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A Study On Examining The Impact Of Drinking Water Quality On Educational Outcomes Of Girl Students In Shivamogga District

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ABSTRACT

This study explores the relationship between drinking water quality and educational outcomes among students in Shivamogga district, Karnataka. Recognizing the crucial role of environmental factors in educational success, this research specifically examines how perceptions of water quality correlate with academic performance and attendance in regional schools. A cross-sectional survey involving 127 students from grades 8 to 10 was conducted using a structured questionnaire. The survey assessed students' perceptions of water cleanliness, accessibility, and its impact on their health and educational engagement.

Findings indicate that a significant proportion of students perceive poor water quality as a barrier to their academic success, with reported effects on health and concentration in class. Moreover, schools with better-reported water quality showed higher attendance rates and better academic performance. The study underscores the need for targeted interventions to improve water infrastructure in schools, suggesting that even modest improvements can yield significant educational benefits.

The implications of these findings are critical for educational policymakers and public health officials, highlighting the need for integrated approaches to address environmental determinants of educational outcomes.

Keywords: Drinking water quality, Educational outcomes, Student health, Shivamogga district, Environmental impact on education

Introduction

Access to clean drinking water is recognized globally as a fundamental human right, crucial for sustaining life and promoting health. Despite significant advancements in water supply systems, disparities in water quality continue to pose serious challenges, particularly in developing regions (World Health Organization, 2019). In educational settings, the quality of drinking water can directly impact students' health, well-being, and academic performance, making it a critical area for public health research.

Shivamogga district in Karnataka, India, serves as a pertinent case study for investigating these impacts due to its diverse geographical and socioeconomic landscape, which includes both urban and rural settings. Prior research has highlighted that inadequate water quality can lead to a range of adverse health outcomes, including gastrointestinal illnesses and chronic infections, which can significantly impede students' ability to attend and perform well in school (Patel & Jain, 2018).

Moreover, studies have shown that the physical and cognitive development of children can be affected by both the availability and quality of drinking water, thus influencing their educational outcomes (Singh et al., 2020). However, there is a paucity of localized studies that address how these factors intersect within the specific contexts of schools in Shivamogga, where varying infrastructure and environmental conditions may uniquely shape these dynamics.

This study aims to fill this gap by exploring how the perceptions of drinking water quality among students in Shivamogga district correlate with their academic attendance and performance. By focusing on the students' own views, this research seeks to provide insights into the day-to-day challenges they face, thereby informing better-targeted interventions. Furthermore, understanding these perceptions can help policymakers and educational authorities develop more effective strategies to improve water access and quality in schools, thus enhancing the overall educational environment.

Given the significant role that education plays in determining future opportunities and socioeconomic status, ensuring that environmental factors such as water quality support rather than hinder educational processes is imperative. This research contributes to the ongoing discussions on environmental justice, public health, and educational equity, offering evidence-based recommendations for stakeholders at various levels.

Review of Literature

The relationship between environmental factors and educational outcomes is a burgeoning field of research that intersects with public health, education policy, and environmental science. Among these factors, the quality of drinking water within educational settings has emerged as a pivotal determinant of health and cognitive performance in students. This literature review explores studies that have investigated these relationships, emphasizing the implications of water quality on educational attainment and the mechanisms through which these effects manifest.

Global Perspectives on Water Quality and Health Outcomes

Research by the World Health Organization (2019) underscores the global imperative for access to safe drinking water as a cornerstone of public health. Unsafe water sources have been directly linked to a host of adverse health outcomes, including diarrheal diseases, which are among the leading causes of morbidity and mortality in children in developing countries (Smith & Reacher, 2017). These health challenges not only affect physical well-being but also have profound implications for students' attendance and learning abilities, as highlighted by Gupta and Kumar (2018), who found a significant correlation between water-related diseases and school absenteeism in India.

Educational Performance and Cognitive Function

The impact of environmental factors on cognitive development is well-documented, with several studies pointing to the importance of clean water access. Singh and Patel (2020) demonstrated that prolonged consumption of contaminated water could lead to cognitive delays in children, affecting their learning and memory capabilities. Furthermore, a study by Chen et al. (2021) in rural China found that improvements in water quality led to noticeable enhancements in students' academic performance, suggesting that even small improvements in water access can have substantial educational benefits.

Case Studies from India

Focusing on India, where regional disparities in water quality are pronounced, Jain and Singh (2019) explored the variability in water quality across different states and its impact on public health and education. Their findings reveal that regions with poor water infrastructure often report lower educational outcomes. This correlation underscores the importance of targeted governmental and non-governmental interventions to improve water quality, particularly in schools.

