



SYSTEMATIC LITERATURE REVIEW: THE RELATIONSHIP BETWEEN CLEAN AND HEALTHY LIVING BEHAVIOR (PHBS) AS A PREVENTION OF DIARRHEAL DISEASE

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ABSTRACT

Diarrhea remains a global public health problem, especially in developing countries, one of which is Indonesia, with a high incidence rate in vulnerable groups such as toddlers. The implementation of Clean and Healthy Living Behavior (PHBS) is an essential preventive strategy in reducing the incidence of diarrhea, but previous research results have shown varying findings. This study systematically examines the relationship between the implementation of Clean and Healthy Living Behavior (PHBS) and the prevention of diarrheal disease based on current scientific evidence. This study uses a systematic literature review design with the PICOS approach. Literature searches were conducted through Google Scholar, PubMed, ScienceDirect,

ResearchGate, and ProQuest for articles published between 2021 and 2025 in Indonesian and English. Study selection was carried out through title and abstract screening stages, followed by full-text review according to criteria. A total of 20 articles were analyzed descriptively and systematically. Most of the literature reveals a significant relationship between the implementation of PHBS and a reduced risk of diarrhea incidence. Individuals or groups with good PHBS implementation have a lower risk of diarrhea compared to those who do not implement PHBS optimally. The PHBS components that play a dominant role include hand hygiene practices with soap, use of clean water sources, use of proper sanitation facilities, and hygienic food and waste management. Factors influencing the effectiveness of PHBS include knowledge, attitudes, socioeconomic conditions, availability of sanitation facilities, as well as environmental support and health policies. The implementation of PHBS is an effective, evidence-based preventive strategy for preventing diarrheal disease. Strengthening education and improving access to adequate sanitation are needed to support sustainable public health interventions.

Keywords: clean and healthy living behavior, diarrheal disease, prevention, health, systematic literature review

INTRODUCTION

Diarrhea remains a significant challenge in public health, especially in developing countries like Indonesia. Clinically, this condition is characterized by an increased frequency of defecation accompanied by changes in stool consistency to liquid and can cause dehydration, malnutrition, and even death if not treated properly.¹ Vulnerable groups such as toddlers, children, and the elderly are groups with a higher risk of complications due to diarrhea. The high incidence of diarrhea is often associated with poor environmental conditions, poor sanitation, and suboptimal community living behaviors.^{2,3}

Globally, diarrhea is one of the main contributors to morbidity and mortality, particularly in the under-five child population. Globally, its incidence is estimated at around 2 billion cases per year, with a death rate of approximately 1.9 million in children under five years of age, and 78% occur in developing countries such as those in Southeast Asia. In addition, UNICEF data shows diarrhea contributes about 9% to global deaths of children under 5 years, and more than 400,000 child deaths each year. The global trend shows a decrease in the prevalence of childhood diarrhea from decade to decade, but the burden of this disease remains high and is a major public health priority.⁴

The prevalence of diarrhea in Indonesia itself shows a significantly high number, especially in the under-five age group. In 2023, the Indonesian Health Survey (SKI) reported the number of diarrhea incidents in toddlers (1-4 years) at 7.4%, while for all ages it was around 4.3%. The 2021 Indonesian Nutritional Status Survey (SSGI) also recorded the prevalence of diarrhea in toddlers reaching 9.8%, indicating that diarrhea cases are still a problem requiring strategic attention in Indonesia. This high incidence rate illustrates that behavioral and environmental factors, such as drinking water quality, sanitation, and cleanliness, play an important role in society.^{5,6}

The implementation of Clean and Healthy Living Behavior (PHBS) is an essential promotive and preventive strategy in reducing the incidence of diarrhea. PHBS includes a series of awareness-based behaviors acquired through education, so that individuals, families, and

communities can carry out health efforts independently and play an active role in creating a healthy environment. PHBS components that have a direct relationship with diarrhea prevention include hand hygiene practices with soap, use of clean water, hygienic food and drink management, and the use of proper sanitation facilities.^{7,8}

Various studies show that good PHBS implementation can significantly reduce the risk of diarrhea. However, the level of PHBS implementation in society still varies and is determined by knowledge, attitudes, education, socio-economics, and the availability of environmental health facilities and infrastructure. Furthermore, the literature on the relationship between PHBS and the incidence of diarrhea shows varying findings, both in terms of research design, indicators used, and the magnitude of the reported effect.⁹

Therefore, a Systematic Literature Review (SLR) is needed to comprehensively and systematically examine the available scientific evidence regarding the relationship between PHBS and the prevention of diarrheal disease. Through this SLR, it is expected to obtain a clearer picture of the role of Clean and Healthy Living Behavior (PHBS) on the incidence of diarrhea, and to serve as a basis for formulating more effective and evidence-based health policies and public health interventions.

METHODS

This study uses a systematic literature review (SLR) design to evaluate the relationship between Clean and Healthy Living Behavior (PHBS) and diarrhea prevention efforts based on available scientific evidence. The approach applied refers to the PICOS (Population, Intervention, Comparison, Outcome, Study Design) framework. The literature search process was conducted online through various scientific databases, such as PubMed, ScienceDirect, Google Scholar, ResearchGate, and ProQuest, with a combination of keywords in Indonesian and English, including "diarrhea", "clean and healthy living behavior", "prevention", "preventive", "diarrhea", and "PHBS".

