

PERSPECTIVE

Water, Sanitation, and Hygiene: A Global Imperative for HealthSurekha Kishore¹, Venkatesh U², Shikhar Kishore Verma³, Shival Kishore Verma⁴, Parteek Walia⁵¹Executive Director and CEO, All India Institute of Medical Sciences Gorakhpur, Uttar Pradesh;²Assistant Professor, Department of Community and Family Medicine, All India Institute of Medical Sciences Gorakhpur, Uttar Pradesh;³Medical Officer (ex), THDC India Limited;⁴Project Coordinator, Johns Hopkins University, United States;⁵Project Consultant, All India Institute of Medical Sciences Gorakhpur, Uttar Pradesh

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Abstract

Clean water, proper sanitation, and hygiene (WASH) can have a significant impact on human health. Lack of financial resources prevent developing nations from making investments in WASH infrastructure, such as water treatment plants and sanitation facilities. Achieving universal access to clean water and sanitation is hampered by poor governance and insufficient policy frameworks. Governments, civil society organizations, and the private sector need to collaborate to invest in infrastructure and technology, promote good hygiene practices, and undertake education and awareness-raising programmes in order to ensure that everyone has access to clean water and sanitation.

Keywords

Water; Sanitation; Hygiene; Health; Infectious Diseases

Introduction

Water sanitation and hygiene (WASH) are essential factors in promoting human health and well-being. Access to clean water, adequate sanitation, and good hygiene practices are crucial for preventing infectious diseases and maintaining overall health. Sustainable Development Goal 6 recognizes access to clean water, proper sanitation, and hygiene as fundamental human needs for health and well-being. (1)

Impact of Unclean Water and Contamination: Consumption of unclean and contaminated water can have severe health consequences, particularly in relation to diarrheal diseases. Inadequate sanitation and poor hygiene practices also contribute to the spread of illnesses such as typhoid, diarrhea, and intestinal worm infections. The detrimental effects of these diseases highlight the criticality of ensuring access to clean water and promoting proper sanitation and hygiene practices.

Global WASH Challenges:

- **Access to Safely Managed Water:** According to the WASH Joint Monitoring Program by WHO and UNICEF, approximately 2 billion people worldwide lack access to safely managed drinking water in their homes. This staggering number underscores the urgent need for improved water supply systems and infrastructure.
- **Sanitation and Hygiene Disparities:** More than half of the global population lacks access to properly managed sanitation facilities, while around 2.3 billion people do not have a handwashing station with soap and water in their households. Addressing these disparities is essential for preventing the spread of diseases and improving overall health outcomes. (2)
- **Environmental Changes and Urbanization:** Rapid global environmental changes, urbanization, and climate change have amplified WASH-related issues and challenges. These include water contamination in distribution systems, water scarcity, the adoption of

affordable sanitation systems, and the establishment of sustainable water supplies and sanitation for urban areas. Adaptation strategies are crucial in mitigating the effects of these challenges.

- **Promoting Equity and Financial Sustainability:** A paramount objective is to address inequities in water and sanitation access services at both global and regional levels. Simultaneously, it is essential to ensure the financial sustainability of these services. Sustainable funding mechanisms and equitable distribution of resources are vital for achieving universal access to safe water and sanitation. (3)

Water Sanitation

Safe water and its quality are essential for human well-being and development, as it plays a crucial role in promoting good health. A household can consider its drinking water safe when it comes from a regulated source, is easily accessible, and free from faecal matter and harmful chemical pollutants. (4)

The Impact of Water Sanitation:

Water sanitation plays a critical role in preventing the spread of waterborne diseases. Untreated and contaminated water can give rise to various illnesses, including cholera, typhoid, dysentery, and hepatitis A. Particularly vulnerable are under-five children who frequently encounter environments with high faecal loads, leading to enteropathy. This condition, not only affects their nutrition but also has long-term consequences like stunting and delayed cognitive development. (5)

Affordable Solutions for Safe Water:

Several affordable and promising methods exist to ensure safe water at the household level. These cost-effective and efficient techniques include boiling, ceramic filter filtration, chlorination with storage in unconventional vessels, sedimentation, filtration, and chlorination. Implementing these methods can significantly enhance the safety of water for human consumption. (6)

