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IMPACT OF TEACHER TRAINING ON REDUCING COMMUNICABLE DISEASES AMONG SCHOOL-AGE CHILDREN: A NARRATIVE REVIEW

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Abstract
Communicable diseases found a major problem among school going children universally, especially in low resource communities where insufficient WASH (water, sanitation and hygiene) overcrowding, infrastructure and inadequate health awareness accelerate infection spread. As teachers are frontline health educators and have the potential to decrease these risks through organized training programs focused on hygiene promotion, early detection and infection prevention. This review highlights key training components which includes, infection prevention and control practices, hygiene promotion, WASH education, early identification of illness and health communication strategies. Findings show that teacher training improves student hygiene behaviors, reductions the prevalence of diarrheal and respiratory infections, improves school attendance, and supports overall learning environments. Structural limitations such as insufficient facilities, inadequate resources and limited professional growth opportunities, continue to restrict the full impact of school based health programs. The review also emphasizes the alignment of teacher training with global development significances, mainly Sustainable Development Goals #3 and #4, which advocate for improved child health and quality of education. Strengthening teacher capacity through organized, context appropriate training is important for building strong school systems and reducing communicable disease risks among children.
Keywords: *teacher training, communicable diseases*

1. Introduction

Communicable diseases are remaining a major cause of morbidity, absenteeism and low academic performance among children, mainly in low and middle income countries where structural differences shapes daily learning situations. The (WHO) World Health Organization identifies diarrheal disorders, acute respiratory infectious conditions, influenza like illnesses, worm infections and skin diseases as principal causes of preventable illness among children, excessively affecting those in resource constrained environments (WHO, 2023).

UNICEF (2021) The load is significantly higher in closely populated urban slum areas, where schools often lack clean drinking water, satisfactory sanitation, appropriate ventilation and crucial hygiene supplies. UNICEF's universal WASH assessment reports that millions of school going children attend institutions even without basic handwashing facilities or safe clean toilets, circumstances that accelerate the spread of infectious agents like bacteria etc.

Within these situations, teachers play an important role in shaping students' daily health activities. As the key point of contact in the classroom, teachers' inspiration hand hygiene routines, sanitation practices and early illness acknowledgement. Evidence shows that trained teachers significantly improve infection prevention activities, increase hand washing compliance and support ecological hygiene in ways that can reduce the occurrence of common infectious diseases (Freeman et al., 2019).

Despite critical role, teachers in numerous low resource settings obtain minimal or no formal training about communicable disease prevention. Research studies from South Asian and African school education systems highlight general gaps in teacher readiness, limited professional development chances and insufficient integration of school health into teacher training curricula (Baig et al., 2021).

Shezad et al. (2025) Circumstances are especially challenging in urban slum area schools, where infrastructural shortages coincide with high disease load. A very recent review of health issues in Pakistani slum area schools documented extensive WASH inadequacies, high student teacher ratios and inadequate teacher capacity to manage infection risks.

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Strengthening teachers training is therefore a planned and cost effective method to reducing communicable disease transmission specially in schools. Programs which includes hand hygiene instructions, WASH education, infection prevention and control (IPC) practices, behavior change communication and initial illness identification have verified measurable benefits, including reduced absenteeism and better child health outcomes (Talaat et al., 2013). This focus aligns strictly with universal development significances. SDG # 3 highlights reducing illness through prevention and strengthened health promotion, whereas SDG # 4 highlights the requirement for safe, comprehensive and healthy school settings. Teacher training lies at the connection of these goals, representing a applied means to improve both quality of education and child's health.

Given these factors, this narrative review observes universal evidence on the impact of teacher training in decreasing communicable diseases among school aged children, with specific attention to high risk settings such as urban slum areas. The review synthesizes open access research studies, classifies effective training components and assesses structural challenges to notify future policy, practice and research in school health.

2. Methodology

2.1 Review Design

A **narrative review design** employed to synthesize various evidence on teacher training and its influence on communicable disease prevention among school aged children. A narrative method was chosen because the available literature encompasses mixed study designs, including intervention studies, qualitative investigations, randomized school based trials, mixed methods evaluations and policy reports. This design allowed for an integrative scrutiny of varying intervention models, contextual aspects and consequences across universal school settings, with specific attention to low resource and slum area environments.

2.2 Search Strategy

A comprehensive search of open access literature conducted between **August and September 2025**. Numerous academic databases and administrative repositories were used to guarantee broad exposure of educational and public health research. These included:

- ERIC (Education Resources Information Center)
- PubMed Central (PMC)
- WHO Institutional Repository
- PubMed
- Google Scholar
- Zenodo and ScienceOpen
- UNICEF WASH library

The search strategy included Boolean operators and mixtures of keywords. Example search terms includes:

- "slum schools AND disease prevention"
- "SDG 3 AND SDG 4 school health"
- "hand hygiene promotion in schools"
- "school health programs AND LMICs"
- "teacher training AND communicable diseases"
- "school-based infection prevention"
- "WASH education AND teachers"
- "teacher-led health interventions"

The search was limited to **open access** bases to ensure transparency and replicability.

