South American Publishing

SAP Multidisciplinary Open. 2023; 1:21
doi: 10.62486/mo202321

ORIGINAL

Analysis of potable water quality in the Belisario Quevedo sector, Cuatro Esquinas neighborhood, during the period of may to september 2023

Análisis de la calidad del agua potable en el sector Belisario Quevedo, barrio Cuatro Esquinas, durante el periodo de mayo a septiembre de 2023

Cristian Caillagua[1], Henry Tenelema[1], David Toasa[1], Dennis Tovar[1]

[1]Universidad de las Fuerzas Armadas. Ecuador.

Cite as
Caillagua C, Tenelema H, Toasa D, Tovar D. Analysis of potable water quality in the Belisario Quevedo sector, Cuatro Esquinas neighborhood, during the period of may to september 2023. SAP *Multidisciplinary Open*. 2023; 1:21. https://doi.org/10.62486/mo202321

Publication History
Submitted: 10-07-2023
Revised: 18-10-2023
Accepted: 24-12-2023
Published: 25-12-2023

ABSTRACT

The current research project had the purpose of determining the quality of drinking water in the sector of the neighborhood Cuatro Esquinas de Belisario Quevedo. The research has a non-experimental design, and its modality was quantitative, descriptive research modality, the inquiry was of bibliographic field and descriptive type. The population consisted of 10 individuals from the neighborhood to be investigated, 2 heads of household of 5 families in the neighborhood were chosen, being the main affected. The survey technique was applied.

Keywords: Contamination; Water; Inhabitants; Animals; Health; Diseases.

RESUMEN

El actual proyecto de investigación tuvo como finalidad determinar la calidad del agua potable en el sector del barrio Cuatro Esquinas de Belisario Quevedo. La investigación ocupa un diseño no experimental y su modalidad fue de manera cuantitativo, modalidad de investigación descriptiva, la indagación fue de tipo bibliográfico de campo y descriptiva. La población se formó de 10 individuos del barrio a investigar, los cuales fueron elegidos 2 jefes de familia de 5 familias del barrio, siendo los principales afectados. Se aplico la técnica de encuesta.

Palabras clave: Contaminación; Agua; Pobladores; Animales; Salud; Enfermedades.

© 2023; The Authors. This Open access article is distributed under the Creative Commons Attribution 4.0 license (https://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

In the Belisario Quevedo sector, there needs to be more quality in the water supply for human consumption. Residents have reported that the water has an unusually cloudy color and bitter taste, which raises serious doubts about its safety for consumption.[1,2] Given that a large part of the population depends directly on this water source for their daily needs and many do not have access to purified water, it is essential to thoroughly analyze the underlying causes of this alarming situation.[3,4]

The primary contaminants identified in Belisario Quevedo's water could include sediments, dissolved minerals, pathogenic microorganisms, and undesirable chemical compounds. These contaminants can come from a variety of sources, including industrial wastes, sewage discharges, agricultural activity, and other environmental factors.[5,6]

Potential sources of water contamination in the community could be related to the lack of adequate infrastructure for wastewater treatment, inadequate solid waste disposal, and poor regulation of industrial activities that could be releasing harmful substances into the environment.[7,8]

Consumption of poor-quality water can have adverse effects on the health of the inhabitants of Belisario Quevedo, such as gastrointestinal diseases, bacterial and viral infections, kidney disorders, and other long-term health problems. Continued exposure to these contaminants can compromise the wellbeing and quality of life of the community.[9,10]

The Belisario Quevedo community's opinion of the quality of the water they consume is one of concern and discomfort. Residents are aware of the abnormal appearance and taste of the water, which has generated concern about its safety and has led to the search for solutions to improve this situation.[11,12]

Testing and improving water quality in Belisario Quevedo could provide significant benefits. These include reducing water-related illnesses, improving overall community health, increasing confidence in the water supply, and promoting a healthier and more sustainable environment.[13]

To correct the water quality problems in Belisario Quevedo, actions could include implementing adequate water treatment systems, promoting safer waste management practices, regulating and monitoring industrial and agricultural activities that may contaminate water, as well as raising community awareness and education about the importance of safe water consumption and active participation in solving this problem.[14]

