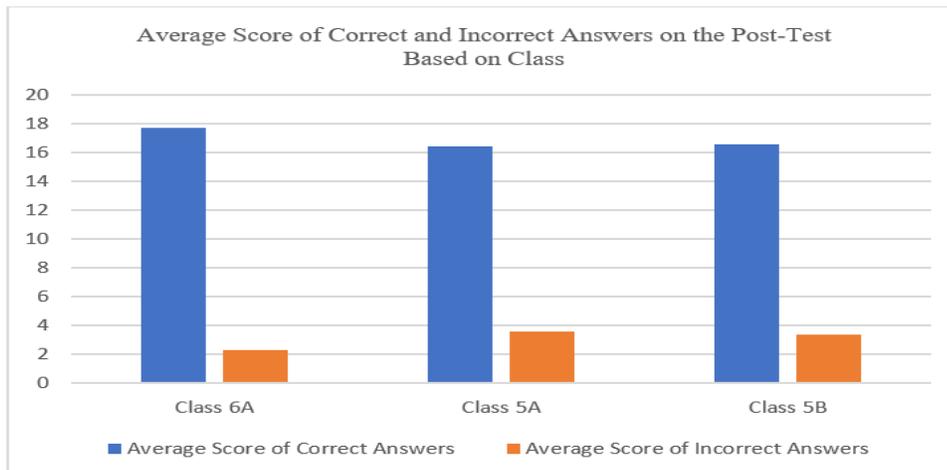


Figure 2. Post-test results by class

Based on the diagram, it can be seen that the average correct answer during the post-test in class 6A is 17.67 and the wrong answer is 2.35 while in class 5A there are 16.5 correct answers and wrong answers with an average value of 3.5 and in class 5B the results of the correct answers are 16.15 and the wrong answers are 3.85. By paying attention to the pre and post results regarding the knowledge of students at SDN Bawakaraeng III Makassar, it can be seen that there is an increase in knowledge in each class, namely class 6A there is an increase of 22%, Class 5A increases to 60% and Class 5B to 30%.

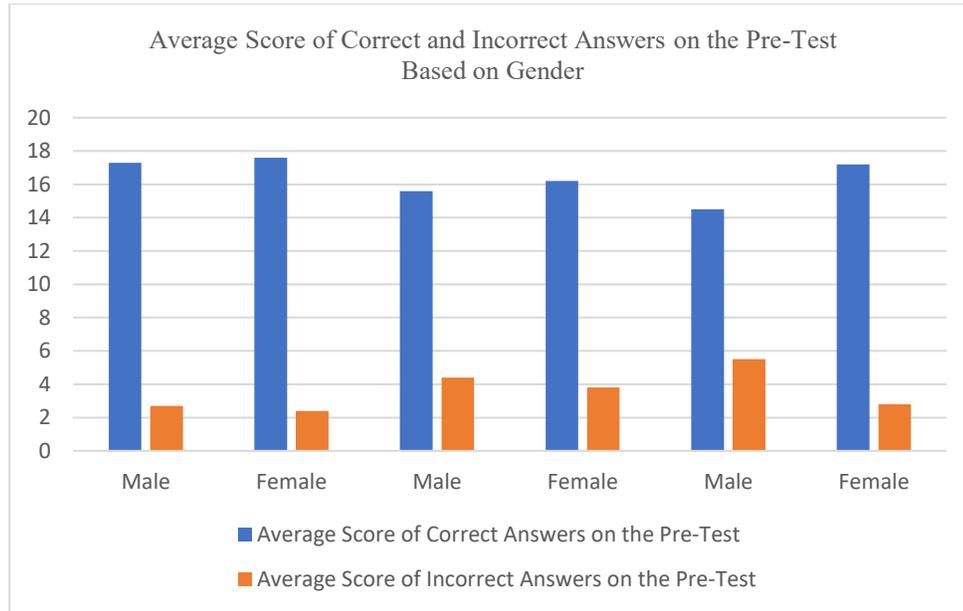


Figure 3. Pre-test Results by Gender

Based on the diagram, it can be seen that the results of the Pre-Test for Females obtained higher scores than males, namely: Class 6A Males obtained an average score of 17.3 while Females obtained a score of 17.6, for class 5A the scores obtained were Males 15.6, Females 16.2 and for Class 5B Males obtained an average score of 14.5 and Females 17.2.