2.3 Inclusion Criteria

Research studies were included if they met on the following criteria:

1. **Population:** School-aged children or school teachers who involved in health education promotion.
2. **Intervention:** Teacher's training or teacher-led programs which are related to hygiene promotion, WASH, infection prevention or transmissible disease reduction.
3. **Outcome:** Reported belongings to student behavior, disease occurrence, attendance and teacher capacity or school health environment.

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4. **Study Type:** Mixed-methods, qualitative, quantitative, randomized trials, evaluations, and policy or technical reports.
5. **Time Frame:** Research studies done between 2000–2025.

2.4 Exclusion Criteria

Studies were excluded if they:

- Focused only on hospital or clinical infection control.
- Did not involve teachers or school based components.
- Were pay walled or not accessible full text.
- Were published in other than English language.

2.5 Screening and Selection Process

The initial search generated **one hundred thirty-eight (138) articles and reports**. After subtraction of duplicates (n = 27), the remaining titles and abstracts (n = 111) were screened for application. A total number of **sixty-eight (68) records** felt full-text review. After applying inclusion and exclusion criteria, **fifty-two (52) studies** were selected for final synthesis.

The Chosen Reporting Items for Systematic Reviews PRISMA (Preferred Reporting Items for Systematic Reviews & Meta Analyses) strategies were adapted to structure the review process, while full PRISMA reporting was not mandatory due to the narrative design.

2.6 Data Extraction and Synthesis

An organized extraction table was used to collect material across studies, including:

- Study location and population
- Features of teacher training
- Disease prevention components (e.g., WASH, IPC, hand hygiene)
- Implementation policies
- Measured conclusions (behavioral, health, environment and attendance)
- Stated barriers and related factors

Data were synthesized thematically, guided by three main domains:

1. **Training Content and Pedagogy**
2. **Structural, Environmental and Systemic Challenges**
3. **Impact on Pupil and School Health Consequences**

This thematic approach allowed for integration of the findings across various study designs and topographical settings, providing a comprehensive evidence base.

2.7 Ethical Considerations

As this study is a narrative review of present literature, it did not involve humans so not require ethical approval. All data included were openly accessible and used in harmony with open access permissions.

3. Communicable Disease Risks in School Settings

Schools are active social environments where child interact closely, spend extended hours and share materials in limited spaces. These features make schools chiefly vulnerable to the transmission of transmissible diseases, especially in low resource locations. The risk is amplified in environments where hygiene facilities, infra-structure and health literacy are inadequate to support active disease-prevention behaviors.

3.1 Dominant Communicable Diseases Among Schoolchildren

A substantial amount of illness among school aged children is attributable to communicable diseases, most commonly:

- **Acute respiratory infections**
- **Diarrheal diseases**
- **Influenza and related illnesses**
- **Worm infections**
- **Skin infections (scabies and impetigo)**
- **Conjunctivitis**

WHO (2023) these infections are among the leading causes of preventable mortality and morbidity in children under the age of fifteen, mostly driven by insufficient hygiene practices and unsafe environments.

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Current universal analyses reveal that diarrheal diseases persist a major cause of school absenteeism, mainly in countries with limited water and sanitation infrastructure. Respiratory infections also spread quickly in crowded classrooms where ventilation is poor and cough protocol is not widely practiced. Worm infections are common in areas where poor environmental hygiene, soil contamination and insufficient footwear are prevalent.

3.2 Environmental and Behavioral Elements of Disease Transmission

The spread dynamics of transmissible diseases in schools are powerfully influenced by ecological and behavioral aspects. UNICEF's universal assessment shows that nearly one in three schools in low resource locations lacks basic hand washing services and almost half lack safe, functional toilets (UNICEF, 2021).

Key elements of disease spread in schools include:

- **Insufficient WASH services**: Limited access to soap, clean water and hygienic toilets delays basic hand hygiene.
- **Overcapacity**: High student teacher ratios and overfilled classrooms increase airborne disease transmission.
- **Joint things**: Communal use of desks, pens and learning supplies rises surface contamination.
- **Poor ventilation**: Inadequate airflow contributes to the spread of respiratory system infections.
- **Minimum health alertness**: Children often lack information of hygiene practices such as handwashing before eating meal or after using toilet.