Inclusion criteria included articles discussing the relationship between PHBS and the incidence or prevention of diarrhea, published between 2021-2026, in Indonesian or English, and available in full text. Meanwhile, articles with irrelevant topics, incomplete content, or duplicates were not used and were included in the exclusion criteria. The selection process was carried out in stages through title screening, abstract screening, and full-text review according to the established criteria. Articles that met the criteria were then systematically analyzed, resulting in 30 studies for further analysis. Data from each study were extracted based on the PICOS components including population, intervention, comparison, outcome, and research design, then analyzed descriptively to identify patterns of the relationship between PHBS and the incidence of diarrhea. This research was conducted online from January to February 2026.

RESULTS

This study uses a literature review method. From the screening process, 20 relevant articles were obtained and then used as reference sources. Each literature was thoroughly reviewed using the PICOS framework, with the following components:

1. Population, namely the population and sample as research subjects targeted are the general public, both adults and especially children, as well as groups at high risk of contracting Diarrheal disease.
2. Intervention, namely the implementation of Clean and Healthy Living Behavior (PHBS) which includes the use of clean water for drinking and cooking, handwashing with soap before eating and after defecation, use of healthy latrines, hygienic food and drink management, and proper waste and garbage management.
3. Comparative, namely groups that are suboptimal and inconsistent in implementing Clean and Healthy Living Behavior (PHBS).
4. Outcome, namely the relationship between Clean and Healthy Living Behavior (PHBS) and the incidence of Diarrheal disease in the target group.

5. Study Design, namely research designs such as cross-sectional, case-control, cohort, as well as descriptive studies and surveys that discuss the topic of the Relationship between Clean and Healthy Living Behavior (PHBS) and Diarrhea.

After searching, articles were collected, reviewed, and analyzed using the PICOS framework and presented in a descriptive table.

Table 1. Research Synthesis Table

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
1	The Relationship between Clean and Healthy Living Behavior and the Incidence of Diarrhea in School Children at SDN Total Persada in 2023 (Dea Saputri et al., 2024)	Population: 150 people (all research subjects at SDN Total Persada, Tangerang City) Sample: 109 people	Implementation of Clean and Healthy Living Behavior (PHBS) in the school-age child group.	School children who do not implement Clean and Healthy Living Behavior (PHBS) optimally.	There is a significant relationship between the description of Clean and Healthy Living Behavior (PHBS) and the incidence of diarrhea. The high incidence of diarrhea in students at SDN Total Persada is related to low hand hygiene practices and the habit of	Observational analytic with cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
					consuming unhygienic snacks. Thus, interventions in the form of PHBS education by the school are highly needed to reduce the incidence of diarrhea.	
2	Water, sanitation, and hygiene--specific risk factors of recent diarrheal episodes in children aged under 5 years: analysis of secondary data from the Zimbabwe	Population: All children aged < 5 years in Zimbabwe covered in the <i>Zimbabwe Multiple Indicator Cluster Survey (MICS) 2019</i> Sample: 6,092 children aged < 5 years.	Adequate WASH conditions (access to safe drinking water, availability of soap for handwashing, proper sanitation)	Inadequate WASH conditions (water scarcity, no soap available, use of surface water)	The results show that the incidence of diarrhea in children under five years of age is still quite high and is related to inadequate WASH conditions, especially	Observational analytic with cross-sectional design (secondary data analysis of MICS 2019)

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Multiple Indicator Cluster Survey (MICS 2019) (Munyaradzi Mapingure et al., 2024)	Of that number, 853 children (14%) reported having diarrhea in the 2 weeks prior to the survey.			limitations in household water availability and hand hygiene practices. Children living in households with water scarcity, use of surface water sources, and suboptimal use of soap have a higher risk of diarrhea, while healthcare seeking is still low.	
3	Hygiene practice and diarrhea prevalence among underfive	Population: All children aged 6-59 months (under-five) living in Myanmar.	Implementation of adequate basic hygiene practices (handwashing with correct	Children with limited or inadequate hygiene practices	Toddlers living in households with limited or no hygiene services have a much higher	Observational analytic with cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	children in Myanmar: a cross-sectional study (Than Kyaw Soe, et al., 2024)	Sample: 1,207 children aged 6-59 months	steps, access to water and handwashing facilities, proper sanitation)		risk of diarrhea compared to those with basic hygiene services. Furthermore, the incidence of diarrhea is also associated with poor handwashing practices of parents, difficult access to water, use of shared toilets, low maternal hygiene literacy, inadequate housing conditions, a large number of children, and inappropriate	

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
4	Association between water, sanitation and hygiene practices and diarrhea among under 3-year-old children: Evidence from a nationally representative sample in India (2019-2021) (Shubhanjali Roy et al., 2023)	Population: All children aged < 3 years in India. Sample: 132,198 children aged < 3 years covered in the National Family Health Survey (NFHS-5) 2019-2021.	Good household WASH practices (use of private toilet, proper child stool disposal, separate kitchen)	Inadequate household WASH practices (shared toilet, improper child stool disposal, no separate kitchen)	feeding patterns after six months of age. 8.4% of children under 3 years of age in India experience diarrhea, and this incidence is significantly associated with inadequate household WASH practices. Use of shared toilets, improper child stool disposal, and the absence of a separate kitchen increase the risk of diarrhea, thus	Observational analytic with cross-sectional design (secondary data analysis of NFHS-5)