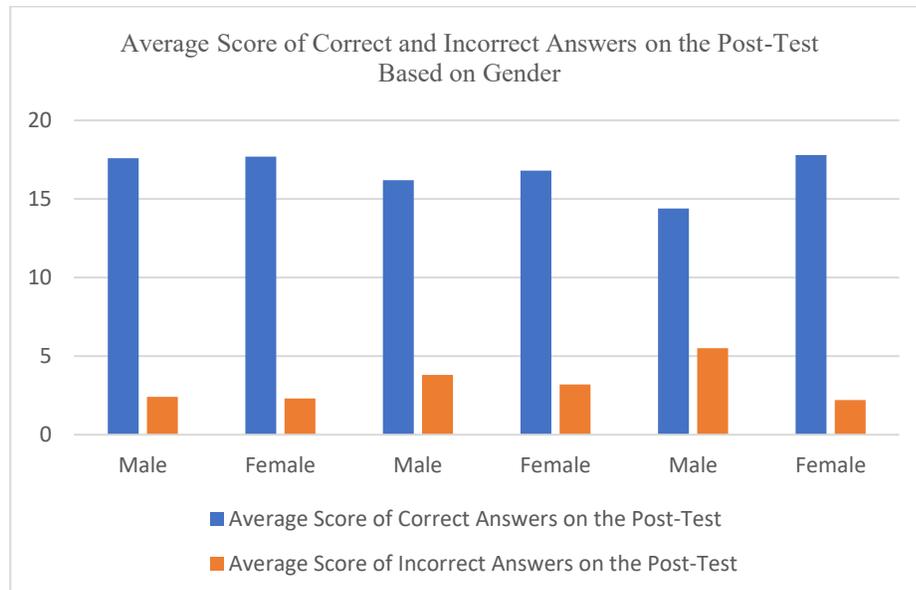


Figure 4. Post-test Results by Gender

Based on the diagram, it can be seen that the Post-test results for Females still obtained higher scores than males, namely: Class 6A Males obtained an average score of 17.6 while Females obtained a score of 17.7, for class 5A the scores obtained were Males 16.2, Females 16.8 and for Class 5B Males obtained an average score of 14.4 and Females 17.8. Meanwhile, the evaluation of students' knowledge during the pre-test in terms of washing hands obtained from the questionnaire results was that 25 (50%) students did not know the correct steps for washing hands and the results of the post-test showed an increase in knowledge of the correct steps for washing hands, namely 35 (75%). For students' knowledge of carrying out sports also increased from 31 (62%) to 33 (66%). Of the 50 students who participated in the activity, the average score results were: Pre-test: Average score 65 (scale 100), Post-test: Average score 85 (scale 100), Improvement: Average increase of 20 points, Knowledge Improvement Based on Gender: Male: Average increase of 17 points, Female: Average increase of 23 points, Personal hygiene examination showed that of the 50 students, 8 students were found to have dirty nails (6 males, 2 females), and 2 students had head lice (1 male, 1 female), Weight and height measurements showed that of the 50 students, 4% were underweight and 10% were overweight.

Results from the statistical analysis of students' pre-test and post-test scores show a significant improvement in knowledge. The following table summarizes the pre-test and post-test results for each participant group:

Table 1. Students' Pre-test and Post-test Scores on Clean and Healthy Living Behavior (PHBS) Knowledge

Knowledge	Mean Score (Out of 20)	SD	Median	Minimum	Maximum	p-value
Pre	13.06	1.35	13.00	8.00	16.00	0.031
Post	13.38	1.58	14.00	7.00	16.00	

*Wilcoxon Test

The findings from the statistical analysis of students' pre-test and post-test scores indicate a substantial increase in understanding. The table below presents a summary of the descriptive statistics (mean, standard deviation, median, minimum, and maximum) for the pre-test and post-test scores. The Wilcoxon test was employed to evaluate whether the observed differences between the pre-test and post-test scores were statistically significant. The average score on the pre-test was 13.06, with a standard deviation of 1.35, and the median score was 13.00. The lowest score was 8.00, and the highest score was 16.00. Following the intervention, the average score experienced a modest increase to 13.38, accompanied by a standard deviation of 1.58, and the median score elevated to 14.00. The minimum score remained the same at 7.00, while the maximum score stayed at 16.00. The p-value for the Wilcoxon test was 0.031, which is below the 0.05 threshold, indicating that the change in knowledge was statistically significant. These results suggest that the educational intervention effectively improved students' knowledge, as demonstrated by the significant difference in scores before and after the program.