A systematic review by Freeman et al. (2019) emphasized that poor WASH situations in schools are constantly related with higher rates of diarrheal and respiratory diseases, reduced attention spans and increased absenteeism among students.

3.3 Disease Burden in Slum areas Schools

The health-related risks faced by school going children are significantly magnified in urban slum areas due to combined infrastructural and socio-economic vulnerabilities. Schools in informal settlements often lack:

- Soap or handwashing stations
- Reliable water supply
- Separate toilets of girls and boys
- Waste material disposal systems
- Clean, ventilated and suitable classrooms

A study form slum areas schools of South Asia reported that environmental contamination, overcrowding and poor sanitation formed high risk conditions for the spread of diarrheal and skin related infections (Baig et al., 2021).

Correspondingly, a Pakistani slum areas-based review found that teachers in schools frequently reported recurrent outbreaks of communicable diseases, high absenteeism and limited institutional volume to implement hygiene enhancements (Shezad, 2025).

These challenges excessively affect girls, who may avoid school due to insufficient toilet facilities, further contributing to gender inequalities in education and health.

3.4 Implications for Children Health and Learning

Infectious diseases harmfully impact children's well-being, school attendance and cognitive growth. Recurrent illness disturbs learning continuity, reduces concentration and may impair long term academic performance. Evidence proves that even mild infections can lead to measurable declines in learning outcomes due to absenteeism and reduced classroom engagement (Talaat et al., 2013).

Additionally, repeated illness can exacerbate malnutrition, anemia and developmental delays, creating a cycle of difficulty that disproportionately impacts marginalized children in slum societies.

4. Teacher Training Involvements for Communicable Disease Prevention

Teacher training plays a key role in consolidation school health systems and reducing infectious diseases among school aged children. Evidence constantly shows that when teachers receive structured, competency based training, they become active agents of health promotion,

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behavior change and infection prevention within classroom environments. This section synthesizes global open access literature on the major components of teacher training involvements and their documented outcomes.

4.1 Hand Hygiene Training Programs

Hand hygiene is widely familiar as one of the most effective policies for preventing the spread of diarrheal and respiratory diseases in schools. Teacher-led hand washing programs have recognized substantial improvements in hygiene compliance and reductions in infection rates. Talaat et al. (2013) A cluster based research from Egypt involving 60 primary schools presented that training teachers to conduct hand hygiene demonstrations and daily monitoring significantly reduced influenza like illness as well as absenteeism among children.

Likewise, a multi country systematic review also found that teacher-led handwashing creativities were associated with a **31% reduction in respiratory acute infections** and a **47% reduction in diarrheal diseases** (Willmott et al., 2016).

These programs often include:

- Time schedule for hand washing
- Demo that how to wash hand
- Visual cues like posters in classes
- Peer-led hygiene teams managed by teachers

4.2 WASH Education and Environmental Hygiene Training

WASH (Water, sanitation and hygiene) education is a initial component of teacher training in infectious disease prevention. Teachers trained in environmental hygiene practices can promote:

- Management of waste
- Safe clean water use and storage
- Cleaning and monitoring of toilets
- Classroom cleaning practices
- Sanitation practices of young girls
- Hygiene behavior reinforcement

Freeman et al. (2019) recognized teacher directed WASH education as a serious determinant of improved hygiene behavior and reduced disease transmission in low income settings.

In locations where WASH training was combined with improved infrastructure, outcomes were considerably stronger, highlighting the importance of pairing teacher training with school resources.

4.3 Deworming and Parasitic Infection Control

Teachers frequently contribute in mass deworming and parasitic infection control programs, especially in endemic areas. Training teachers to administer medication, track circulation and educate students on protective behaviors has shown clear benefits.

Studies across South Asia and sub Saharan Africa demonstrate:

- Growth indicators improved
- Deceases helminth burden
- Increased attendance
- Better parental awareness of parasitic infections

Teachers often serve as the main implementers of deworming programs when health workers are unavailable, highlighting their essential role in parasite-control initiatives.

4.4 Infection Prevention and Control Training

Post COVID-19 pandemic, infection prevention and control (IPC) training for teachers has become progressively prioritized. However, gaps remain; universal data show that many teachers have limited knowledge of basic IPC measures.

A recent 2024 survey of teachers across multiple countries Lobo et al. (2024) revels that over **80% lacked formal training** in disease prevention practices, highlighting the need for structured IPC modules.

Effective IPC training includes:

- Education of cough etiquette
- Recognition of illness on early basis

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- Classroom ventilation policies
- Protocols of isolation for sick children
- Surface disinfection procedures
- Managing shared learning resources

Teachers trained in IPC demonstrate higher self-confidence and greater adherence to infection prevention behaviors, resulting in safer learning environments.