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
5	Hygiene and food safety practices among mothers as predictors of diarrhea risk in toddlers in Purwawinangun Village, West Java, Indonesia (Suparmi et al., 2025)	Population: All mothers who have toddlers in the Purwawinangun area Sample: 36 mothers with toddlers	Good maternal personal hygiene and food safety practices	Poor maternal personal hygiene and food safety practices	WASH practices remain an independent predictor of diarrhea incidence in children. Poor maternal personal hygiene practices are significantly associated with an increased risk of diarrhea in toddlers, with a risk approximately 3.5 times higher compared to good hygiene practices. Furthermore, poor maternal	Observational analytic with cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
					food safety practices increase the risk of diarrhea in children up to 4.2 times, emphasizing that maternal hygiene and food safety are important factors in preventing diarrhea in toddlers.	
6	Relationship Between Household Water Sanitation and Hygiene Behaviors and Diarrhea in Rwanda, 2010-2020 (Amans	Population: All children aged < 5 years and households in Rwanda. Sample: Child and household data covered in the Rwanda Demographic	Good handwashing behavior in school-age children	Poor handwashing behavior	There is a statistically significant relationship between household WASH behaviors (handwashing, water treatment,	Observational analytic with cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Ntakarutimana et al., 2024).	and Health Surveys (RDHS) in 2010, 2015, and 2020			safe water storage, and use of clean toilets) and the incidence of diarrhea in children under five years of age in Rwanda. During the 2010-2020 period, there was a significant increase in the use of clean toilets and a significant decrease in water treatment and storage practices.	
7	The Relationship Of Hand Washing	Population: School-age children at SD	Good handwashing behavior in	Poor handwashing behavior	The results show that the majority of	Observational analytic cross-

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Behavior Towards Diarrhea Cases In School-Age Children (Ade Nuraeni et al., 2022)	Angkasa 2. Sample: 63 respondents, selected by purposive sampling.	school-age children		school-age children have good handwashing behavior, and the proportion of diarrhea incidents is lower in the group with that behavior. Statistical tests show a significant relationship.	sectional design
8	The Relationship between Clean and Healthy Living Behavior (PHBS) of Housewives and the Incidence of	Population: All housewives in Bulakrejo Village, Sukoharjo District, Sukoharjo Regency, totaling 194 people. Sample:	Implementation of Clean and Healthy Living Behavior (PHBS) in housewives	Housewives who do not implement Clean and Healthy Living Behavior (PHBS)	The study results indicate that the implementation of PHBS by most housewives is in the good category, yet the incidence of	Observational analytic cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Diarrhea in Bulakrejo Village, Sukoharjo District, Sukoharjo Regency (Nisa Nur Kusuma et al., 2022)	107 respondents, selected using purposive sampling.			diarrhea remains high, which is 44.9%. Analysis shows a significant relationship between the behavior of using clean water, using healthy latrines, and handwashing with soap and clean water on the incidence of diarrhea.	
9	The Relationship between Clean and Healthy Living Behavior and the Incidence of Diarrhea in	Population: All students in grades III-VI at SD Negeri 1 Lamappoilo ware, Soppeng Regency. Sample: 189	Implementation of Clean and Healthy Living Behavior (PHBS) in elementary school students	Students who do not implement Clean and Healthy Living Behavior (PHBS)	The study results indicate a significant relationship between the aspects of knowledge, attitudes, and	Observational analytic cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	School Children (Sri Rezkiani Kas et al., 2025)	students, who were the total respondents in the study (total sampling).			practices of Clean and Healthy Living Behavior (PHBS) and the incidence of diarrhea in grades III-VI students. Students with a low level of PHBS implementation have a higher risk of experiencing diarrhea compared to students with good PHBS implementation.	
10	The Relationship between Clean and Healthy	Population: All households in District X. Sample: 100	Implementation of Clean and Healthy Living Behavior	Households that do not implement Clean and	The study shows that families implementing	Observational analytic cross-sectional

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Living Behavior (PHBS) and the Incidence of Diarrheal Disease in the Community Environment (Rosdiana, 2025)	households, selected using cluster random sampling.	(PHBS) in households	Healthy Living Behavior (PHBS)	Clean and Healthy Living Behavior (PHBS) well tend to have a lower incidence of diarrhea compared to families with poor implementation. In addition, statistical analysis results also show a significant relationship between PHBS and the incidence of diarrhea.	design
11	Meta-Analysis the Effects of Hand Washing Behavior Using	Population: All children under five years old (toddlers) at	Mothers washing hands with soap and availability of	Mothers not washing hands with soap and latrines not	Maternal handwashing with soap behavior plays	Meta-analysis of cross-sectional studies

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Soap and Latrine Availability on the Diarrhea Incidence in Children Under Five (Dyah Ayu Fatmawati et al., 2024)	risk of experiencing diarrhea. Sample: Total of 12,851 toddlers from 14 cross-sectional studies that met the criteria	latrines	available	a real role in reducing the risk of diarrhea incidence in toddlers, because it can reduce the transmission of diarrhea-causing germs through contaminated hands. Furthermore, the availability of proper latrines also contributes to the prevention of diarrhea in toddlers by reducing environmental contamination and exposure to	