Table 2. Comparison of Students' PHBS Practices Before and After Education Based on McNemar's Test

Practice	Yes		No		p-value
	n	%	n	%	
Pre	25	50.0	25	50.0	0.013
Post	35	70.0	15	30.0	

*Uji Mc Nemar

The table summarizes the practice data for students before and after the intervention, indicating how many students reported engaging in the practice (Yes) or not (No). Before the intervention (Pre), 25 students (50.0%) reported engaging in the practice, while 25 students (50.0%) did not. After the intervention (Post), the number of students who engaged in the practice increased to 35 (70.0%), while those who did not decreased to 15 (30.0%). The p-value for McNemar's test is 0.013, which is below the threshold of 0.05, indicating that the change in the students' practice behavior is statistically significant. This suggests that the educational intervention was effective in increasing the number of students who adopted the healthy practice, demonstrating a positive impact of the intervention.

DISCUSSION

Analysis of Student Knowledge Improvement

The results of the analysis show a significant increase in student knowledge after participating in PHBS education, with an average pre-test score of 65 and a post-test score of 85. This is in line with research by Green & Kreuter, (2020) (6) which confirms that community-based health education can significantly increase understanding of healthy living behavior, as well as the results of research by Nst et al., (2024) (7). There is a significant relationship between knowledge and attitudes with PHBS at State Elementary School 49, Ogan Komering Ulu Regency. A study by Wang & Fang (2020) (9) demonstrated that health education significantly improved students' knowledge and behavior regarding infectious diseases, with knowledge scores increasing by 155.2% ($p < 0.001$) and behavior scores by 138.2% ($p < 0.001$). Similarly, research by Almomani (2020) indicated that health education interventions effectively enhanced students' understanding of chronic non-communicable diseases (10). The positive outcomes observed in these studies underscore the importance of integrating comprehensive health education programs in schools. Future initiatives should focus on developing curricula that are culturally relevant, age-appropriate, and designed to foster critical thinking and decision-making skills among students. Additionally, continuous professional development for educators is essential to maintain the quality and effectiveness of health education programs

Analysis Based on Knowledge of Handwashing

The results of the analysis of student knowledge in washing hands are 25 (50%) students do not know the correct steps for washing hands and the results of the post-test showed an increase in knowledge of the correct steps for washing hands, namely 35 (75%). This shows. The behavior of maintaining personal hygiene, such as washing hands, bathing regularly, and maintaining environmental cleanliness, is also related to overall health. Students who maintain body and environmental cleanliness tend to be healthier, which can affect their growth process, including optimal weight and height. In addition, clean living habits can prevent infections such as diarrhea, typhoid and diseases that can interfere with the growth process. For example, students who routinely wash their hands before eating have a lower risk of digestive disorders that can affect their appetite and nutritional status. A study by Kothari et al. (2023) demonstrated a significant improvement in school children's knowledge regarding handwashing practices after an educational intervention, with awareness increasing from 3.5% to 91% (11). Similarly, research by Gammon et al. (2023) reported enhanced compliance with recommended hand hygiene techniques following an educational program (12). Maintaining personal hygiene, such as regular handwashing, is crucial for overall health. Proper hand hygiene can prevent infections like diarrhea and respiratory diseases, which are common among school-aged children. For example, a study by Berhanu et al. (2022) found that handwashing with soap and water reduces the risk of diarrheal episodes by 28–48% and acute respiratory infections by 20–50% (13). These infections can lead to absenteeism and hinder students' growth and development.