During the research process, a possible assumption emerges that could be the underlying cause of this problem. It is proposed that the insufficiency in the adequate treatment of drinking water in the Belisario Quevedo sector, Barrio Cuatro Esquinas, could be contributing to the presence of parameters that exceed acceptable limits in terms of physical, chemical, and microbiological quality. This deficiency in treatment is expected to allow the persistence of contaminants and pathogens in the water supply, which in turn could represent a potential risk to the health of residents and the safety of their consumption.[15,16]

In Ecuador, the growing concern about the quality of drinking water and its impact on public health has made it imperative to carry out exhaustive analyses in various regions to guarantee the safety and well-being of the population. In this sense, the topic of "Analysis of Drinking Water Quality in the Sector Belisario Quevedo, Barrio Cuatro Esquinas, in the period May-September 2023" becomes relevant in the framework of the investigations and measures adopted to ensure access to high-quality drinking water.[17,18]

In Cotopaxi province, the analysis is carried out in collaboration with government agencies responsible for monitoring water quality and implementing environmental sanitation policies. Local public health institutions also play a crucial role in data collection and analysis, as well as in interpreting the results in terms of potential health risks to the community.[19,20,21]

In the city of Latacunga, specifically in the neighborhood During this time, systematic sampling and detailed analysis of drinking water samples were carried out in the Sector Belisario Quevedo, Barrio Cuatro Esquinas. This analysis covers multiple parameters, such as levels of chemical and microbiological contaminants, pH, and turbidity, among others, in order to assess whether the drinking water meets the standards established by national and international water quality regulations. The results of this analysis will have a direct impact on the health and wellbeing of the area's residents, as well as on the regulatory and management measures that can be implemented to improve water quality and prevent potential health risks.[22,23,24]

The studies reviewed address drinking water quality in various regions. Problems in service continuity and water properties were found in Cartago. In Costa Rica, a comprehensive evaluation of development policies to improve water quality is suggested. In San Antonio de Rancas, the water is not fit for human consumption, and the local perception of its quality needs to be improved. In contrast, in the District of Rázuri, Peru, the water is safe for human consumption. In San José, water of inadequate quality is used for human consumption. However, in San Andres, Chimborazo, the water meets drinking water standards. In Manta, Ecuador, a wastewater treatment plant could reduce contamination. In San Miguel, the levels of some chemical parameters exceed permitted limits. Water quality in La Maná, Cotopaxi, is of poor quality for human consumption. In Guayacana, the concentration of contaminants is lower in the groundwater. The efficiency of the treatment plant in Belisario Quevedo, Latacunga, has problems that pose a risk to the inhabitants. In response to the COVID-19 pandemic, optimization strategies were proposed for the drinking water distribution network in Latacunga.

METHOD

The research project focused on a quantitative approach to assess water quality in Belisario Quevedo Parish and analyze the causes of contamination by reviewing scientific articles and collecting data from online sources. In addition, we explored how this contamination affected the health of community residents.

Bibliographic and field methods were used. The bibliographic part collected information from various sources, such as journals, scientific articles, websites, and theses. The field research collected data based on the situation of the people residing in the community of Belisario Quevedo.

A descriptive level of depth was applied, using data obtained through surveys to provide statistics on the rate of affectation of the surrounding sectors due to the production of the vegetables in question.

The project was non-experimental, observing and analyzing the effects of water quality on the health of residents. Surveys directed at heads of households were used to collect data on drinking water quality and its effects.

The target population was the residents of Belisario Quevedo parish. A sample of about 25 people was selected to conduct surveys.

For data collection, observation was used in statistical graphs for the independent variable (drinking water quality) and surveys directed to heads of households with a 15-question questionnaire for the dependent variable (effect of poor drinking water quality).

A control set was used for comparison of results and surveys were conducted at the beginning and end of the work to analyze the effects of poor drinking water quality in the population's households.

To establish the reliability of the instrument, a test survey was administered to two families, and the responses were analyzed using statistical graphs.

Finally, an informative triptych was developed on the effects and possible consequences of poor drinking water quality in Belisario Quevedo, Barrio 4 Esquinas, Cantón Latacunga, Cotopaxi Province. The triptych contained relevant and attractive information to generate interest in the readers.