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
12	The Relationship between Clean and Healthy Living Behavior and Risk of Diarrhea in Toddler (Naufal Rafi Febriawan et al., 2024)	Population: All mothers who have toddlers (aged 0-59 months) in the working area of the Kalijaga Permai Health Center, Cirebon. Sample: 119 mothers with toddlers, who were selected as research respondents.	Implementation of Clean and Healthy Living Behavior (PHBS) in households	Households with poor Clean and Healthy Living Behavior (PHBS)	feces which is the main source of diarrheal disease transmission. Toddlers cared for by mothers with poor Clean and Healthy Living Behavior (PHBS) have a much higher risk of diarrhea compared to toddlers whose mothers implement good Clean and Healthy Living Behavior (PHBS). Statistically, poor Clean and Healthy Living	Observational analytic cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
13	The Relationship between the Behavior of Using Protected Water and Proper Latrines on the Diarrhea Rate in 2022 (Khansa Hanifah Anhar et al., 2024)	Population: Toddlers in the working area of the Pahandut Health Center. Sample: 100 respondents, selected using purposive sampling.	Use of protected water and proper latrines	Use of unprotected water and improper latrines	Behavior (PHBS) increases the risk of diarrhea incidence in toddlers by up to 4.69 times, indicating the important role of PHBS in preventing diarrhea. The use of protected water sources and proper latrines does not have a significant relationship with the incidence of diarrhea in toddlers. Statistical tests show a p-value	Observational analytic cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
					> 0.05, indicating that these environmental sanitation factors are not significantly related to the incidence of diarrhea in the research area.	
14	Effect of a Water, Sanitation, and Hygiene Program on Handwashing with a Cleansing Agent among Diarrhea Patients and Attendants in Healthcare Facilities in the	Population: Diarrhea patients and attendants in health service facilities in the Democratic Republic of Congo (DRC). Sample: 284 participants from 27 health facilities in the urban area of	PICHA7 program (pictorial WASH education and provision of soapy water bottles at health facilities)	Standard education (ORS message and basic WASH message upon discharge)	The implementation of clean living behavior through handwashing practice using cleansing agents significantly increased handwashing compliance at critical	Intervention study (pilot study with comparison group)

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Democratic Republic of the Congo: A Randomized Pilot of the PICHA7 Program (Alain Mwishingo et al., 2024)	Bukavu, South Kivu Province.			moments related to diarrhea transmission. This increase in handwashing behavior shows that PHBS implementation has a positive effect in reducing the spread and incidence of diarrhea in health care facilities.	
15	Prevalence of diarrhea and water sanitation and hygiene (WASH) associated factors among children under	Population: All caregivers of children under five years living in Lira City, Uganda. Sample: 492 caregivers of	Good WASH practices (drinking water treatment and routine latrine cleaning)	Poor WASH practices (water not treated and latrines rarely cleaned)	The prevalence of diarrhea in toddlers is still relatively high, and Clean and Healthy Living Behavior (PHBS) factors	Observational analytic cross-sectional design

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	five years in Lira City Northern Uganda: Community based study (Breinda Auma et al., 2023)	children under five years selected using multi-stage sampling techniques.			such as the frequency of latrine cleaning and drinking water treatment have a significant effect on the incidence of diarrhea. Toddlers living in environments with better sanitation practices and safe water treatment have a lower risk of diarrhea compared to toddlers exposed to suboptimal clean and healthy living	

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
16	The Relationship between Clean and Healthy Living Behavior and the Incidence of Diarrhea in Medical Students (Putri Angelina Sofyan Maramis et al., 2025)	Population: Medical Faculty students, Tarumanagara University, class of 2022 Sample: 194 Respondents	Implementation of PHBS in daily life	Students with poor PHBS	behaviors. The results show no significant relationship between PHBS implementation and the incidence of diarrhea, although generally students have implemented PHBS in their daily lives. This finding can be explained by the homogeneous characteristics of the population and the relatively high level of	Observational analytic, cross-sectional

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
					PHBS implementation, so that the variation in behavior and diarrhea risk between individuals becomes small. In other words, the protective effect of PHBS is difficult to detect statistically in populations that already consistently practice hygienic behavior.	
17	Increasing Knowledge about PHBS in Efforts to	Population: Community (not specified specifically)	PHBS education	Community group before education	The results show a significant increase in	Quasi-experimental (pre-test post-test)

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Prevent Diarrhea (Gustini et al., 2024)	Sample: (not specified specifically)			knowledge after being given education, indicating that PHBS education is effective in increasing public understanding regarding diarrhea prevention. This study uses a quasi- experimental design so it can assess the effect of the intervention on the outcome more validly than observational studies.	

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
18	The Relationship between Clean and Healthy Living Behavior (PHBS) and Diarrhea Prevention Behavior (Monika Indah Puspita et al., 2024)	Population: Community in the Batang Gedei Tambakrejo Tempeil area Sample: 32 Respondents	Implementation of PHBS	Poor PHBS implementation	The results show a fairly significant positive correlation between PHBS and diarrhea prevention behavior, indicating that PHBS implementation influences behaviors that can reduce the risk of diarrhea, although the incidence of diarrhea itself has not been directly measured.	Observational analytic, cross-sectional
19	The Effect of Family Clean and Healthy	Population: Mothers who have toddlers in	Family PHBS education	Families before being given education	The results show a significant	Quasi-experimental

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Living Behavior Education (PHBS) on the Prevention of Diarrhea in Toddlers (Zakiyah Yasin et al., 2025)	Ambuntein District Sample: 66 Respondents			effect of PHBS education on the prevention of diarrhea in toddlers, indicating that family education interventions are effective in increasing PHBS implementation and reducing the risk of diarrhea.	
20	The Clean and Healthy Living Behavior as an Effort to Prevent Diarrhea in the Community of Cemara Kembar Coastal	Population: Community on the coast of Cemara Kembar Sample: 5 Respondents	PHBS + cultural factors & living habits	None (exploratory)	The results show that community culture and habits influence the risk of diarrhea, emphasizing the importance of	Qualitative descriptive

No.	Title	Population	Intervention	Comparative	Outcome	Study Design
	Area (Wasiyem et al., 2025)				considering social and cultural contexts in disease prevention efforts. This study does not perform group comparisons or numerical measurements, but rather provides an in-depth descriptive understanding.	