4.5 Health Communication and Behavior Change Skills

Teacher training also integrates communication techniques that improve behavior change among students. Actual approaches include:

- Visual learning by posters
- Activates and games focuses hygiene
- Storytelling and interactive learning
- Health clubs led by students managed by teacher
- Session focus on health among parents and teachers

Behavior change communication led by trained teachers has been revealed to significantly increase students' willingness to adopt defensive behaviors and sustain them over time.

4.6 Multi-component and Integrated Training Programs

Few evidence recommends that training programs combining multiple component like WASH education, hand hygiene, IPC and communication strategies are highly effective than single focus training program.

Integrated school health programmes, reported:

- Stronger institutionalization of hygiene routines
- Boosted teacher motivation
- Lower disease occurrence
- Developed academic participation

These programs replicate a systems based method that recognizes the consistent nature of health behaviors, school environments and teacher capacity.

5. Influence of Teacher Training on Pupils and Institutes

The review recognizes multiple impact pathways through which teacher training decreases communicable and infectious diseases.

Teacher training is extensively known as a transformative intervention that enhances knowledge, shapes behavior and reinforces infection prevention in school environments. Evidence from multiple countries demonstrates that when teachers obtain structured skills in WASH, hygiene promotion and communicable disease prevention, the benefits extend beyond individual classrooms to influence overall school functioning, student well-being and academic continuity. This section synthesizes major influence areas documented across open-access research.

5.1 Improvements in Behavior of Student towards Hygiene

One of the most fast and measurable outcomes of teacher-led training is the development in student hygiene practices. Trained teachers reliably demonstrate stronger capacity to reinforce daily hygiene routines, establish structured handwashing times and perfect healthy practices.

A large multi-school intervention in Egypt reveal that training teachers to conduct handwashing demonstrations and integrate hygiene communications into daily lessons resulted in substantial increases in the frequency and quality of student handwashing (Talaat et al., 2013).

Likewise, a global systematic review described that teacher-supported handwashing programs improved student obedience by up to **60%**, demonstrating the significant behavioral effect of instructional reinforcement (Willmott et al., 2016).

Behavioral improvements usually observed include:

- Washing of hands before meals and after toilet use
- Safer use of drinking water
- Proper handwashing technique
- Cleaner toilet practices
- Reduced sharing of personal things

These behavior variations are foundational for reducing communicable disease transmission.

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5.2 Reduction in Communicable Disease Frequency

Teacher training contributes directly to reductions in disease occurrence by improving hygiene practices, classroom cleanliness and early detection of illness. Schools where teachers receive planned training report fewer outbreaks, fewer symptomatic children and stronger adherence to preventive measures.

A comprehensive review by Freeman et al. (2019) found that teacher-led hygiene and WASH and programs were linked with **constant reductions in diarrheal disease, parasitic infestations and respiratory infections** in low-income school settings.

Documented health influences include:

- Lesser rates of respiratory infections
- Fewer diarrheal episodes
- Reduced spread of influenza like illnesses
- Decreased parasitic worm burden
- Less skin infections

In locations with integrated teacher training and improved sanitation infrastructure, outcomes were even more pronounced.

5.3 Increased School Attendance and Learning Continuity

Infectious diseases are among the leading causes of nonappearance in primary and middle school children. When teacher training reduces infections, attendance increases and learning continuity improves.

Evidence from multiple school-based trials indicates:

- Hygiene-focused teacher training can reduce absenteeism
- Classroom engagement can be improved by fewer illness-related disruptions
- Enhanced concentration and participation among healthy children

A 2024 open-access analysis revealed that improved hygiene environments led to measurable gains in academic performance, mediated by reductions in school absenteeism (Romero et al., 2024).

Children who attend school consistently demonstrate stronger cognitive performance, higher literacy and proficiency scores and improved psychosocial well-being.

5.4 Strengthened School Environments and Classroom

Teacher training does not only advantage students, it also strengthens overall school systems. Trained teachers:

- Structured hygiene routines implementation
- Ensure constant environmental cleaning
- Connect with parents regarding illness
- Identify early signs of disease
- Keep safer classroom environments

These improvements contribute to the creation of **“health-promoting schools”**, a concept supported by WHO and UNICEF.

Teacher training also improves school readiness for outbreaks, enabling teachers to respond more effectively during episodes of influenza, scabies, diarrhea, or cholera-like symptoms.

5.5 Enhanced Teacher Competence and Professional Confidence

Training strengthens teachers’ knowledge, skills and confidence in management of health-related challenges. Studies have shown that trained teachers:

- Feel more proficient of managing hygiene practices
- Report better confidence in collaborating with parents
- Experience reduced anxiety during disease outbreaks
- Are more likely to adopt sustained health-promotion roles

A 2024 cross-sectional research study found that teachers with infection prevention and control training exhibited significantly higher self-efficacy and were more likely to implement preventive routines consistently (Lobo et al., 2024).