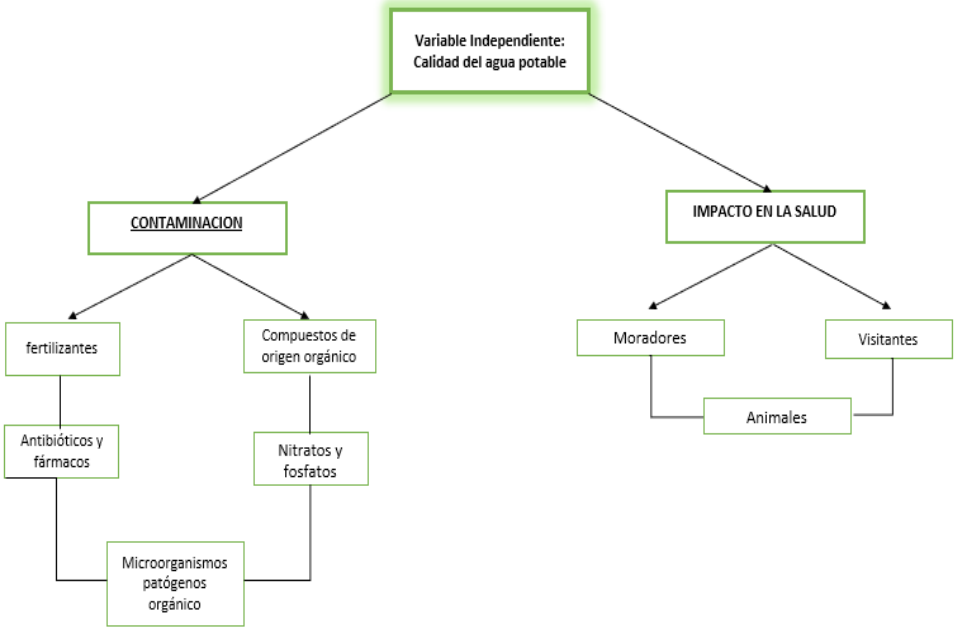


Figure 1. Independent variable drinking water quality

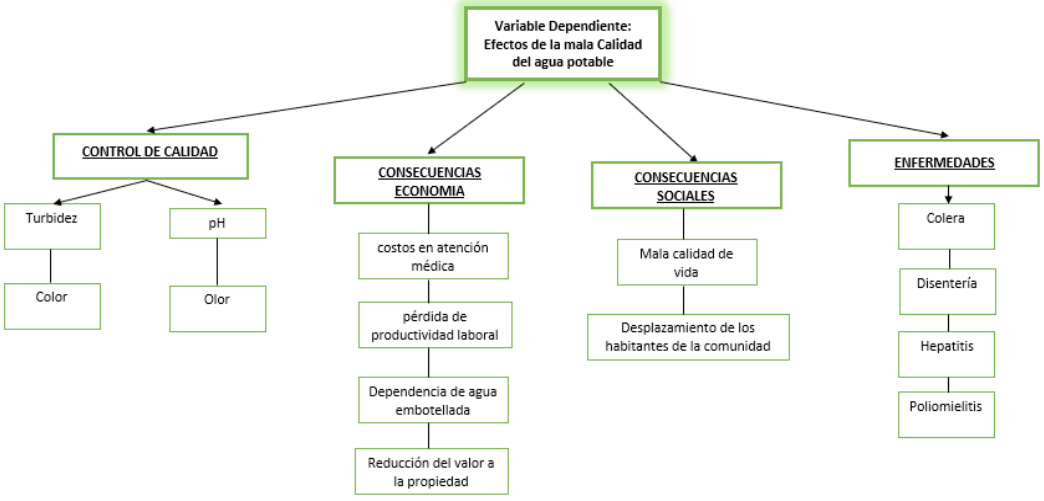


Figure 2. Dependent variable effects of poor drinking water quality

RESULTS AND DISCUSSION

For the development of this research it is considered of vital importance to resort to the analysis and interpretation of the data obtained from the survey conducted to the residents of the community of four corners of Belisario Quevedo, in the city of Latacunga.