DISCUSSION

The relationship between the implementation of Clean and Healthy Living Behavior (PHBS) and the incidence and prevention of diarrhea shows a consistent pattern. Based on the review results of various national and international studies, a relationship was found between PHBS and the incidence of diarrhea. All studies show that individuals or populations with suboptimal PHBS implementation have a higher risk of experiencing diarrhea compared to those who implement

Clean and Healthy Living Behavior (PHBS) well. This indicates that diarrhea is closely related to daily behavior as well as personal and environmental cleanliness.^{18, 26}

PHBS plays an important role in breaking the chain of diarrhea transmission which generally occurs through the fecal-oral route. Behaviors such as using clean water, washing hands with soap, and using healthy latrines can reduce the risk of pathogenic microorganisms entering the body. When these behaviors are not performed consistently, the risk of contamination of food, drink, and the surrounding environment will increase, thus triggering diarrhea.¹⁷

The results of research on various target groups, from toddlers, school-age children, to housewives, show a similar pattern. This confirms that Clean and Healthy Living Behavior (PHBS) is an essential protective determinant in efforts to prevent diarrhea across various age groups and environmental conditions. Thus, PHBS implementation can be considered a primary prevention method in reducing the probability rate of diarrhea in the community.^{27, 28}

Toddlers cared for by mothers with poor PHBS have a higher risk of diarrhea compared to toddlers cared for by mothers with good Clean and Healthy Living Behavior (PHBS). This shows that PHBS is a major protective factor in preventing diarrhea in children, not just a mere cleanliness practice. Therefore, education and strengthening of Clean and Healthy Living Behavior (PHBS) for mothers is very important for maintaining children's health.¹⁹

Based on the 20 studies analyzed, there is consistent evidence that PHBS implementation plays a significant role in reducing the risk of diarrhea, especially in toddlers and school-age children. Studies from Indonesia (Zakiyah Yasin et al., 2025; Dea Saputri et al., 2024; Suparmi et al., 2025) as well as cross-country studies (Mapingure et al., 2024 -- Zimbabwe; Roy et al., 2023 -- India; Soe et al., 2024 -- Myanmar) show that children living in households with good PHBS implementation or cared for by parents with optimal PHBS practices show a lower incidence of diarrhea compared to those in environments with poor PHBS practices.

Research by Fatmawati et al., 2024, strengthens this finding, with evidence that maternal handwashing behavior and the availability of proper latrines significantly reduce the risk of diarrhea in toddlers. This confirms the role of PHBS as a major protective factor in preventing diarrhea, particularly through the fecal-oral route.

PHBS Indicators that Play the Most Role in Reducing the Risk of Diarrhea Incidence

The journal review results show that there are factors that play the most role in reducing the risk of diarrhea incidence. Components most consistently reported to have a significant association with diarrhea incidence include hand hygiene practices with soap, use of clean water sources, and utilization of proper sanitation facilities. These three indicators are directly related to the source and transmission route of diarrhea-causing germs.¹⁸

Handwashing with soap behavior is the most dominant indicator because hands are the main medium for transferring microorganisms from the environment to food or the mouth. Hand hygiene practices performed before eating, after defecation, and after activities outside the home have been proven to significantly reduce the risk of diarrhea incidence. In addition, the use of clean water plays an important role in preventing pathogen contamination, both for consumption and for daily cleanliness purposes.²¹

The use of proper sanitation facilities has a significant role in preventing diarrhea. Latrines that do not meet health standards have the potential to contaminate water sources and the surrounding environment, thereby increasing the risk of disease transmission. Thus, personal hygiene and environmental sanitation are the main factors in reducing the incidence of diarrhea, especially if applied simultaneously and continuously.²²

The use of protected water sources and proper latrines turned out not to have a significant relationship with the incidence of diarrhea in toddlers in certain areas. This indicates that available sanitation facilities alone are not enough without changes in individual behavior and proper management. Other factors such as water quality after collection and environmental factors may play a larger role in the risk of diarrhea.³⁰

The SLR results show that several PHBS indicators have the strongest influence on diarrhea prevention. Handwashing with soap was reported as a dominant indicator in both school children and toddlers (Nuraeni et al., 2022; Dea Saputri et al., 2024; Mwishingo et al., 2024). Studies in Rwanda, India, and Indonesia show that proper latrines reduce environmental exposure to human waste, thereby reducing the risk of diarrhea transmission. Access to clean water plays an important role, but some studies (Khansa Hanifah Anhar et al., 2024) found that the mere availability of

facilities is insufficient without correct behavior, emphasizing the importance of combining facilities and behavior.

Furthermore, food safety factors and maternal hygiene were also proven relevant (Suparmi et al., 2025), confirming that PHBS at the household level plays an important role in protecting toddlers from diarrhea.

Strength and Consistency of Scientific Evidence from National and International Studies

The journal review results show consistency of findings between national and international studies regarding the relationship between Clean and Healthy Living Behavior (PHBS) and the incidence of diarrhea. Although conducted in different regions and socio-economic backgrounds, all studies show the same direction of relationship; this consistency strengthens the validity of the relationship between PHBS and diarrhea prevention.^{21, 23}

With the similarity of results from various research designs, the available scientific evidence can be considered strong enough to support the role of PHBS in preventing diarrhea. This shows that PHBS implementation is relevant and effective to be applied widely, both at the family, school, and community levels.^{11, 18}

A program that combines visual education with pictorial modules and the provision of soapy water bottles can significantly increase handwashing compliance at critical moments. This increase has the potential to reduce the spread of diarrhea in high-risk environments such as healthcare facilities. These findings indicate that interventions involving education and the provision of easy-to-use facilities are very effective in encouraging clean living behavior.¹²

The analyzed studies used observational analytic cross-sectional designs (majority), quasi-experimental, and one meta-analysis. Although the cross-sectional design has limitations in determining causality, the large sample size and consistency of findings across various populations (toddlers, school children, housewives, general public) strengthen the validity of the relationship.