Teacher confidence is a strong predictor of program sustainability.

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5.6 Community Spillover Effects

The influence of teacher training covers beyond school boundaries, impacting health practices at home and within communities. Children often model new hygiene behaviors for siblings and parents, creating a multiplier effect.

Common spillover outcomes include:

- Parents accepting improved hand-washing routines
- Reduced household infection rates
- Greater request for clean drinking water and sanitation services
- Increased parental awareness towards communicable disease prevention

Teacher-led health education therefore contributes to broader community health improvements, particularly in dense urban slums.

5.7 Advancing SDG 3 and SDG 4 Goals

Teacher training directly supports global development priorities:

SDG 3 – Good Health and Well-Being

- Reduced communicable disease burden
- Improved child health consequences
- Strengthened prevention systems

SDG 4 – Quality Education

- Lesser absenteeism
- Safer learning settings
- Increased educational equity for marginalized children

Because teacher training effects both education and health sectors, it represents an essential cross-cutting intervention for achieving SDGs targets in low-income and slum societies.

6. Barriers to Training Effectiveness

Despite substantial evidence supporting the role of teacher training in reducing communicable diseases among school-aged children, its impact is often constrained by systemic, infrastructural, and contextual barriers. These challenges are particularly pronounced in low-income and slum-based school settings, where limitations in resources and capacity hinder the implementation and sustainability of health-promoting practices. Understanding these barriers is essential for designing effective teacher training programs that can be realistically implemented in high-risk environments.

6.1 Inadequate WASH Infrastructure

A fundamental barrier to the effectiveness of teacher training is the absence of essential water, sanitation, and hygiene (WASH) infrastructure. Even when teachers are trained and motivated, the absence of clean water, soap, functional toilets, or waste disposal systems restricts their ability to implement learned strategies. UNICEF's global monitoring report indicates that millions of schools lack basic WASH facilities, with **42% of schools in low-income countries lacking handwashing stations with soap and water** (UNICEF, 2021).

Without adequate infrastructure, teacher training cannot translate into actual behavior change among students. This gap is especially severe in slum-based schools, where water scarcity, broken toilet facilities, and overcrowded conditions are common.

6.2 Overcrowding and High Student–Teacher Ratios

Overcrowded classrooms are a defining characteristic of urban slum schools. High student–teacher ratios reduce teachers' ability to monitor hygiene compliance, observe early symptoms of illness, or ensure proper handwashing techniques. Overcrowding also increases the risk of airborne disease transmission and makes physical distancing impossible.

Freeman et al. (2019) identified overcrowding as a major determinant of poor WASH outcomes and heightened infection transmission in school environments.

Even the most well-designed training programs are limited when teachers supervise large groups with minimal space or resources.

6.3 Limited Opportunities for Professional Development

A recurring challenge across the literature is the limited availability of structured in-service and pre-service training opportunities. Teacher education programs in many low-income

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countries do not systematically integrate communicable disease prevention, WASH promotion, or infection control into their curriculum.

Global data suggest that **more than 80% of teachers lack formal training in infection prevention and control (IPC)** (Lobo et al., 2024).

The lack of continuous training or refresher programs also weakens long-term retention of knowledge and reduces program sustainability.

6.4 Weak Coordination Between Health and Education Sectors

Effective school health programming requires strong collaboration between education departments, local health authorities, NGOs, and municipal services. However, institutional fragmentation is a persistent barrier. Schools often operate in isolation, with minimal technical support from health departments, irregular monitoring of hygiene conditions, and inconsistent supply of hygiene materials.

Studies in South Asia report that health–education coordination is particularly weak in slum communities, where bureaucratic delays, limited inter-agency communication, and unclear roles impede program implementation (Baig et al., 2021).

Without coordinated systems, teacher training efforts remain fragmented and difficult to scale.

6.5 Resource Constraints and Funding Limitations

Many schools in low-resource settings operate with extremely limited budgets. Funding shortages affect:

- Procurement of soap and cleaning supplies
- Maintenance of toilets
- Access to safe drinking water
- Implementation of hygiene activities
- Printing of educational materials
- Classroom cleaning schedules

These material deficits severely restrict teachers' ability to carry out preventive practices, even when adequately trained. In slum settings, the financial burden of maintaining hygiene often falls on teachers or parents, further limiting program uptake.

6.6 Workload, Burnout, and Psychosocial Stress Among Teachers

Teacher burnout is a significant barrier to the effective implementation of health programs. Slum-school teachers frequently face:

- High student loads
- Multiple administrative responsibilities
- Limited instructional resources
- Emotional and psychosocial stress
- Inadequate institutional support

Shezad et al., (2025) These factors reduce teacher motivation and capacity to sustain health-promotion routines. A review of Pakistani slum schools highlighted that teachers often feel overextended and unprepared to manage additional health-related responsibilities.