Table 1. Genre

Genre	No.	%
Male	5	50
Female	5	50
Total	10	100

Table 2. Responses to survey questions

Questions and options		No.	%
Water purification and decontamination	I pour chlorine	1	10
	I boil it	7	70
	I do nothing, I consume it like this	2	20
People with drinking water problems	Yes	4	40
	No	6	60
Health care costs	Yes	2	20
	No	1	10
	Maybe	7	70
People who buy bottled water	Yes	9	90
	No	1	10
Types of bottled water	Bottle of water	6	67
	Gallon of water	3	33
	Water bottles	0	0
People who believe it lowers property values	Yes	9	90
	No	1	10
People who agree with the loss of labor productivity	Yes	8	80
	No	2	20
People who have experienced a poor quality of life	Yes	7	70
	No	3	30
People who would change where they live	Yes	6	60
	No	1	10
	Maybe	3	30
People who are aware of the diseases caused by poor water quality	Yes	10	100
	No	0	0
Effects of poor water quality	Yes	9	90
	No	1	10
Contaminants in the water	Yes I did know	5	50
	No knowledge	5	50
Physical changes in drinking water	Yes	7	70
	No	3	30
Contaminants	Yes I did know	3	30
	Did not know of its existence	5	50
	I knew of some	2	20
People and animals affected	Yes since it causes diseases	7	70
	No	1	10
	Maybe	2	20

Water quality is a vital aspect of the well-being and health of any community. In the present study, we analyze data collected through surveys conducted in a specific community, exploring several variables related to water quality and its impact on the health

and daily life of the inhabitants. The results reveal a number of worrying trends that deserve detailed attention.

First, it is observed that gender does not seem to influence the measures taken to decontaminate water. With 50 % male and 50 % female respondents, there is evidence of an equal distribution in the actions taken to treat water. However, it is alarming to note that only 10 % of respondents choose to pour chlorine to purify water, while a worrying 20 % take no action at all. This finding underscores the need for more awareness or access to adequate water sanitation measures in the community.

Furthermore, it highlights that the consumption of contaminated water has direct repercussions on the health of the inhabitants. Forty percent of the people surveyed have suffered illnesses as a result of consuming community water, suggesting a significant public health risk. These illnesses can overwhelm the local healthcare system, as evidenced by the fact that 20 % of respondents spend more than $20 on medical care due to water quality-related problems.[25]

The reliance on bottled water as an alternative solution is evident, with an overwhelming 90 % of respondents opting to purchase bottled water. This can place an additional financial burden on households, especially those with limited resources. In addition, the widespread perception that water quality negatively affects land value appreciation (90 % of respondents) underscores the broader economic implications of this problem.

In terms of impact on quality of life and labor productivity, the results are equally troubling. Seventy percent of respondents claim to have experienced a decrease in their quality of life due to water pollution. In addition, 80 % of respondents believe that poor water quality can affect work productivity, suggesting significant socioeconomic consequences for the community.[26]

Awareness of the risks associated with water contamination appears to be high, as 100 % of respondents are aware of the diseases that can be caused by consuming contaminated water. However, a lack of understanding about the specific contaminants present in water persists, as indicated by the fact that only 30 % of respondents are familiar with a wide range of potential contaminants.

The general purpose of this research is to evaluate the quality of drinking water in the Belisario Quevedo area through a descriptive tripartite study, using residents' responses as a basis for reporting to the community in the year 2023. The results obtained reveal that the drinking water in this region appears to be adequate for human consumption, as no cases of diseases related to its ingestion have been recorded among the inhabitants. This finding compares with previous studies, which indicate that groundwater in other areas has a low concentration of contaminants. This comparison reinforces the claim that the water in Belisario Quevedo is safe for human consumption. In addition, it highlights the importance of raising awareness of the health risks associated with the consumption of poor-quality water.[27,28,29,30]

Regarding the specific objective of collecting information on the quality of drinking water in Belisario Quevedo, it is noted that this problem is common in this area but is present in various regions of the country and the world. Previous research highlights the increasing pressure on water resources and the demand for better quality drinking water service.[31,32,33] In addition, it highlights the warning about how water contamination can have negative repercussions on the economic development of countries.[34,35,36,37]