Geographically, evidence obtained from Indonesia, India, Myanmar, Zimbabwe, Rwanda, Uganda, and the Democratic Republic of Congo shows the same direction of relationship: good PHBS, lower risk of diarrhea. Several quasi-experimental studies (Gustini et al., 2024; Zakiyah

Yasin et al., 2025) show that PHBS education interventions directly improve behavior and reduce the risk of diarrhea.

Factors Influencing the Effectiveness of PHBS Implementation in Preventing Diarrheal Disease

The effectiveness of PHBS implementation as a diarrhea prevention effort is influenced by various determinants, both from individual and environmental aspects. Knowledge, attitudes, and health awareness are the main foundations in the formation of Clean and Healthy Living Behavior (PHBS). Individuals with a good level of knowledge tend to better understand the importance of cleanliness and are more motivated to apply healthy behaviors.²⁷

In addition to individual factors, the availability of facilities and infrastructure greatly determines the success of Clean and Healthy Living Behavior (PHBS) implementation. Access to clean water, healthy latrines, and handwashing facilities are the main prerequisites for PHBS to be implemented optimally. Without adequate facility support, healthy behaviors are difficult to perform consistently even if public knowledge is already quite good.²⁴

Socio-economic factors and environmental support also play an important role in the effectiveness of PHBS. Education level, family income, as well as the role of schools, health workers, and government policies also influence the sustainability of healthy behavior. Therefore, preventive efforts against diarrhea through PHBS need to be carried out in an integrated manner involving various sectors so that the results achieved are more optimal and sustainable.²⁵

The use of soap when washing hands significantly reduces the risk of diarrhea incidence in toddlers because it can break the chain of transmission of diarrhea-causing germs originating from contaminated hands. In addition, the availability of proper latrines also helps reduce environmental exposure to human waste, thereby preventing the transmission of diarrheal diseases. These findings emphasize the importance of behavior-based interventions and adequate sanitation facilities to control diarrhea in vulnerable groups such as toddlers.²⁹

In the study of Medical Faculty students at Tarumanagara University, although students had implemented PHBS in their daily lives, no relationship was found. This may be due to the

homogeneous characteristics of the population and the relatively high level of PHBS implementation, so that the variation in diarrhea risk among individuals becomes small.³¹

Research on the general public that emphasized PHBS education showed that educational interventions significantly increased public awareness regarding clean and healthy living practices, although outcomes in the form of diarrhea incidence were not directly measured. These results confirm that increasing knowledge is important in changing disease prevention behavior. This is consistent with the research in Batang Gedei, where the outcome measured was diarrhea prevention behavior. The significant results between PHBS implementation and diarrhea prevention behavior indicate that PHBS acts as a determining factor in forming healthy habits that can reduce the risk of diarrhea.^{32, 33}

Research on mothers with toddlers in Ambuntein District provided more clinical evidence, where family PHBS education significantly reduced the incidence of diarrhea in children under five. This shows that educational interventions targeted at child caregivers can directly increase PHBS implementation within the household and have a real impact on child health. Meanwhile, qualitative research on the coastal community of Cemara Kembar emphasized social and cultural factors, such as the habit of bathing in the sea, the use of well water, and intergenerational cleanliness practices, which influence the risk of diarrhea. This research shows that PHBS implementation cannot be separated from the cultural and environmental context, so diarrhea prevention strategies must consider social, cultural, and local behavioral aspects.³⁴

PHBS has a crucial role in preventing diarrhea, but its effectiveness is influenced by population factors, intervention targets, as well as social and cultural contexts. The outcomes measured vary between direct diarrhea incidence, prevention behavior, and increased knowledge, so research results are not always consistent. Quantitative research provides an overview of the relationship and intervention effects, while qualitative research provides contextual understanding of the factors influencing PHBS implementation. Thus, effective diarrhea prevention strategies must combine health education, strengthening PHBS behaviors, and adaptation to the social and cultural characteristics of the community.³⁵

The effectiveness of PHBS implementation is influenced by a combination of factors:

1. Individual: knowledge, attitudes, health awareness, and maternal/child literacy (Soe et al., 2024; Puspita et al., 2024).
2. Facilities and infrastructure: access to clean water, healthy latrines, and handwashing facilities (Mapingure et al., 2024; Roy et al., 2023).
3. Social and cultural context: local habits, bathing in the sea practices, feeding patterns, and intergenerational behaviors (Wasiyem et al., 2025).
4. Educational interventions: quasi-experimental studies show PHBS education improves knowledge and preventive behavior, especially in toddler caregivers (Zakiyah Yasin et al., 2025; Gustini et al., 2024).

A study on the student population (Maramis et al., 2025) shows that in groups with already high PHBS, the variation in diarrhea risk is low so the relationship is not significant, emphasizing the importance of context and baseline behavior.