Challenges in Water Sanitation:

Water sanitation remains a significant challenge, particularly in rural areas of developing countries where the infrastructure and access to clean water sources are limited. Overcoming these challenges requires addressing two key issues: providing water services in households and ensuring sustainable use of water sources in terms of quantity and quality. (6)

The Consequences of Limited Access:

The lack of basic water sanitation infrastructure, such as toilets, handwashing stations, and wastewater treatment systems, leads to poor hygiene practices and contamination of water sources. This, in turn, contributes to the spread of diseases. Moreover, reliance on contaminated surface water sources due to limited access to clean water leads to waterborne illnesses from drinking, cooking, and washing with unsafe water.

Accelerating Infrastructure Improvement:

Reforms involving the creation of new legal and regulatory frameworks, establishment of designated institutions, modification of institutional and industrial structures in the public sector, and, in some cases, transferring water and sanitation services to the private sector can expedite infrastructure improvement and access to clean water sources. These measures pave the way for significant progress in water and sanitation services. (7)

Hygiene Practices

The transmission of infectious diseases can be effectively halted by adopting good hygiene practices. Simple personal habits like regular handwashing, maintaining a clean face, and bathing with soap and water contribute to cleanliness and overall well-being. (8)

The Impact of Poor Personal Hygiene:

Neglecting personal hygiene can result in waterborne diseases such as fungal skin infections like ringworm, or eye diseases like trachoma and conjunctivitis. Handwashing, in particular, serves as a powerful tool to prevent the transmission of viruses and bacteria, which can cause respiratory illnesses and diarrhea. Proper handwashing involves using clean water and soap, washing hands for at least 20 seconds, and drying them with a clean towel or air dryer. It is crucial to wash hands before eating or handling food, after using the restroom, sneezing, coughing, blowing the nose, or coming into contact with animals or animal waste. Additionally, proper food handling practices play a vital role in preventing foodborne illnesses. These practices include storing food at the correct temperature, separating raw and cooked foods, cooking food to the appropriate temperature, and avoiding cross-contamination.

Challenges in Promoting Hygiene Practices:

Promoting hygiene practices in various settings, such as households, schools, and communities, can be challenging due to several factors ([Table 1](#)). Within households, cultural beliefs, lack of awareness, inadequate education on hygiene importance, and limited access to clean water can act as barriers to adopting good hygiene practices. Health education initiatives have proven to be effective in enhancing people's attitudes and understanding regarding the use of sanitary facilities, wearing shoes, and handwashing. (9)

Hygiene Practices in Schools:

Promoting hygiene practices in schools faces challenges due to limited resources and inadequate facilities. According to a UNICEF evaluation, only 51% of schools in low-income countries had access to acceptable water sources, and only 45% had adequate sanitation facilities. Furthermore, students may lack education on hygiene practices at home, making it more challenging to establish good habits at school. Schools play a crucial role in teaching children essential hygiene lessons, which may

not be practical or supported in their home environments. Teachers can act as powerful advocates for proper hygiene by educating students and serving as positive role models. (10, 11)

Promoting good hygiene practices in communities can be a challenging endeavor due to various factors such as poverty, inadequate infrastructure, and cultural beliefs. However, by addressing these challenges, we can make water projects more sustainable and effective, ultimately improving community health and well-being.

Challenges in Promoting Hygiene Practices:

Poverty and inadequate infrastructure pose significant hurdles to promoting good hygiene practices in communities. Limited access to clean water sources and sanitation facilities can hinder the adoption of proper hygiene habits. Additionally, cultural beliefs and preferences play a crucial role in shaping behavior. Therefore, it is essential to consider cultural contexts when planning and implementing Water, Sanitation, and Hygiene (WASH) interventions.

Empowering Women in Community Water Management:

To enhance the sustainability and effectiveness of water projects, it is vital to include women in leadership positions in community water management and water and sanitation initiatives. Women often play a central role in water collection and household hygiene practices. By involving them in decision-making processes and empowering them to take leadership roles, we can ensure that the needs and perspectives of women are adequately represented, leading to more inclusive and successful interventions.