Another specific objective is to inform the community about the results of the study and provide recommendations for improving drinking water quality. From the surveys conducted, it is suggested that additional precautionary measures be taken when consuming water, such as boiling it before ingesting it, especially for those who obtain it directly from the tap.[38,39,40,41] This recommendation is based on findings that identify deficiencies in the Belisario Quevedo water treatment plant, which represents a risk to public health. In addition, it stresses the importance of water quality control at all stages, from its origin to final consumption.[42,43,44,45,46]

Finally, the data collected are analyzed, and the perception of drinking water quality in Belisario Quevedo is evaluated. Although the majority of respondents are aware of the problems related to water quality, it is observed that there is still a significant group of people who need more information on the subject. These results highlight the need to address this problem at both the local and regional levels.[47]

CONCLUSIONS

In the present study, an investigation was carried out to determine the quality of drinking water in the Belisario Quevedo sector using a descriptive approach based on residents' responses. The main objective was to identify potential contaminants in the drinking water, as it was known that the water quality was compromised and could be causing discomfort or illness in the local population. The research benefited from extensive information gathering through various sources, such as websites, magazines, and books, and the direct collaboration of the residents, who shared their knowledge and experiences about drinking water in the area.

In this study, information on drinking water quality in Belisario Quevedo was collected through a triptych and bibliographic approach. We sought to understand the causes and effects of contaminated water consumption on the health of residents, as well as to collect essential data for the research through the analysis of available information. Despite the time constraints to carry out a complete descriptive study, all the information needed for the project was collected.

The detailed analysis of the data collected and the comprehensive assessment of drinking water quality in the Belisario Quevedo sector highlight the critical importance of implementing effective measures to decontaminate the water. The results obtained underscore the need to ensure that the water consumed meets health standards to prevent potential health risks.

In conclusion, the findings of this study are fundamental to informing the community of Belisario Quevedo about water quality in the area. This will provide them with accurate information about the water they consume and practical advice on how to make it safer. Doing so will help the inhabitants protect their health when drinking water and prevent possible diseases. In addition, this action will foster a sense of community by working together to ensure a healthy drinking water supply both now and in the future.

FINANCING

There is no funding for this work.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Cristian Caillagua, Henry Tenelema, David Toasa, Dennis Tovar.
Research: Cristian Caillagua, Henry Tenelema, David Toasa, Dennis Tovar.
Methodology: Cristian Caillagua, Henry Tenelema, David Toasa, Dennis Tovar.
Project Administration: Cristian Caillagua, Henry Tenelema, David Toasa, Dennis Tovar.
Original drafting: Cristian Caillagua, Henry Tenelema, David Toasa, Dennis Tovar.
Writing-revision and editing: Cristian Caillagua, Henry Tenelema, David Toasa, Dennis Tovar.

BIBLIOGRAPHIC REFERENCES

1. Schullehner J, Cserbik D, Gago-Ferrero P, Lundqvist J, Nuckols JR. Integrating different tools and technologies to advance drinking water quality exposure assessments. J Expo Sci Environ Epidemiol 2024;34:108-14. https://doi.org/10.1038/s41370-023-00588-0.

2. Dalmieda J, Kruse P. Metal Cation Detection in Drinking Water. Sensors 2019;19:5134. https://doi.org/10.3390/s19235134.

3. Koelmans AA, Mohamed Nor NH, Hermsen E, Kooi M, Mintenig SM, De France J. Microplastics in freshwaters and drinking water: Critical review and assessment of data quality. Water Res 2019;155:410-22. https://doi.org/10.1016/j.watres.2019.02.054.

4. Rockey N, Bischel HN, Kohn T, Pecson B, Wigginton KR. The utility of flow cytometry for potable reuse. Curr Opin Biotechnol 2019;57:42-9. https://doi.org/10.1016/j.copbio.2018.12.009.

5. Zhang H, Liu D, Zhao L, Wang J, Xie S, Liu S, et al. Review on corrosion and corrosion scale formation upon unlined cast iron pipes in drinking water distribution systems. J Environ Sci China 2022;117:173-89. https://doi.org/10.1016/j.jes.2022.04.024.

6. Saal L, Ruhl AS. Automated scraping and analyses of drinking water quality data. Int J Hyg Environ Health 2024;255:114295. https://doi.org/10.1016/j.ijheh.2023.114295.