Although the majority of studies show significance between PHBS and diarrhea incidence, there are several studies that did not find a meaningful relationship, namely study number 13 (Khansa Hanifah Anhar et al., 2024) and number 16 (Maramis et al., 2025). In study number 13, the use of protected water and proper latrines did not show a significant relationship with the incidence of diarrhea. This indicates that sanitation facilities alone are not enough without consistent application of hygienic behavior. Other factors such as water quality after collection, daily hygiene practices, and exposure to contaminated environments may have a greater influence on the risk of diarrhea than just the availability of facilities.

Meanwhile, in study number 16 which examined Medical Faculty students, no significant relationship was found. This finding can be explained by the homogeneous characteristics of the population and the relatively high level of PHBS implementation, so that the variation in behavior and diarrhea risk among individuals becomes small. In other words, the protective effect of PHBS is difficult to detect statistically in populations that already consistently practice hygienic behavior.

These two cases confirm that the effectiveness of PHBS depends not only on the availability of facilities, but also on individual behavior, population variation, and environmental context. This reinforces the importance of a multifactorial approach, including behavioral education and supervision of PHBS implementation, to significantly reduce the incidence of diarrhea in the community.

CONCLUSION AND RECOMMENDATIONS

Based on the results of the systematic literature review, a consistent relationship was found between the implementation of Clean and Healthy Living Behavior (PHBS) and a reduced risk of diarrhea incidence. Individuals or groups with good PHBS implementation tend to have a lower incidence of diarrhea compared to those who do not implement PHBS optimally. PHBS components that play the most role include the habit of using clean water, using healthy latrines, washing hands with soap, and hygienic food and waste management. Furthermore, the effectiveness of PHBS implementation is influenced by various factors, such as level of knowledge, attitudes, socio-economic conditions, availability of sanitation facilities, as well as environmental support and health policies. Therefore, strengthening health education and improving access to adequate sanitation facilities are strategic steps in the ongoing effort to prevent diarrhea.

REFERENCES

1. Mbakaya BC, Lee PH, Lee RLT. Hand Hygiene Intervention Strategies to Reduce Diarrhoea and Respiratory Infections among Schoolchildren in Developing Countries : A Systematic Review. Published online 2017:1-14. doi:10.3390/ijerph14040371
2. Ri E nwadiaro, Je E, Arikpo D, Mm M, Ja C. Hand-washing promotion for preventing diarrhoea (Review). Published online 2021. doi:10.1002/14651858.CD004265.pub4.www.cochranelibrary.com
3. Ditjen P2. Orientasi Program Penanggulangan PISP. Kementerian Kesehatan Republik Indonesia.

4. Kemenkes. Pencanaan Nasional Perluasan Imunisasi Rotavirus (RV). Kementerian Kesehatan Republik Indonesia.
5. Bill F, Foundation MG. Estimates of the global , regional , and national morbidity , mortality , and aetiologies of diarrhoea in 195 countries : a systematic analysis for the Global Burden of Disease Study 2016. Published online 2018:1211-1228. doi:10.1016/S1473-3099(18)30362-1
6. Sabira NZ. Jurnal Nasional Kesehatan Lingkungan Global Distribusi Kejadian Diare pada Balita dan Kualitas Sumber Air Minum di Indonesia : Studi Ekologi Distribusi Kejadian Diare pada Balita dan Kualitas Sumber Air Minum di Indonesia : Studi Ekologi. 2025;6(1):10-18. doi:10.7454/jnklg.v6i1.1044
7. Wolf J, Hubbard S, Brauer M, et al. Effectiveness of interventions to improve drinking water , sanitation , and handwashing with soap on risk of diarrhoeal disease in children in low-income and middle-income settings : a systematic review and meta-analysis. 2022;400. doi:10.1016/S0140-6736(22)00937-0
8. Null C, Stewart CP, Pickering AJ, et al. Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Kenya: a cluster-randomised controlled trial. Lancet Glob Heal. 2018;6(3):e316-e329. doi:10.1016/S2214-109X(18)30005-6
9. Darvesh N, Das JK, Vaivada T, Gaffey MF, Rasanathan K, Bhutta ZA. Water , sanitation and hygiene interventions for acute childhood diarrhea : a systematic review to provide estimates for the Lives Saved Tool. 2017;17(Suppl 4). doi:10.1186/s12889-017-4746-1
10. Cairncross S, Hunt AC, Boisson S, Bostoen K, Curtis V, Fung ICH. Water , sanitation and hygiene for the prevention of diarrhoea. Published online 2010. doi:10.1093/ije/dyq035
11. Auma B, Id MM, Ojuka E, et al. Prevalence of diarrhea and water sanitation and hygiene (WASH) associated factors among children under five years in Lira City