High workload, combined with low support, creates an environment where even trained teachers struggle to consistently apply acquired skills.

6.7 Cultural Beliefs, Parental Attitudes, and Social Barriers

Community beliefs and misconceptions can undermine teacher-led health education. In some regions, parents may resist hygiene practices, deworming campaigns, or illness identification due to:

- Myths associated with medicine
- Cultural taboos
- Stigma around infectious diseases
- Distrust of school-based health programs

Teacher training alone cannot overcome these barriers without community engagement strategies that align school health messages with local cultural contexts.

6.8 Policy Gaps and Lack of Institutionalized School Health Frameworks

Many low-income countries do not have formal school health policies or do not fully implement existing guidelines. As a result,:

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- Training is sporadic
- Monitoring is inconsistent
- Accountability mechanisms are weak
- Disease prevention lacks institutional priority

In Pakistan and similar contexts, school health is not yet fully integrated into national teacher training frameworks, limiting scalability and program sustainability.

6.9 Implications for Program Design and Sustainability

These structural and contextual barriers indicate that training teachers alone is not sufficient to reduce communicable diseases. For maximum impact, teacher training must be embedded within broader systemic reforms, including:

- Strengthened WASH infrastructure
- Cross-sector collaboration
- Sustainable funding mechanisms
- Teacher workload management
- Community engagement initiatives
- Policy integration within national education strategies

Only through such multi-level approaches can the full benefits of teacher training be realized.

7. Integration with the Sustainable Development Goals (SDGs)

The role of teacher training in reducing communicable diseases intersects directly with the United Nations Sustainable Development Goals (SDGs), particularly **SDG 3: Good Health and Well-Being** and **SDG 4: Quality Education**. These goals emphasize health promotion, equitable access to education, and the creation of safe, inclusive learning environments. Improving teacher capacity for disease prevention is therefore not only a school-level intervention but also a strategic contribution to the global development agenda.

7.1 Advancing SDG 3: Good Health and Well-Being

SDG 3 seeks to "ensure healthy lives and promote well-being for all at all ages," with specific targets focused on reducing preventable diseases, strengthening health systems, and increasing public health education. Teacher training directly contributes to these targets by improving health literacy within school communities and reducing the incidence of communicable diseases through preventive strategies.

Contribution to SDG 3.3: Ending Communicable Diseases

Teacher-led WASH and hygiene programs have been consistently linked to reductions in:

- diarrheal diseases
- respiratory infections
- influenza-like illnesses
- soil-transmitted helminths
- skin infections

Freeman et al. (2019) highlight that school-based hygiene interventions, when delivered by adequately trained teachers, significantly decrease the burden of infectious diseases in low-income communities.

These reductions directly support SDG target 3.3, which aims to combat communicable diseases and strengthen prevention strategies.

Contribution to SDG 3.8: Universal Health Coverage & Prevention

Teacher training strengthens primary prevention at the community level—an essential component of universal health coverage. By modeling preventive behaviors and identifying early symptoms, trained teachers act as decentralized health promoters, contributing to early detection, timely referrals, and reduced disease transmission.

Contribution to SDG 3.d: Strengthen Capacity for Health Risk Management

Post-pandemic literature shows that teachers with infection prevention and control (IPC) training are more capable of managing health risks during outbreaks (Lobo et al., 2024).

This aligns with SDG 3.d, which emphasizes building capacities for health risk reduction and management.

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7.2 Advancing SDG 4: Quality Education

SDG 4 promotes inclusive, equitable, and quality education for all. Health and education are deeply interconnected: children who experience frequent illness or absenteeism have lower academic performance, reduced concentration, and poorer long-term outcomes.

Contribution to SDG 4.a: Safe and Healthy Learning Environments

Teacher training strengthens school safety and health by:

- establishing hygiene routines
- maintaining clean classroom environments
- supporting sanitation management
- reducing disease transmission

UNICEF's school WASH framework highlights that safe learning environments are foundational for achieving educational equity (UNICEF, 2021).

Schools where teachers are trained in WASH and IPC practices are better equipped to sustain healthy conditions.

Contribution to SDG 4.c: Increasing the Supply of Qualified Teachers

Teacher training in hygiene promotion and IPC enhances the professional qualifications of teachers by expanding their competencies beyond academic instruction. This aligns with SDG 4.c, which aims to increase the number of trained and qualified teachers through improved professional development.

Health-related competencies are increasingly considered essential components of teacher professionalization, especially in low-resource and slum-based environments.

