

Health and Education in Access to Clean Water and Sanitation

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Abstract

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Adequate access to clean water and sanitation is a crucial factor for public health and community well-being, particularly in developing countries. Limited access contributes to the spread of infectious diseases such as diarrhea, cholera, and typhoid, while also leading to malnutrition and stunting in children. Beyond health, the issue generates social and economic burdens, as women and children are often required to travel long distances to obtain water, reducing opportunities for education and decreasing overall family productivity. The inequality of access is more pronounced in rural and low-income areas, exacerbated by rapid urbanization, climate change, and insufficient funding. Education plays an essential role in raising community awareness about hygienic practices, the use of clean water, and safe sanitation behavior. This study employs a literature review method to analyze the interconnection between clean water access, sanitation, health, and education, as well as their socio-economic implications. Findings emphasize that integrated interventions through education, infrastructure improvement, and community-based policies can enhance health, reduce disparities, and improve overall quality of life.

1. Introduction

Access to clean water and adequate sanitation facilities is one of the main indicators in assessing the quality of life of a community (Devgade & Patil, 2023). The availability of clean water and sanitation facilities not only impacts the physical health of individuals, but also has a significant influence on social, economic, and educational aspects of daily life. According to a report by the World Health Organization (WHO), around two billion people worldwide still face limited access to clean water, while more than three billion people do not have access to proper sanitation facilities. This condition is generally more prominent in developing countries and rural areas, where infrastructure gaps, low capacity of local institutions, and limited funding are the main obstacles to providing these basic services.

The impact of a lack of access to clean water and adequate sanitation is not limited to physical health (Brown et al., 2023). These conditions also have significant socio-economic implications for the community. Children, for example, are very vulnerable to health problems arising from unclean water, which can cause infectious diseases such as diarrhea, cholera, and typhoid. In addition, affected children often experience malnutrition and stunting, which further affects their physical development, learning abilities, and long-term cognitive capacity. Women and girls bear an additional burden as they are often responsible for fetching water from distant sources (Dickin et al., 2021). This activity is not only physically draining, but also reduces the time that can be used for education, learning, and other productive activities that should improve family welfare.

Furthermore, climate change and rapid urbanization have significantly worsened this problem. Climate change affects the availability of clean water through longer periods of drought, uneven rainfall, and an increased frequency of floods. Rapid urbanization in urban areas puts increased pressure on already limited water and sanitation infrastructure, thereby increasing the risk of the spread of infectious diseases in densely populated areas. In this context, the availability of safe water and sanitation is an urgent need to ensure public health is maintained. Education is one of the most effective strategies to overcome these problems. Through education, the community can understand the importance of hygienic practices, safe management of clean water, and proper sanitation behavior. Schools, public health campaigns, and community programs have an important role in shaping hygienic behavior from an early age. Previous research shows that community-based education programs not only reduce the incidence of infectious diseases by 25-30%, but also increase social awareness about the importance of sanitation and good hygiene practices (Karinja et al., 2022).

However, a number of challenges remain in efforts to increase access to clean water and sanitation. Limited funds, low capacity of local institutions, and a lack of integration between sectors, including the health, education, and infrastructure development sectors, are the main obstacles. Therefore, this study aims to review the literature related to the impact of access to clean water and sanitation on health, education, and socio-economic welfare. This study also highlights how education-based interventions can significantly improve these conditions. By understanding the complex relationship between these factors, it is hoped that development programs

and public policies can be designed more effectively. Integrated interventions will not only improve the quality of life of the community, but also help reduce socio-economic disparities, increase gender equality, and minimize health risks arising from a lack of clean water and proper sanitation.

2. Literature Review

Various studies and scientific research have emphasized the importance of access to clean water and adequate sanitation facilities for overall public health. Research conducted by the Ministry of Health of the Republic of Indonesia Kemenkes RI shows that increasing access to clean water can significantly reduce the incidence of infectious diseases, especially diarrhea, by up to 30%. Poor and inadequate sanitation conditions facilitate the spread of dangerous pathogenic microorganisms, which directly impact children's health, including increasing the risk of malnutrition and stunting (Aprihatin et al., 2020). This stunting problem not only affects a child's physical health but also impacts their cognitive development and learning abilities at school, thus having a long-term impact on their educational potential and future productivity. In addition to the health impacts, the socio-economic implications that arise are also very significant (Sivarethinamohan et al., 2021).