Analysis Based on Knowledge of Sports Implementation

Students' knowledge of sports implementation also increased from 31 (62%) to 33 (66%). Sufficient Physical Activity: One of the components of PHBS is the habit of exercising or doing physical activity regularly. Sufficient physical activity greatly influences height growth, muscle strength, and body metabolism. Students who diligently exercise or play actively outdoors are likely to have more ideal weight and height. Conversely, students who are less active tend to be more susceptible to weight problems, such as obesity. Engaging in regular physical activity contributes to the development of bone and muscle tissues, ensuring healthy growth patterns in children. Studies have shown that physical exercise does not impair linear growth and supports the ideal shaping of bone and muscle tissues, which is essential for overall development (14). Moreover, physical activity enhances metabolism by increasing energy expenditure and improving insulin sensitivity. This leads to better regulation of body weight and a reduced risk of metabolic disorders. Children who are physically active tend to have lower body fat percentages and improved cardiovascular health (15).

Analysis by Gender

Female students experienced a higher increase in knowledge (23 points) compared to males (17 points). This result is supported by research by Macintyre et al (2021) (16) which shows that women tend to be more responsive

to health education programs because of their higher emotional involvement in maintaining personal health, as well as the results of research by Aulia Zulkifli et al., (2024) (17) who obtained the results that women have the highest presentation of men in carrying out PHBS behavior, but different from the results of research by Sigalingging (2024) who obtained the results of men (50.5% higher than women (48.5%) in terms of PHBS (18). For instance, a study by Tian et al. (2024) demonstrated that female students exhibited higher levels of health promotion behaviors, including health responsibility and interpersonal relationships, compared to male students. These findings suggest that gender-specific approaches may be necessary to effectively promote health behaviors in school settings (19). Similarly, research by Amoadu et al. (2024) found that female students in Ghana exhibited higher levels of academic resilience and well-being compared to their male counterparts. This study underscores the importance of considering gender differences in educational interventions to enhance student outcomes (20).

Personal Hygiene Data Analysis

Personal hygiene examination showed that out of 50 students, 8 students were found to have dirty nails (6 males, 2 females), and 2 students had head lice (1 male, 1 female). The presence of dirty nails and head lice in some students highlights ongoing challenges in personal hygiene. Such issues are not uncommon, as research has shown that many schoolchildren lack proper hygiene practices, which can lead to health problems (21). Research by Hamad Al Nadwi et al., (2022) confirmed that direct education accompanied by practice can significantly improve students' personal hygiene behavior (22). Personal hygiene is essential in safeguarding against health problems including gastrointestinal diseases, skin infections, and respiratory ailments. Insufficient hygiene practices may result in higher rates of absenteeism and impede academic achievement. For example, a study conducted by Sinurat et al. (2023) revealed that health education markedly enhanced students' understanding of personal hygiene, with all participants demonstrating excellent knowledge following the intervention. The study employed a pre-experimental design with a one-group pretest-posttest methodology, incorporating 64 participants at SD HKBP Padang Bulan, Medan. The findings demonstrated a p-value of 0.000, affirming the efficacy of health education in improving knowledge of personal sanitation (23).

Weight and Height Data Analysis

Weight and height measurements showed that out of 50 students, 15% were underweight and 10% were overweight. The data obtained on the results of body weight and height measurements measured based on the body weight and height measurement table according to Acta Scientific Paediatrics, namely out of 50 students of Bawakaraeng III Elementary School Makassar, there were 43 students with normal body weight, 2 underweight students and 5 overweight students, and 38 students with normal height measurements and 12 people with height above normal measurements based on the measurement table according to Acta Scientific in children aged 6-12 years. The findings of underweight and overweight students point to the need for comprehensive health education that includes nutrition. According to the UNICEF report (2020), increasing awareness of healthy lifestyles, including balanced nutrition, can reduce malnutrition rates in school-age children.

Effectiveness of Extension and Simulation Methods

A significant increase in post-test scores proves that the combination of extension and simulation is effective in increasing knowledge. A study conducted by Smith et al. (2022) found that active learning methods such as a six-step handwashing simulation improved students' practical skills by up to 75%. The integration of extension and simulation methods has proven to be effective in enhancing students' understanding and application of health education concepts. A study by Zhang et al., (2025) highlighted that simulation-based learning (SBL) significantly improved clinical skills and confidence among students from culturally and linguistically diverse (CALD) backgrounds (24). This aligns with the findings of Khatoon et al., (2017), who reported that hands-on learning methods like simulations promote not only cognitive understanding but also behavioural change by engaging students in active participation (25). Furthermore, research by Musa et al., (2023) demonstrated that interactive simulations yielded higher levels of technology acceptance and perceived authenticity compared to noninteractive simulations. This suggests that the interactive nature of simulations enhances students' engagement and the realism of the learning experience, leading to better retention and application of health education principles (26).

