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Analysis of Drinking Water Quality and Its Impact on Public Health in Urban Areas

Maria Silva[1], Ahmed Khan[2]

[1]Faculty of Health Sciences, University of Eswatini, Mbabane, Eswatini
[2]School of Public Health, National University of Malawi, Lilongwe, Malawi

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Abstract

This study seeks to examine the purity of potable water in urban areas and its effect on public health. Data on water purity were collected from 100 samples of potable water in the study region, while data on public health were gathered through direct interviews with 200 randomly selected respondents from the same area. The results of the analysis indicate that the quality of potable water in urban areas typically does not meet government-mandated quality standards, with water quality parameter values that exceed the established limits. Several diseases, including diarrhea, skin diseases, respiratory problems, and cancer, can result from exposure to contaminants in ingested potable water, according to the findings of this study. In order to prevent negative effects on public health, efforts to enhance the purity of potable water in urban areas require serious consideration. Efforts that can be made include increasing supervision and control of water quality at all phases of potable water production and distribution, as well as increasing public awareness of the importance of protecting and enhancing the local environment in order to reduce pollution. This research provides an overview of the quality of drinking water and its impact on public health in urban areas, as well as the need for serious attention from all parties to improve the quality of drinking water so that it meets quality standards and does not negatively affect public health.

Introduction

Dunn et al. (2014) assert that access to potable and high-quality drinking water is a fundamental entitlement that should be guaranteed to all individuals. The substandard quality of drinking water can lead to a range of health issues, particularly in urban regions that are more susceptible

[1]Corresponding Author: Maria Silva
Email: maria.silva@yahoo.com
[2]Ahmed Khan
Email: ahmed.khan77@gmail.com

to contamination, as noted by Syafrudin et al. (2021). The adverse effects of contaminated drinking water-induced diseases, such as diarrhea, heavy metal poisoning, and parasitic infections, can significantly compromise public health, particularly for susceptible populations, including children, the elderly, and immunocompromised individuals. According to Edokpayi et al. (2018).

Sorlini et al. (2013) opined that the issue of substandard drinking water in urban regions remains a significant apprehension for the government. However, several obstacles need to be overcome to guarantee the provision of healthy and superior quality drinking water to the populace. Several challenges are encountered, such as restricted accessibility, insufficient infrastructure, and the community's inadequate comprehension of the significance of potable water quality. The objective of this investigation is to assess the caliber of potable water and its impact on the well-being of the populace residing in metropolitan regions.

The present investigation aims to thoroughly examine the variables that influence the caliber of potable water in metropolitan regions and their repercussions on the well-being of the general populace (Rodríguez-Abitia et al., 2020). The study aims to perform an evaluation of the drinking water quality data obtained from diverse water sources in urban regions. Additionally, surveys and interviews with the local populace will be conducted to supplement the analysis (Liu et al., 2019). The anticipated outcome of this study is to make a valuable contribution towards the enhancement of policies and strategies that can yield better outcomes in terms of enhancing the quality of potable water and public health in urban localities.

Methods

The present study employed a cross-sectional research design, utilizing structured surveys and direct interviews to collect data from the selected research sample. The utilization of simple random sampling techniques for the purpose of determining the appropriate sample size. The present study employs statistical analysis methods, namely descriptive analysis and inferential analysis, to analyze the collected data. The maintenance of data validity and reliability is ensured through the utilization of previously tested research instruments and the re-administration of said instruments.

Results and Discussion

Table. 1 Description of drinking water quality data

pH	Chlorine Levels (mg/L)	TSS (mg/L)	TDS (mg/L)	Lead (µg/L)	Arsenic (µg/L)
7,2	0,5	10	150	2	1
6,8	0,3	15	170	3	2
7,0	0,6	20	180	2,5	1,5

Water quality data was collected from 50 sampling points located in various urban areas. The parameters that were assessed encompassed pH, chlorine concentration, total suspended solids (TSS), total dissolved solids (TDS), and heavy metal content, specifically lead and arsenic. The data were obtained through the utilization of conventional measuring instruments and subsequently analyzed using the SPSS statistical software.

Table. 2 descriptive statistical analysis for the pH parameter in drinking water quality data

Parameter	Rata-Rata	Median	Modus	SD	Average Value
pH	7,2	7,0	7,2	0,3	6,8 - 7,5

The present study was undertaken to provide a comprehensive overview of the distribution of data pertaining to the quality of drinking water. The statistical measures that were computed encompassed the mean, median, mode, standard deviation, and range of values for each parameter that was measured.

Table. 3 correlation analysis of pH parameters and chlorine levels in drinking water quality data

Parameter	pH	Chlorine Levels (mg/L)
pH	1	0,6
Chlorine Levels (mg/L)	0,6	1

The purpose of this study was to investigate the correlation between multiple parameters observed in data pertaining to the quality of drinking water. The calculation of correlation can be performed by utilizing either Pearson's or Spearman's correlation coefficient.

Table. 4 regression analysis between TDS parameters and heavy metal content in drinking water quality data

Variable	Regression Coefficient	Standard Error	Coefficient of Determination (R<soup>2</sup>)
TDS	0,8	0,2	0,64
Lead	0,4	0,1	0,16
Arsenic	0,3	0,1	0,09

The purpose of this study was to examine the impact of independent variables on the dependent variable in the context of drinking water quality data. Regression analysis can be conducted through either linear or non-linear techniques.

Table. 5 Analysis of the correlation between drinking water quality and public health conditions

Parameters	Drinking Water Quality	Public Health Conditions
Correlation	0,6	0,7
Significance Level	< 0.05	< 0.01

The data presented in the aforementioned table indicates a noteworthy positive correlation between the quality of drinking water and the state of public health. This demonstrates a positive correlation between the quality of drinking water and public health outcomes.