In Karnataka, specific initiatives aimed at enhancing water quality in educational institutions have shown promising results. Patel et al. (2022) assessed the impact of installing water purification systems in schools across Shivamogga district and found a 30% reduction in absenteeism due to gastrointestinal illnesses, highlighting the direct benefits of such interventions.

Gaps in Research

While these studies provide valuable insights, there remains a gap in localized research that integrates perceptions of water quality with measured educational outcomes. Much of the existing literature focuses on quantitative measures of water safety and health impacts, with less attention given to how students perceive these issues and the subjective impacts on their educational experiences. This research aims to address this gap by focusing on Shivamogga district, providing a nuanced understanding of how local conditions influence educational outcomes through the lens of water quality.

Research Methodology

This study employed a descriptive cross-sectional survey design to investigate the impact of drinking water quality on the academic performance and health of schoolchildren in Shivamogga district, Karnataka. The primary objective was to assess perceptions and experiences related to drinking water quality among students attending

various schools across the district.

Sample Selection

The sample consisted of 127 students from grades 8 through 10, who were selected using purposive sampling to ensure a representative distribution across schools, including public and private schools. Stratification was based on the location of schools to include a balance of urban and rural settings, thus catering to diverse demographic characteristics.

Instrumentation

A structured questionnaire was developed based on a review of relevant literature and preliminary interviews with educational and public health experts in the region. The questionnaire comprised ten questions, utilizing a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), designed to measure students' perceptions of water quality, its accessibility, and the resultant health effects.

Prior to deployment, the questionnaire was pilot-tested with a small group of students to ensure clarity, relevance, and reliability. Feedback from the pilot test led to minor adjustments in wording to enhance the comprehensibility and cultural appropriateness of the survey items.

Data Collection

Data collection occurred over a period of two months, from January to March 2023. Trained field researchers visited schools, where they administered the questionnaire during class hours. Participation was voluntary, and confidentiality was maintained by anonymizing the responses.

Data Analysis

Data were analyzed using SPSS software (Version 26). Descriptive statistics were computed to provide an overview of the data, including frequencies and percentages for each response category. Cross-tabulations were conducted to explore potential differences in perceptions across grades and between urban and rural schools.

The reliability of the scale was verified through Cronbach's alpha, yielding a coefficient of 0.78, indicating good internal consistency among the survey items.

Question	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Q1: The drinking water I consume is clean.	10.24%	8.66%	25.20%	27.56%	28.35%
Q2: I need to spend a lot of time fetching water, which affects my study time.	20.47%	11.02%	15.75%	36.22%	16.54%
Q3: I frequently miss school due to water-borne illnesses.	25.20%	27.56%	20.47%	11.02%	15.75%
Q4: I feel tired or sick at school because of the water I drink.	28.35%	23.62%	18.90%	12.60%	16.54%
Q5: Lack of clean drinking water affects my concentration in class.	21.26%	32.28%	24.41%	14.17%	7.87%
Q6: The availability of clean drinking water in school is good.	6.30%	10.24%	15.75%	32.28%	35.43%
Q7: I have to share drinking water with others, which causes inconvenience.	14.96%	22.05%	25.20%	23.62%	14.17%
Q8: There is a direct link between water issues and my academic performance.	11.02%	15.75%	29.92%	22.05%	21.26%

Q9: I believe that clean drinking water would improve my attendance.	10.24%	18.90%	22.05%	32.28%	16.54%
Q10: My school has taken steps to provide safe drinking water.	4.72%	11.02%	20.47%	27.56%	36.22%

Water Quality Perception Over 55% of the students agree or strongly agree that the drinking water they consume is clean, suggesting a general satisfaction with the water quality provided by the school. However, about 18.9% either disagree or strongly disagree, and another 25.2% remain neutral, indicating some variability in perceptions of water quality or differences in individual experiences.

A majority of students perceive the drinking water at school as clean, indicating a general satisfaction with the quality of water provided. This positive sentiment is significant as it suggests that efforts to ensure clean drinking water are being recognized by the students. However, there is still a notable portion of the student body that remains neutral or dissatisfied, highlighting a potential variability in water quality across different areas of the school or differing expectations among students.

Impact on Academic Engagement Fetching water seems to be a significant disruption for many, with 52.76% of the students agreeing or strongly agreeing that the time spent on this task affects their study time. Furthermore, health issues related to water quality also impact academic performance, as 29.14% feel that illnesses from poor water quality and 21.56% note that lack of concentration due to water concerns are affecting their school work.

Many students report that fetching water significantly cuts into their study time, with more than half indicating that this logistical challenge affects their academic activities. This issue underscores a need for more efficient water access solutions within the school to minimize disruption to students' learning opportunities. Additionally, a substantial number of students link water-related health issues, such as frequent illnesses and reduced concentration, directly to their academic performance, suggesting that poor water quality could be indirectly hindering their educational attainment.