Deliberate Community Engagement:

Successful community engagement requires a deliberate and sustained effort over an extended period. It is essential to work collaboratively with existing leadership structures that are deeply rooted in the community's culture. Teachers, spiritual leaders, and change agents can act as influential figures who can effectively promote and advocate for good hygiene practices. By leveraging these established leadership structures, we can create a supportive environment for long-term behavioral change. (12)

Impact of Water Sanitation and Hygiene

Improved water sanitation and hygiene practices have a profound impact on health outcomes, particularly in developing countries where access to clean water and sanitation facilities may be limited. By addressing these challenges, we can significantly reduce the rates of waterborne diseases and improve overall well-being. Moreover, investing in WASH initiatives not only benefits health but also contributes to economic growth and promotes gender equality.

Health Benefits of Improved WASH:

Studies have shown that improving water and sanitation services can lead to a reduction in the rates and severity of various diseases, including ascariasis, diarrheal disease, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. By enhancing access to clean water and sanitation facilities, we can significantly lower morbidity rates associated with these diseases, particularly among vulnerable populations. (13)

Impact on Child Mortality:

Preventable water and sanitation-related diseases claim the lives of approximately 1,300 children under the age of five every day, according to UNICEF. By improving water and sanitation services, we can not only reduce mortality rates due to diarrheal diseases but also lower the risk of malnutrition and other severe infections. Enhanced access to clean water positively impacts nutrition, reduces the distance required to gather water, and contributes to better health outcomes and increased survival rates for children. (14)

Benefits to Overall Well-being:

Access to improved WASH services brings numerous benefits to individuals and communities, including greater comfort, safety, dignity, status, and convenience. Improved water supply and sanitation have broader effects on the living environment, leading to improved overall well-being. Furthermore, investing in WASH helps prevent the spread of neglected tropical diseases such as trachoma, schistosomiasis, and helminthiasis, which are transmitted through the soil.

Economic and Gender Equality Impacts:

Investments in water, sanitation, and hygiene yield increased productivity as access to clean water and sanitation facilities reduces the time spent fetching water and decreases the number of sick days taken due to waterborne illnesses. (15) This, in turn, reduces healthcare costs and allows for the allocation of resources to other areas of healthcare, contributing to economic growth. Additionally, by alleviating the burden on women and girls, improved WASH services promote gender equality. Access to clean water and sanitation empowers women and girls, enabling their increased participation in education and income-generating activities, leading to improved economic opportunities and greater gender equality overall. (16,17)

Challenges and Solutions

The lack of universal, affordable, and sustainable access to WASH remains a crucial concern for public health and development. (18) Developing countries face key constraints, including limited financial resources, poor governance, inadequate policy frameworks, cultural practices, and inadequate infrastructure. Overcoming these challenges requires a multifaceted approach, including increased investment, technological innovations, improved governance and policy

frameworks, and enhanced community engagement. International cooperation and partnerships are vital in supporting developing countries to achieve universal access to clean water and sanitation.

Financial Constraints and Governance Challenges:

Insufficient financial resources pose a significant obstacle to investing in WASH infrastructure, such as water treatment plants and sanitation facilities. Many developing countries struggle to allocate adequate funds for these essential services. Additionally, poor governance and inadequate policy frameworks hinder progress towards universal access to clean water and sanitation. Lack of political will, ineffective regulation, and weak enforcement of existing regulations further exacerbate the problem. Addressing these challenges requires increased investment in WASH infrastructure, improved governance, and stronger policy frameworks. (18)

Cultural Practices and Behavior Change:

Cultural practices can present challenges to ensuring universal access to clean WASH facilities. For instance, in certain cultures, open defecation is still a common practice, making it difficult to promote the use of sanitation facilities. Changing such behaviors and promoting behavior change require comprehensive community engagement strategies that focus on education, awareness, and cultural shifts. By involving community leaders, educators, and change agents, sustainable behavior change can be achieved. (18)

Infrastructure and Climate Change:

Inadequate infrastructure, including the lack of access to sanitary facilities and piped water systems, poses a major barrier to achieving universal access to WASH. This is particularly evident in rural areas, where infrastructure development lags behind urban areas. Climate change further complicates the situation, as variations in precipitation and increased temperatures can negatively impact infrastructure. These effects can lead to service disruptions, environmental contamination, and deterioration of water quality, thereby compromising public health. Adapting to climate change and building resilient WASH infrastructure are crucial in ensuring sustained access to clean water and sanitation. (19)

The Way Forward:

Addressing the challenges of universal access to WASH requires a coordinated and multifaceted approach. (20) This involves increasing investment in WASH infrastructure, promoting technological innovations that enhance access and efficiency, improving governance and policy frameworks, and engaging communities to drive behavior change. International cooperation and partnerships are crucial in providing support to developing countries in their efforts to achieve universal access to clean water and sanitation. By working together, we can overcome these challenges and improve the health and well-being of communities worldwide.

Technological innovations and policy interventions have played crucial roles in improving water sanitation and hygiene worldwide. Innovative water technologies, such as protected hand-dug wells, boreholes, tube wells, rainfall collection systems, and community or household water treatment options, have contributed to better access to clean water. Sanitation systems, including pit toilets, composting toilets, pour-flush toilets, and public restrooms with septic tanks, have also made significant contributions. (21) Furthermore, policy interventions at the government and international levels have supported the development of water and sanitation infrastructure, funding mechanisms, and regulations to ensure sustainable and equitable access to WASH services.

Technological Innovations:

Technological innovations have significantly improved water sanitation and hygiene practices. Protected hand-dug wells, boreholes, tube wells, and rainfall collection systems have enhanced access to clean water sources. Protected spring plans, infiltration galleries, and community or household water treatment options have further improved water quality. These innovations have played a crucial role in reducing waterborne diseases and promoting good health. Additionally, sanitation systems, including simple pit toilets, composting toilets, pour-flush toilets, and public restrooms with septic tanks, have improved sanitation practices and contributed to better public health outcomes.

Policy Interventions:

Policy interventions have been effective in promoting universal access to clean water and sanitation. Many governments have implemented intersectoral policies and regulations that support the development of water and sanitation infrastructure. These policies provide funding and incentives to encourage private sector investment, leading to improved access and quality of WASH services. International organizations like the World Health Organization (WHO) have developed WASH strategies that emphasize three main pillars: water safety, sanitation and hygiene, and water resource management. These strategies highlight the importance of community engagement, capacity building, and the development of policies and regulations to ensure sustainable and equitable access to WASH services. (22)

Integration and Evidence-Based Interventions:

Integrating WASH interventions into various sectors, including education, nutrition, healthcare facilities, maternal and child health, and the environment, can significantly accelerate the process of achieving sustainable WASH services. Evidence-based interventions provide a strong foundation for decision-making and policy development in WASH. By integrating WASH into key sectors and basing interventions on solid evidence, we can enhance the effectiveness and impact of WASH

initiatives, leading to improved health outcomes and sustainable development. (22)

Conclusion & Recommendation

With a large body of literature and empirical support, WASH has a well-established role and significance for both individual and community health. However, especially in poorer nations, billions of people still do not have access to adequate sanitation systems and clean water. The difficulties in providing these fundamental services are intricate and multifaceted, necessitating a comprehensive strategy that includes infrastructure development, policy and regulatory frameworks, and behaviour. Although there has been improvement in many areas of the world regarding access to water, sanitation, and hygiene, much effort has to be done to guarantee that everyone has access to these fundamental services. Therefore, efforts must be made to ensure that everyone has access to clean water and sanitary facilities. Governments, civil society organizations, and the corporate sector must work together to invest in infrastructure and technology, promote good hygiene practices, deliver education and awareness-raising programmes, and ensure that everyone has access to clean water and sanitation.

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Tables

TABLE 1 CHALLENGES IN PROMOTING HYGIENE PRACTICES IN DIFFERENT SETTINGS

Households	Schools	Community
<ul style="list-style-type: none"> ● Cultural beliefs ● Lack of awareness and education concerning the significance of hygiene ● Lack of access to clean and adequate water 	<ul style="list-style-type: none"> ● Inadequate facilities ● Lack of access to education about hygiene practices at home 	<ul style="list-style-type: none"> ● Poverty ● Inadequate infrastructure ● Cultural beliefs