7. Ahmad A, van der Wens P, Baken K, de Waal L, Bhattacharya P, Stuyfzand P. Arsenic reduction to <1 μg/L in Dutch drinking water. Environ Int 2020;134:105253. https://doi.org/10.1016/j.envint.2019.105253.

8. Vellingiri K, Kumar PG, Kumar PS, Jagannathan S, Kanmani S. Status of disinfection byproducts research in India. Chemosphere 2023;330:138694. https://doi.org/10.1016/j.chemosphere.2023.138694.

9. Umoafia N, Joseph A, Edet U, Nwaokorie F, Henshaw O, Edet B, et al. Deterioration of the quality of packaged potable water (bottled water) exposed to sunlight for a prolonged period: An implication for public health. Food Chem Toxicol Int J Publ Br Ind Biol Res Assoc 2023;175:113728. https://doi.org/10.1016/j.fct.2023.113728.

10. Perveen S, Amar-Ul-Haque null. Drinking water quality monitoring, assessment and management in Pakistan: A review. Heliyon 2023;9:e13872. https://doi.org/10.1016/j.heliyon.2023.e13872.

11. Patel PS, Pandya DM, Shah M. A systematic and comparative study of Water Quality Index (WQI) for groundwater quality analysis and assessment. Environ Sci Pollut Res Int 2023;30:54303-23. https://doi.org/10.1007/s11356-023-25936-3.

12. Panizzolo M, Gea M, Carraro E, Gilli G, Bonetta S, Pignata C. Occurrence of human pathogenic viruses in drinking water and in its sources: A review. J Environ Sci China 2023;132:145-61. https://doi.org/10.1016/j.jes.2022.07.035.

13. Elkhatib D, Oyanedel-Craver V. A Critical Review of Extraction and Identification Methods of Microplastics in Wastewater and Drinking Water. Environ Sci Technol 2020;54:7037-49. https://doi.org/10.1021/acs.est.9b06672.

14. Francy DS, Brady AMG, Cicale JR, Dalby HD, Stelzer EA. Nowcasting methods for determining microbiological water quality at recreational beaches and drinking-water source waters. J Microbiol Methods 2020;175:105970. https://doi.org/10.1016/j.mimet.2020.105970.

15. Ighalo JO, Adeniyi AG. A comprehensive review of water quality monitoring and assessment in Nigeria. Chemosphere 2020;260:127569. https://doi.org/10.1016/j.chemosphere.2020.127569.

16. Kuwayama Y, Olmstead SM, Wietelman DC, Zheng J. Trends in nutrient-related pollution as a source of potential water

quality damages: A case study of Texas, USA. Sci Total Environ 2020;724:137962. https://doi.org/10.1016/j.scitotenv.2020.137962.

17. Nishimura T. [Steps to Regulatory Science]. Yakugaku Zasshi 2023;143:565-80. https://doi.org/10.1248/yakushi.22-00221.

18. McGarrity M, Zhao F. Graphene-Based Chemiresistor Sensors for Drinking Water Quality Monitoring. Sensors 2023;23:9828. https://doi.org/10.3390/s23249828.

19. Lee D, Gibson JM, Brown J, Habtewold J, Murphy HM. Burden of disease from contaminated drinking water in countries with high access to safely managed water: A systematic review. Water Res 2023;242:120244. https://doi.org/10.1016/j.watres.2023.120244.

20. Kothe A, Wachasunder N, Rodge A, Labhasetwar P, Maldhure A. Trihalomethanes in developed and developing countries. Environ Monit Assess 2023;196:17. https://doi.org/10.1007/s10661-023-12106-8.

21. Hu XC, Dai M, Sun JM, Sunderland EM. The Utility of Machine Learning Models for Predicting Chemical Contaminants in Drinking Water: Promise, Challenges, and Opportunities. Curr Environ Health Rep 2023;10:45-60. https://doi.org/10.1007/s40572-022-00389-x.

22. Tamele IJ, Vasconcelos V. Microcystin Incidence in the Drinking Water of Mozambique: Challenges for Public Health Protection. Toxins 2020;12:368. https://doi.org/10.3390/toxins12060368.