7.3 SDG Interlinkages: Health–Education Synergy in Slum Communities

The relationship between SDG 3 and SDG 4 is strongly synergistic, and teacher training is positioned at their intersection.

Health Influences Education

Healthier students attend school more regularly, participate actively, and demonstrate better cognitive performance (Romero et al., 2024).

Education Influences Health

Schools serve as hubs for early health education, shaping lifelong behaviors related to hygiene, disease prevention, and environmental health.

Teacher Training as a Bridging Mechanism

In slum communities—where disease burden is high, infrastructure inadequate, and health services limited—teacher training becomes a powerful mechanism to advance both goals simultaneously. By equipping teachers with skills in hygiene promotion, IPC, and communication, schools become integrated platforms for public health empowerment.

7.4 Policy Implications for SDG Alignment

To maximize contributions toward SDG 3 and SDG 4, school health initiatives should:

- integrate WASH and IPC training into teacher education frameworks
- strengthen coordination between health and education departments
- secure stable funding for school hygiene materials
- develop monitoring systems for school-level disease prevention
- prioritize slum and underserved communities in national policies

Such policy measures ensure that teacher training is not an isolated intervention but an institutionalized component of sustainable school health systems.

8. Discussion

The findings of this narrative review demonstrate that teacher training is a critical and underutilized strategy for reducing communicable diseases among school-aged children, particularly in low-resource and slum-based environments. Across diverse geographical contexts, teacher-led interventions have consistently improved hygiene behaviors, reduced infection prevalence, enhanced school attendance, and strengthened overall learning environments. These outcomes highlight the central role of teachers not only as educators but also as health promoters and community influencers.

The present findings are strongly aligned with the study conducted by Shezad (2025), which emphasized the pivotal role of teachers in monitoring student hygiene, identifying school-based

health risks, and promoting preventive health practices in slum school environments. Study demonstrated that teachers' awareness of environmental health conditions and communicable disease risks can positively influence student health behaviors. Similarly, the current review confirms that structured teacher training enhances educators' capacity to implement hygiene promotion, infection prevention, and health education strategies in routine classroom activities. These findings collectively highlight that teacher empowerment through structured training can serve as a sustainable and cost-effective approach to improving school health outcomes.

A growing body of international evidence further supports the effectiveness of teacher training programs in WASH education, hand hygiene promotion, and infection prevention and control (IPC) practices. Studies indicate that teacher-led interventions, including classroom-based hygiene education, supervised handwashing routines, deworming awareness programs, and early symptom recognition training, produce measurable improvements in student health behaviors and infection prevention outcomes (Freeman et al., 2019). Such interventions are particularly beneficial in slum environments where children experience compounded health vulnerabilities due to inadequate sanitation infrastructure, overcrowded classrooms, and limited access to formal healthcare services (Baig et al., 2021). The integration of health promotion into daily classroom routines allows teachers to reinforce positive behavioral changes and ensures sustained health awareness among students.

Despite these positive outcomes, the review identifies several structural and systemic barriers that limit the effectiveness and scalability of teacher training initiatives. Among these barriers, inadequate WASH infrastructure emerges as the most significant constraint. Even when teachers receive appropriate training, their capacity to implement hygiene promotion practices remains restricted when schools lack access to safe drinking water, functional sanitation facilities, handwashing stations, or proper waste management systems (UNICEF, 2021). Furthermore, overcrowded classrooms reduce teachers' ability to monitor hygiene compliance, conduct individualized health assessments, and identify early signs of communicable diseases, thereby increasing the risk of infection transmission within school environments.

The findings of the present review also partially contradict the observations reported by Shezad et al. (2025) which suggested that teachers often demonstrate awareness of school health challenges but face substantial limitations in implementing preventive interventions due to inadequate institutional support. This discrepancy may be explained by contextual variations across different school settings. While teachers may possess basic knowledge of hygiene and communicable disease prevention, the absence of structured training frameworks, limited professional development opportunities, and resource constraints frequently hinder the practical application of this knowledge. These contextual differences highlight the importance of integrating teacher training programs with infrastructural improvements and systemic support mechanisms to achieve sustainable school health outcomes.

Another critical challenge identified in this review is the absence of institutionalized and standardized teacher training frameworks within school health systems. Global evidence indicates that a large proportion of teachers receive minimal or no formal training in IPC, hygiene promotion, or communicable disease prevention, and only a limited number have access to continuous professional development opportunities in health-related competencies (Lobo et al., 2024). The lack of structured training programs results in inconsistent implementation of school health initiatives, weak sustainability of interventions, and limited integration of health education into routine teaching practices. In Pakistan and other low- and middle-income countries (LMICs), teacher education curricula often exclude comprehensive school health modules, leaving educators inadequately prepared to address communicable disease risks within school settings.