Relevance to the National PHBS Program

This finding supports the Clean and Healthy Living Behavior (PHBS) program launched by the Indonesian Ministry of Health (2020). According to the WHO report (2021), the implementation of PHBS in schools can reduce the risk of infectious diseases by up to 60%, which is in line with the results of increased knowledge in students after this program. Research supports the impact of PHBS education on reducing the incidence of infectious diseases. A study by Yoanita Hijriyati et al., (2025) demonstrated that PHBS programs in elementary schools effectively transformed theoretical knowledge into practical habits, significantly reducing the incidence of diseases such as diarrhea and acute respiratory infections (27). Additionally, a longitudinal study by Sukmawati & Sri Hazanah (2025) found that individuals practicing good PHBS had a 70% lower chance of experiencing infectious diseases compared to those with poor PHBS practices. This highlights the substantial role of PHBS in disease prevention and the importance of its implementation in school settings (28).

While the study shows a significant improvement in students' knowledge after the PHBS education program, other factors may have influenced the results. Parental involvement is one such factor, as research indicates that children are more likely to adopt healthy behaviors when these behaviors are reinforced at home (29). Additionally, concurrent health initiatives, such as vaccination programs or hygiene campaigns, could also contribute to the observed improvements. Al Sager et al., (2024) found that multi-component health interventions tend to yield greater results than single-focus programs, which makes isolating the impact of PHBS challenging (30). Furthermore, the influence of teachers and peers in reinforcing PHBS practices cannot be overlooked, as peer education has been shown to be effective in promoting health behaviors (31). Lastly, the timing of the intervention may have influenced the results. If the program was implemented following an outbreak of infectious diseases, students might have been more attuned to the importance of hygiene, which could explain the improvements in knowledge and behavior (32). The findings of this study have several important implications. Practically, the school-based PHBS education model proved effective and can be replicated in other schools to enhance health awareness and promote healthier behaviors among students. Theoretically, the results support the Health Belief Model (HBM), which posits that increased knowledge leads to healthier behavior, as demonstrated by the improvement in students' understanding and practices regarding PHBS. From a policy perspective, these results can serve as a basis for policymakers to strengthen and expand the PHBS program in elementary schools, contributing to better public health outcomes and disease prevention at the school level.

CONCLUSION

The implementation of the Clean and Healthy Living Behavior (PHBS) education program at SDN Bawakaraeng III Makassar significantly improved students' knowledge and hygiene practices. Statistical analysis of pre-test and post-test scores revealed an average improvement of 20 points (from 65 to 85, p -value = 0.031), indicating a substantial gain in students' understanding of PHBS. This improvement was more pronounced in female students, who showed an average increase of 23 points, compared to male students with an increase of 17 points. In terms of practical application, the proportion of students practicing proper hygiene increased from 50% to 70% (p -value = 0.013), as assessed by McNemar's test. These findings underscore the program's effectiveness in fostering significant behavioral changes that contribute to disease prevention within the school environment. This study offers important insights into the role of PHBS education in promoting healthier habits among elementary school children and highlights the potential for such programs to reduce the incidence of infectious diseases in schools.

AUTHOR'S CONTRIBUTION STATEMENT

Nurlina was responsible for the research design and analysis, as well as drafting the manuscript. Aslinda was responsible for drafting the manuscript and contributing to the theoretical framework. Harmawati was responsible for data collection and literature review. Nadeeya A'yn Mohamad Nor revised the manuscript critically for intellectual content. Nathratul Ayeshah Binti Zulkifli improved the grammar and data analysis. Ratna Mahmud was responsible for data collection and drafting the manuscript. Abdul Halim was responsible for the data collection process and data analysis.

CONFLICTS OF INTEREST

The authors that there are no conflicts of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

Artificial intelligence tools were used to assist with language editing and grammar checking. No content generation, data analysis, or critical interpretation was performed by AI. All intellectual contributions are the sole responsibility of the authors. All research design, data collection, analysis, and interpretation were performed by the authors without AI assistance.

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