23. Devi A, Chiu Y-T, Hsueh H-T, Lin T-F. Quantitative PCR based detection system for cyanobacterial geosmin/2-methylisoborneol (2-MIB) events in drinking water sources: Current status and challenges. Water Res 2021;188:116478. https://doi.org/10.1016/j.watres.2020.116478.

24. Ravanipour M, Hadi M, Rastkari N, Hemmati Borji S, Nasseri S. Presence of heavy metals in drinking water resources of Iran: a systematic review and meta-analysis. Environ Sci Pollut Res Int 2021;28:26223-51. https://doi.org/10.1007/s11356-021-13293-y.

25. Saez J, Catalan-Carrio R, Owens RM, Basabe-Desmonts L, Benito-Lopez F. Microfluidics and materials for smart water monitoring: A review. Anal Chim Acta 2021;1186:338392. https://doi.org/10.1016/j.aca.2021.338392.

26. Shi Z, Chow CWK, Fabris R, Liu J, Jin B. Applications of Online UV-Vis Spectrophotometer for Drinking Water Quality Monitoring and Process Control: A Review. Sensors 2022;22:2987. https://doi.org/10.3390/s22082987.

27. Glassmeyer ST, Burns EE, Focazio MJ, Furlong ET, Gribble MO, Jahne MA, et al. Water, Water Everywhere, but Every Drop Unique: Challenges in the Science to Understand the Role of Contaminants of Emerging Concern in the Management of Drinking Water Supplies. GeoHealth 2023;7:e2022GH000716. https://doi.org/10.1029/2022GH000716.

28. Bilal H, Li X, Iqbal MS, Mu Y, Tulcan RXS, Ghufran MA. Surface water quality, public health, and ecological risks in Bangladesh-a systematic review and meta-analysis over the last two decades. Environ Sci Pollut Res Int 2023;30:91710-28. https://doi.org/10.1007/s11356-023-28879-x.

29. Areche FO, Mamani CMC, Cárdenas J a. L, Sumarriva-Bustinza LA, Pastrana P a. P, Porras-Roque MS, et al. A comprehensive review on monitoring and purification of water through tunable 2D nanomaterials. Braz J Biol Rev Brasleira Biol 2023;83:e273843. https://doi.org/10.1590/1519-6984.273843.

30. Ardila A, Rodriguez MJ, Pelletier G. Spatiotemporal optimization of water quality degradation monitoring in water distribution systems supplied by surface sources: A chronological and critical review. J Environ Manage 2023;337:117734. https://doi.org/10.1016/j.jenvman.2023.117734.

31. Baldeon L. Determinación de la eficiencia de la planta de agua de la Junta de Agua Potable Belisario Quevedo ubicada en el cantón Latacunga parroquia de Illuchi. Tesis de Bachiller. Escuela Politécnica Nacional, 2017.

32. Cajo J. Control de la calidad del agua para consumo humano a través de parámetros fisicoquímicos y microbiológicos en la parroquia de San Andrés, Chimborazo, para una gestión sanitaria eficiente. Tesis de Bachiller. Universidad Internacional SEK, 2018.

33. Villena Chávez JA. Calidad del agua y desarrollo sostenible. Rev Peru Med Exp Salud Pública 2018;35:304. https://doi.org/10.17843/rpmesp.2018.352.3719.

34. Duarte Vera F. Calidad del agua para consumo humano en el proceso de captación, tratamiento, distribución y consumo en el cantón La Maná, Provincia de Cotopaxi. Tesis de Maestría. Universidad Técnica Estatal de Quevedo, 2019.

35. Morales E, Solano M, Morales R, Reyes L, Barrantes K, Achí R, et al. Evaluación de la influencia de la estacionalidad climática en calidad del agua de consumo humano en un sistema de abastecimiento en San José, Costa Rica, periodo 2017-2018. Rev Costarric Salud Pública 2019;28:77-87.

36. Almachi Tipán S, Guachi Guachi T. Evaluación de la calidad del agua en sectores productores de brócoli (Brassica oleracea), en la parroquia Guaytacama, del cantón Latacunga, provincia de Cotopaxi, periodo 2019-2020. Tesis de Bachiller. Universidad Técnica de Cotopaxi, 2020.