The review further identifies governance and coordination barriers that undermine the long-term effectiveness of teacher training interventions. Weak collaboration between education and health sectors frequently results in fragmented service delivery, irregular monitoring, insufficient supply of hygiene materials, and lack of standardized program evaluation mechanisms. Without strong intersectoral coordination and policy integration, teacher training

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programs are unlikely to achieve sustained public health impact or scalability across diverse school environments.

Importantly, the findings of this review demonstrate strong alignment with global development priorities, particularly Sustainable Development Goal 3 (Good Health and Well-being) and Sustainable Development Goal 4 (Quality Education). Teacher training contributes to SDG 3 by strengthening communicable disease prevention, promoting healthy hygiene behaviors, and improving child health outcomes. Simultaneously, it supports SDG 4 by creating safer learning environments, reducing absenteeism, and enhancing academic continuity. These interconnections emphasize the importance of teacher training as a cross-sectoral intervention that bridges education and health systems and contributes to broader social development goals.

From a policy perspective, the findings highlight the urgent need to institutionalize school health training within national teacher education systems. Pre-service teacher education curricula should incorporate structured modules on WASH, hygiene promotion, communicable disease prevention, and IPC practices. In addition, in-service teacher training programs should provide continuous professional development opportunities to strengthen teachers' competencies in school health promotion. Complementary investments in school infrastructure, particularly in underserved slum communities, are essential to ensure that training interventions translate into practical and sustainable improvements in student health outcomes.

Future research should prioritize longitudinal and implementation-focused studies that evaluate the sustained impact of teacher training on both health and educational outcomes. There is also a critical need for context-specific research in South Asian and African slum environments where communicable disease burdens remain disproportionately high and health system resources are limited. Additionally, research exploring cost-effectiveness, teacher workload optimization, and the integration of digital and blended learning approaches for teacher training may provide valuable insights for scaling school health interventions and improving program sustainability.

Overall, this review confirms that teacher training represents a feasible, scalable, and high-impact strategy for reducing communicable diseases in school environments. When supported by adequate infrastructure, strong governance structures, and active community engagement, trained teachers can significantly improve child health outcomes, contribute to achieving SDG targets, and strengthen the resilience and sustainability of school health systems.

9. Conclusion

This narrative review demonstrates that teacher training is a critical, evidence-based strategy for reducing communicable diseases among school-aged children, particularly in low-resource and slum-based settings. Across diverse global studies, teacher-led interventions—ranging from hand hygiene promotion and WASH education to infection prevention and control (IPC) practices—consistently improve student behaviors, reduce infection prevalence, strengthen school environments, and enhance academic continuity. These outcomes underscore the pivotal role that teachers play as frontline agents of health promotion within school communities.

However, the effectiveness of teacher training is heavily dependent on enabling environmental and systemic conditions. Persistent barriers such as inadequate WASH infrastructure, overcrowded classrooms, limited professional development opportunities, weak coordination between health and education sectors, funding constraints, and high teacher workload significantly hinder program implementation and sustainability. These challenges are particularly acute in urban slums, where structural inequalities intensify health risks and undermine school-level prevention efforts.

The findings of this review highlight the strong alignment between teacher training and global development priorities. Strengthening teacher capacity directly advances **SDG 3 (Good Health and Well-Being)** by reducing preventable diseases and enhancing child health, while simultaneously supporting **SDG 4 (Quality Education)** by creating safer learning environments, reducing absenteeism, and improving educational outcomes. Teacher training therefore represents an essential cross-sectoral intervention with the potential to accelerate progress in both health and education domains.

To maximize impact, teacher training must be institutionalized within national teacher education systems, embedded in pre-service curricula, and reinforced through continuous in-service professional development. Investments in school infrastructure—particularly water, sanitation, and hygiene facilities—are essential for translating training into sustained behavioral and health outcomes. Strengthening intersectoral collaboration between health and education authorities, ensuring consistent availability of hygiene supplies, and developing culturally responsive community engagement strategies are also critical for long-term success. Future research should focus on longitudinal studies assessing the sustainability of teacher-led health interventions, context-specific analyses in underserved slum communities, and evaluations of cost-effectiveness to guide policy decisions. Additionally, digital and blended learning approaches for teacher training warrant exploration, especially in resource-limited contexts where traditional training modalities may be difficult to scale.

Overall, this review affirms that empowering teachers through structured training is a highly feasible, impactful, and scalable strategy to reduce communicable diseases and promote healthier, more resilient school environments. When supported by adequate resources and strong institutional commitment, teacher-led health promotion can become a cornerstone of school health systems, helping to protect children's health, support their learning, and advance global equity in both education and public health.

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