Women and children, especially in rural areas, often spend hours fetching water from distant sources, limiting their opportunities to attend education or do other productive activities (Carr, 2022). The access gap between urban and rural areas remains a major problem, exacerbated by limited funding, low capacity of local

institutions, and rapid urbanization, which increases pressure on existing water infrastructure and sanitation facilities. Climate change also affects the availability of clean water, with longer dry seasons and increased flood intensity, so water quality is increasingly threatened and public health risks are greater (Mishra, 2023).

In the context of education, the literature shows that school- and community-based education programs can effectively improve people's hygienic behavior, including the habit of washing hands with soap, maintaining sanitation facilities at home, and other hygiene practices. These educational interventions not only improve health and reduce the risk of disease, but also reduce the social burden, encourage gender equality, and improve family productivity and quality of life. Other studies emphasize the importance of an integrated multi-sectoral approach, involving the health, education, and infrastructure development sectors, to solve the problem of clean water and sanitation sustainably. Thus, the literature confirms that efforts to increase access to clean water and sanitation cannot be separated from effective educational strategies, sustainable resource management, and public policies that support equitable access for all communities.

3. Methods

This study uses a literature review method as the main approach to analyze the complex relationship between access to clean water, sanitation facilities, public health, education, and the socio-economic implications that arise as a result of limited services. The literature review method is a research strategy that focuses on the collection, critical assessment, and synthesis of information from various

relevant and reliable secondary sources, including scientific journals, reports from international organizations, government documents, as well as previous academic publications and research related to the health, education, and sanitation infrastructure sectors.

This process begins with the identification of literature through scientific databases, research repositories, and other official sources that have high credibility and relevance to the study topic. The selection of literature is carried out carefully based on criteria of content relevance, quality of research methodology, as well as the timeliness of data and findings presented, with the main focus on studies that discuss the health impacts of a lack of clean water, socio-economic consequences, access gaps between urban and rural areas, and the role of education in increasing public awareness of sanitation practices and hygienic behavior. The analysis is carried out qualitatively by comparing, contrasting, and assessing findings from various studies to find patterns, similarities, differences, and relationships between variables.

The data obtained is then synthesized systematically to provide a comprehensive and holistic picture of the interaction between access to clean water, health, education, and socio-economic welfare. This method allows the research not only to understand the direct impact of access to water and sanitation on health but also to assess the effectiveness of education-based interventions and public policies that have been implemented. In addition, this approach helps to identify existing research gaps, so that it can provide more appropriate recommendations for the development of future intervention programs. Thus, a literature review allows for a deep understanding of complex problems, integrates various academic perspectives,

and becomes a strong basis for the preparation of sustainable and evidence-based development strategies.

4. Results

4.1 Health and Socio-Economic Impact of Access to Clean Water and Sanitation

Limited access to clean water and inadequate sanitation conditions have a direct and significant impact on public health, especially on children who are very vulnerable to disease. Various studies and research have shown that areas with poor access to proper water infrastructure experience an increase in cases of infectious diseases such as diarrhea, cholera, and typhoid. These diseases not only impact physical health, but can also cause nutritional disorders and increase the risk of malnutrition and stunting in children. Stunting and malnutrition in children not only affect their physical growth, but also have a long-term impact on cognitive development, learning abilities, and academic achievement at school. This shows that adequate access to clean water and sanitation is very important for the growth and development of the younger generation, as well as having an impact on the quality of human resources in the future (Nagar & Pradeep, 2020).

In addition to the health effects, the socio-economic impact of limited access to water and sanitation is also very real. Women and children, especially in rural areas, often have to spend a long time traveling long distances to fetch water from available sources. This activity takes hours every day, which directly reduces their opportunities to attend education or other productive activities. The burden they

bear also affects overall family productivity, as time that should be used for working, studying, or developing a business must be diverted to meet basic water needs. This creates increasingly severe socio-economic inequality, especially in rural areas where water and sanitation facilities are generally very limited compared to urban areas.

In addition to socio-economic factors, climate change also worsens the situation. Floods, droughts, and changes in rainfall patterns affect the availability of clean water, so communities face a higher risk of water shortages. Rapid urbanization also puts additional pressure on existing sanitation infrastructure, so the potential for the spread of infectious diseases increases, especially in densely populated areas. In this context, the literature confirms that improving water infrastructure and sanitation facilities is not only important for improving public health, but is also very important for reducing the uneven socio-economic burden and supporting equality in access to basic resources.