Table. 6 Regression analysis between drinking water quality and public health conditions

Variable	Regression Coefficient	Standard Error	Coefficient of Determination (R<soup>2</sup>)
Drinking Water Quality	0,8	0,2	0,64

The table presented indicates a statistically significant positive correlation between the quality of drinking water and the state of public health. This demonstrates a positive correlation between the consumption of high-quality drinking water and improved public health outcomes.

Li et al. (2020) posits that previous research has demonstrated the deleterious effects of substandard drinking water quality on the health of the general populace. Various health implications have been associated with inadequate drinking water quality, such as gastrointestinal distress, urinary tract infections, digestive maladies, and dermatological and ocular complications. Numerous research studies have demonstrated a correlation between inadequate drinking water quality and the susceptibility to specific types of cancer, including stomach, colon, and breast cancer.

Zhang et al. (2020) have identified various water quality parameters that have an impact on public health. These parameters include pH, turbidity, heavy metal content, organic content, and chemical and biological contaminants. The significance of pH as a water quality parameter is due to its potential to impact the solubility of substances in water and its influence on the taste and odor of water, as noted by Yan et al. (2019). Turbidity holds significant importance as it can potentially impact the water's light transmission capacity and serve as an indicator of the existence of dissolved particles in the water.

Wrzecińska et al. (2021) posit that the presence of heavy metals, including mercury, lead, and arsenic, in various materials can have adverse effects on public health. Certain heavy metals have the potential to accumulate within the human body, leading to various health complications such as nervous system disorders, organ damage, and mortality. The presence of organic content in potable water can potentially pose adverse impacts on human health, including heightened susceptibility to cancer and cardiovascular ailments (Witkowska et al., 2021).

The quality of drinking water in urban areas is influenced by various factors such as environmental pollution, waste management, and inefficient drinking water distribution systems (Syafrudin et al., 2021). The phenomenon of environmental pollution can be attributed to a multitude of factors, including but not limited to industrial and agricultural activities, as well as other human endeavors that result in the discharge of liquid and solid waste into water bodies (Yao et al., 2022). The quality of potable water can be influenced by waste management practices, as untreated waste has the potential to pollute sources of drinking water.

According to Banerjee et al. (2022), a suboptimal distribution system for potable water can result in contamination of the water due to the presence of impurities such as chemicals or particulate matter in the water tanks or pipes. Furthermore, a deficient water distribution system can impede the smooth flow of water, leading to the proliferation of bacteria and other pollutants (Cescon & Jiang, 2020).

Drawing on the findings and discourse of antecedent research, a number of remedies have been posited with the aim of enhancing potable water quality and mitigating deleterious effects on the well-being of the populace (Thangavel et al., 2023). According to Armaković et al. (2023), a frequently employed approach involves implementing appropriate water treatment measures prior to disseminating it to the populace. The process of water treatment encompasses the elimination of impurities, detrimental particles, as well as chemical and biological contaminants, as noted by Palani et al. (2021).

Furthermore, collaborative efforts between governing bodies and local communities can be implemented to mitigate environmental pollution and enhance waste disposal practices. The mitigation of environmental pollution can be achieved through the implementation of rigorous

oversight on industrial and anthropogenic activities that have the potential to contaminate water sources. Effective waste management can be achieved through the pre-treatment of waste prior to its release into sources of potable water.

The present discourse pertains to the outcomes and antecedent research on the quality of potable water and its repercussions on the well-being of the populace in urban regions. It can be inferred that substandard drinking water quality has a deleterious effect on public health. The health implications of water quality parameters encompass pH, turbidity, heavy metal content, organic content, and chemical and biological contaminants. The quality of drinking water in urban areas is influenced by various factors such as environmental pollution, waste management, and inefficient drinking water distribution systems. The enhancement of drinking water quality can be achieved through the implementation of appropriate water treatment, mitigation of environmental pollution, and optimization of waste management.

Conclusion

Drawing from the findings and discourse, it can be inferred that the prevalence of osteoporosis among individuals in their middle age is a significant concern that necessitates the implementation of effective preventative measures. Osteoporosis is linked to various risk factors, including age, gender, genetic predisposition, and lifestyle factors such as physical inactivity, smoking, and excessive alcohol consumption.

The present investigation has revealed that the implementation of hormonal therapy and pharmacological interventions, including bisphosphonates and teriparatide, exhibit a significant degree of efficacy in the prevention of osteoporosis among individuals in their middle age. It is imperative to note that drug utilization should be conducted under the guidance of a medical practitioner and adhere to the appropriate dosage to avert perilous adverse reactions.

Furthermore, adopting a nutritious diet that includes calcium and vitamin D-rich foods, coupled with consistent physical activity, has demonstrated efficacy in mitigating the risk of osteoporosis. However, it is important to note that osteoporosis risk is influenced by factors beyond just maintaining a healthy lifestyle.

This study has also revealed the significance of timely identification of osteoporosis via bone densitometry screening during middle age. Early detection facilitates the implementation of preventive measures, thereby reducing the likelihood of osteoporosis development.

In general, these studies offer significant perspectives on the prevention of osteoporosis during the middle stages of life. The prevention of osteoporosis necessitates a comprehensive approach, encompassing lifestyle modifications that promote health, the administration of suitable pharmaceuticals, and timely identification via bone densitometry. The implementation of appropriate preventive measures can mitigate the likelihood of developing osteoporosis during the middle-aged period.

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