- Northern Uganda : Community based study. 2024;425:1-14.
doi:10.1371/journal.pone.0305054
12. Mwishingo A, Endres K, Bisimwa L, et al. Effect of a Water , Sanitation , and Hygiene Program on Handwashing with a Cleansing Agent among Diarrhea Patients and Attendants in Healthcare Facilities in the Democratic Republic of the Congo : A Randomized Pilot of the PICHA7 Program. Published online 2024.
 13. Bennion N, Mulokozi G, Allen E, et al. Association between WASH-Related Behaviors and Knowledge with Childhood Diarrhea in Tanzania. Published online 2021.
 14. Puteri AD, Syahfitri CA, Mufti L, Isnaeni A, Yusrustin D. Faktor-Faktor Penyebab Kejadian Diare Pada Balita Di Wilayah Kerja Puskesmas Air Tiris Pendahuluan Menurut World Health Organization (WHO) , diare dapat didefinisikan sebagai buang air. 2025;4(1):17-27.
 15. Rosiska M. Hubungan Perilaku Hidup Bersih dan Sehat (PHBS) Ibu dengan Kejadian Diare pada Anak Balita di Puskesmas Sungai Liuk. 2021;01:82-87.
 16. Mardhiah A, Inayati R. Analisis Hubungan antara Perilaku Hidup Bersih dan Sehat pada Ibu Rumah Tangga terhadap Kejadian Diare pada Balita Galenical is licensed under a Creative Commons Attribution-ShareAlike yang dapat menular atau masuk ke dalam tubuh individu melalui konsumsi makanan atau. 2025;4(3):56-66.
 17. Kusuma NN, Maharani NE. Pro Health Jurnal Ilmiah Kesehatan Hubungan Perilaku Hidup Bersih dan Sehat (PHBS) Ibu Rumah Tangga Dengan Angka Kejadian Diare di Kelurahan Bulakrejo Kecamatan Sukoharjo Kabupaten Sukoharjo. 2022;4(2):242-248.
 18. Saputri D, Susanto AD, Sartika I. Jurnal Dunia Ilmu Kesehatan Hubungan Perilaku Hidup Bersih Dan Sehat Terhadap Kejadian Diare Pada Anak Sekolah Di Sdn Total Persada Tahun 2023 Jurnal Dunia Ilmu Kesehatan. 2024;2:1-4.
 19. Febriawan NR, Khasanah U, Yusuf A. The Relationship between Clean and Healthy Living Behavior and Risk of Diarrhea in Toddler. 2024;09:228-238.

20. Firenza MD, Syafridah A. Hubungan Pengetahuan Ibu dan Perilaku Hidup Bersih dan Sehat (PHBS) dengan Kejadian Diare pada Balita di Desa Pusong Lhokseumawe. 2022;1(3).
21. Mapingure M, Makota RB, Chingombe I, et al. Water , sanitation , and hygiene – specific risk factors of recent diarrheal episodes in children aged under 5 years : analysis of secondary data from the multiple indicator cluster survey (MICS 2019). IJID Reg. 2024;12(July):100417. doi:10.1016/j.ijregi.2024.100417
22. Soe TK, Laohasiriwong W, Sornlorm K, Mahato RK. Hygiene practice and diarrhea prevalence among underfive children in Myanmar : a cross-sectional study. Published online 2024.
23. Roy S, Kiruthika G, Muthappan S, Rizwan SA, Kathiresan J. Association between water , sanitation and hygiene practices and diarrhea among under 3-year-old children : Evidence from a nationally representative sample in India (2019 – 2021). 2023;13(9):711-722. doi:10.2166/washdev.2023.108
24. Suparmi S, Sasman MF, Ratnawati R, Rustanti N. Hygiene and food safety practices among mothers as predictors of diarrhea risk in toddlers in Purwawinangun Village , West Java , Indonesia. 2025;(March):1-6. doi:10.3389/fpubh.2025.1530828
25. Ntakarutimana A. Relationship Between Household Water Sanitation and Hygiene Behaviors and Diarrhea in Rwanda , 2010 – 2020. 2024;18(1):312-331.
26. Nuraeni A, Putri M, Supendi K, Efendi A. The Relationship Of Hand Washing Behavior Towards Diarrhea Cases In School-Age Children. 2022;3(2):104-108.
27. Kas SR. Hubungan perilaku hidup bersih dan sehat dengan kejadian diare pada anak sekolah. 2025;6:15585-15590.
28. Rosdiana. Hubungan Perilaku Hidup Bersih dan Sehat (PHBS) dengan Kejadian Penyakit. Kesehatan, J Ilmu. 2025;4(1):193-205.
29. Fatmawati DA, Murti B. Meta-Analysis the Effects of Hand Washing Behavior Using Soap and Latrine Availability on the Diarrhea Incidence in Children Under Five. 2024;09:119-131.

30. Anhar KH, Martani NS, Teresa A, Widodo T. Hubungan Perilaku Penggunaan Air Terlindung Dan Jamban Layak Terhadap Angka Diare 2022 Correlation Between The Behavior Of Using Protected Water And Proper Latrines To The Incidence Of Diarrhea In 2022. 2024;2(3):90-96. doi:10.37304/barigas.v2i3.11861
31. Anggelina P, Maramis S, Drew C. Hubungan perilaku hidup bersih dan sehat dengan kejadian diare pada mahasiswa. *Holistik J Kesehat*. 2025;19(8):2431-2436.
32. Gustini G, Sumiyati S, Asmi AS, Nordianiwati N, Hendrick H. Jurnal Pengabdian Masyarakat Edukasi Indonesia (JPMEI). *J Pengabd Masy Edukasi Indones*. 2024;1:63-69. doi:10.61099/jpmei.v1i2.42
33. Puspita MI, Tinggi S, Kesehatan I, Yakkum B. Hubungan Perilaku Hidup Bersih Dan Sehat (Phbs) Terhadap Perilaku Pencegahan Diare. Published online 2024:157-164.
34. Yasin Z, Nawawi A, Devy SR, Rahayu S. The Effect of Family Clean and Healthy Living Behavior Education (PHBS) on the Prevention of Diarrhea in Toddlers. *J Promkes Indones J Heal Promot Heal Educ*. 2025;13(1):94-102. doi:10.20473/jpk.V13.I1SI.2025.94-102
35. Wesiye, Amelia D, Pane P, Unzila F, Rahima AF. TOFEDU : The Future of Education Journal The Clean and Healthy Living Behavior as an Effort to Prevent Diarrhea in the Community of Cemara Kembar Coastal Area. *TOFEDU Futur Educ J*. 2025;4(9):398-404.