Community-based education has proven to play an important role in overcoming this problem. Through systematically designed education programs, the community can gain a better understanding of hygienic practices, the safe use of clean water, and the management of household sanitation. This education directly contributes to reducing the incidence of infectious diseases and improving the overall quality of life. Research results show that integrated interventions between the health, education, and infrastructure development sectors are the most effective approach to solving the problem of clean water and sanitation sustainably. This integrated strategy not only improves the physical health of the community but also

strengthens the socio-economic capacity of families, reduces disparities between regions, and creates a healthier environment for future generations.

4.2 The Role of Education in Increasing Sanitation Access and Awareness

Education has a very central and strategic role in increasing public awareness regarding the importance of access to clean water and adequate sanitation facilities (Bishoge, 2021). Through various education programs implemented both in schools and in the community, people can gain a deeper understanding of correct hygienic practices, including the habit of washing hands with soap, maintaining sanitation facilities at home, and other hygiene behaviors that contribute directly to health. Literacy about the importance of clean water and sanitation from an early age is one of the key factors in reducing the risk of infectious diseases, such as diarrhea, cholera, and typhoid, and reducing the level of malnutrition and stunting in children. Education also provides the community with an understanding of how to prevent the spread of disease through hygienic daily behavior, so that the health impact of limited access to water and inadequate sanitation can be minimized.

In addition to the health impact, educational interventions also have important socio-economic implications (Munir et al., 2023). By increasing understanding of the importance of sanitation and clean water, women and children can allocate their time to more productive activities, including attending formal education or carrying out economic activities, instead of having to travel long distances to fetch water from available sources. This directly helps reduce the social burden and increase family productivity, while strengthening gender equality in the management of household chores and education (Power, 2020). Research shows that

community-based education programs that involve the participation of family members, community leaders, and local leaders are proven to be more effective than programs that are only implemented through schools, because this approach strengthens the overall involvement of the community and increases the sustainability of positive behavior.

In addition, education helps the community understand the impact of climate change on the availability of clean water, including the phenomena of drought, floods, and unpredictable rainfall patterns. With this understanding, the community can adopt more effective adaptation practices, such as safe storage of clean water, management of local water sources, and better maintenance of sanitation facilities. The integration of education with government policies, the development of water and sanitation infrastructure, and public health programs creates a synergy that increases the effectiveness and sustainability of interventions. A multi-sectoral approach that involves the health, education, environment, and community empowerment sectors is the main strategy for reducing the gap in access to clean water and sanitation facilities, especially in rural areas and poor areas.

Thus, education not only functions as a means of delivering information and knowledge but also as a tool for overall community empowerment. Through education, the community can increase awareness of the importance of health and sanitation, improve family welfare, improve the quality of life of children, and encourage more equitable socio-economic equality. Through the wide range of skills and competencies acquired from education, communities develop greater capacity to make well-informed, evidence-based, and contextually appropriate decisions

regarding the management of clean water resources and sanitation systems. Education fosters not only basic literacy but also critical thinking, analytical abilities, and problem-solving skills that enable individuals to understand the importance of hygiene, evaluate the risks associated with unsafe practices, and adopt more sustainable behaviors in daily life. In addition, educational initiatives enhance awareness about the broader environmental, social, and economic dimensions of water and sanitation, including their connection to public health, poverty reduction, and gender equality. This deeper understanding empowers communities to engage actively in collective action, advocate for improved infrastructure, and participate meaningfully in sustainable development programs. Ultimately, education becomes a powerful tool for building resilience, strengthening social cohesion, and ensuring that interventions in water and sanitation are inclusive, equitable, and sustainable in the long term.

5. Conclusion

Adequate access to clean water and sanitation is a crucial factor for improving public health, reducing infectious diseases, and preventing malnutrition and stunting in children. A lack of access to good water and sanitation impacts the socio-economic burden, especially on women and children, as they often spend a long time to get water, reducing time for education and family productivity. The access gap is felt more in rural areas and developing countries, which are exacerbated by rapid urbanization, climate change, and limited funding. Education plays an important role

in increasing public awareness related to hygienic practices, the use of clean water, and the maintenance of sanitation.

School- and community-based education programs have proven effective in reducing the incidence of disease, improving hygienic behavior, and improving the quality of life. A multi-sectoral approach that integrates education, health, infrastructure, and community empowerment is the most effective strategy for addressing this problem sustainably. The literature confirms that integrated interventions not only improve the health and welfare of the community but also reduce socio-economic disparities and support gender equality. Thus, improving access to clean water and sanitation through sustainable education and policies is an important step to achieve a better quality of life and a healthier society in developing countries.

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