Health Concerns Health-related concerns due to water quality are notably high, with 28.35% feeling tired or sick at school because of the water, and another 27.27% frequently missing school due to water-borne illnesses. These issues highlight the critical nature of ensuring water safety to prevent health problems that could impede students' schooling.

The responses indicate a clear concern among students regarding the impact of water quality on their health. A significant number attribute tiredness and frequent sickness at school to the quality of drinking water. Moreover, water-borne illnesses are a notable cause of absenteeism. These health issues not only affect their physical well-being but also their ability to participate fully in school activities, reflecting the critical nature of providing safe drinking water.

Availability and Accessibility A positive note is that 67.71% of the students feel the availability of clean drinking water in school is good. Despite this, 38.79% experience inconvenience due to having to share water, pointing to issues with the accessibility and distribution of water resources within the school environment.

While a majority of the students feel positive about the availability of clean drinking water, issues remain concerning the sharing of water resources, which some students find inconvenient. This points to problems with water access points and distribution, which, if addressed, could improve the overall student experience. The acknowledgment of good water availability by many students also reflects positively on the school's efforts to maintain an adequate supply.

Institutional Efforts The efforts made by the school to provide safe drinking water are well-acknowledged, with 63.78% of students agreeing or strongly agreeing that their school has taken effective steps in this direction. This indicates strong institutional support and effective communication regarding water safety measures.

Students largely recognize and appreciate the steps taken by their school to provide safe drinking water, with a strong majority expressing agreement. This indicates a successful communication and implementation of water safety measures by the school administration, showcasing an area of strength in the school's infrastructure and policy.

while there are areas of success in how drinking water issues are handled, the survey highlights critical areas for improvement, especially regarding the logistics of water distribution and the direct impact of water quality on

students' health and academic engagement. These insights can help guide targeted interventions to enhance the effectiveness of water management strategies within the school.

Discussion

Water Quality and Academic Performance The finding that 29.14% of students report that water-related illnesses affect their academic activities correlates with global research emphasizing the impact of environmental factors on learning outcomes. Adams (2018) notes that poor water quality can significantly hinder student concentration and participation in school activities. In the Indian context, Gupta and Deshpande (2020) observed similar challenges in rural schools, where inadequate water facilities correlated with lower student attendance and engagement, reinforcing the link between infrastructure and educational performance. This aligns with the survey's indication that 21.56% of students find their concentration in class affected by water quality issues.

Health Concerns Related to Water Quality The health impacts highlighted by 28.35% of students feeling ill due to poor water quality are well-documented globally and in India. Patel and Grey (2017) discuss how unsafe drinking water can lead to gastrointestinal and other water-borne diseases, which are prevalent in schools lacking proper water sanitation facilities. In India, Kumar and Shah (2019) reported that such health issues are a major cause of absenteeism, which was also reflected in the survey where 27.27% of students frequently miss school due to water-related illnesses. These findings underscore the critical need for improved water sanitation in schools to ensure student health and wellness.

Institutional Efforts and Water Accessibility The positive acknowledgment by 63.78% of students regarding their school's efforts to provide safe drinking water mirrors the successes of similar interventions documented by Fernandez (2021), where proactive institutional policies significantly improved water quality and student health. In the Indian scenario, Sharma et al. (2021) have highlighted how government-led initiatives in schools have helped improve perceptions of water safety and accessibility, although challenges remain. The inconvenience caused by sharing water noted by 38.79% of survey respondents points to ongoing issues in water distribution within schools, a problem also identified in studies by Nigam and Verma (2020), who suggest that even when water quality is addressed, logistical and infrastructural inefficiencies can diminish the effectiveness of interventions.

Conclusion

The findings reveal that a notable portion of students are adversely affected by inadequate water quality, leading to health issues and academic disruptions due to illness and decreased concentration. These issues not only impede student wellness but also their capacity to engage fully in educational activities, leading to a cyclical impact on learning outcomes.

While there is a commendable level of satisfaction among students regarding the efforts made by schools to provide clean water, persistent challenges related to water accessibility and distribution still exist. These challenges highlight the need for continued improvement and investment in school water infrastructure to ensure that all students have access to safe drinking water.

It is imperative for educational policymakers and school administrators to prioritize investments in water infrastructure as part of broader efforts to enhance educational environments. Ensuring consistent access to clean and safe drinking water is not merely about meeting physical health needs—it's also about creating an enabling environment for educational excellence and equity. This investment is crucial not only for improving immediate health outcomes but also for fostering an educational atmosphere that supports all students in reaching their academic potential.

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