37. Amar-Ul-Haque N, Centeno Mora E. Evaluación de la calidad del servicio de abastecimiento de agua potable a partir de la percepción de personas usuarias: El caso en Cartago, Costa Rica. Rev Cienc Ambient 2020;54:95-122. https://doi.org/10.15359/rca.54-1.6.

38. Cedeño-Muñoz HA. Análisis de los parámetros de calidad del agua del efluente del río muerto para su posible reutilización del Cantón Manta, Ecuador. Polo Conoc 2020;5:Article 2. https://doi.org/10.23857/pc.v5i2.1299.

39. Elías Silupu J, Abbott C, Medrano Obando J. Calidad bacteriológica del agua para consumo humano y enfermedad diarreica aguda en el Distrito de Rázuri. Provincia de Ascope. La Libertad—Perú. Puriq Rev Investig Científica 2020;2:230-9.

40. Toapanta Tapia E. Desarrollo en la optimización de la red de agua potable del sector urbano de la ciudad de Latacunga, a partir del análisis comparativo del consumo de agua en los meses marzo, abril y mayo del 2020 en relación a los tres meses anteriores debido a la pandemia Covid-19. Tesis para la obtención del Título de Ingeniero Civil. Universidad Técnica de Ambato, 2022.

41. Singh S, Pitchers R, Hassard F. Coliphages as viral indicators of sanitary significance for drinking water. Front Microbiol 2022;13:941532. https://doi.org/10.3389/fmicb.2022.941532.

42. Lindmark M, Cherukumilli K, Crider YS, Marcenac P, Lozier M, Voth-Gaeddert L, et al. Passive In-Line Chlorination for Drinking Water Disinfection: A Critical Review. Environ Sci Technol 2022;56:9164-81. https://doi.org/10.1021/acs.est.1c08580.

43. Kayastha V, Patel J, Kathrani N, Varjani S, Bilal M, Show PL, et al. New Insights in factors affecting ground water quality with focus on health risk assessment and remediation techniques. Environ Res 2022;212:113171. https://doi.org/10.1016/j.envres.2022.113171.

44. Hui Y, Huang Z, Alahi MEE, Nag A, Feng S, Mukhopadhyay SC. Recent Advancements in Electrochemical Biosensors for Monitoring the Water Quality. Biosensors 2022;12:551. https://doi.org/10.3390/bios12070551.

45. Huang Y, Wang X, Xiang W, Wang T, Otis C, Sarge L, et al. Forward-Looking Roadmaps for Long-Term Continuous Water Quality Monitoring: Bottlenecks, Innovations, and Prospects in a Critical Review. Environ Sci Technol 2022;56:5334-54. https://doi.org/10.1021/acs.est.1c07857.

46. Hossain S, Chow CWK, Cook D, Sawade E, Hewa GA. Review of Nitrification Monitoring and Control Strategies in Drinking Water System. Int J Environ Res Public Health 2022;19:4003. https://doi.org/10.3390/ijerph19074003.

47. Bruno A, Agostinetto G, Fumagalli S, Ghisleni G, Sandionigi A. It's a Long Way to the Tap: Microbiome and DNA-Based Omics at the Core of Drinking Water Quality. Int J Environ Res Public Health 2022;19:7940. https://doi.org/10.3390/ijerph19137940.

ANNEXES

Informed Consent to Participate in the Drinking Water Quality Study
I, [Participant's Name], consent to participate in the study on drinking water quality in the Belisario Quevedo sector. I understand that my participation is voluntary, that my answers will be confidential, and that I may withdraw at any time.
Participant's Signature: _____
Date: _____

Questionnaire
By means of the following questionnaire we intend to collect information on the quality of drinking water in the Belisario Quevedo sector in order to be able to make the appropriate recommendations in the field of water pollution and will be used in an academic manner. Strict confidentiality will be maintained.

Read each question carefully and select each answer of your choice.

I.Select an answer
What is your gender?
o Male o Female
What is your age range?
o 25 to 30 o 30 to 35 o 40 to 45
What is your level of education?
o Primary school o Secondary school o Third level o Profession: _____

II. Select one answer to the following quality control questions.
1. How do you purify and decontaminate your water?
o I pour chlorine
o I boil it
o I do nothing, I drink it like this.
2. When you drink the water, do you notice a strange odor? The water has no odor or taste.
o Yes
o No, it does not

III. Select an answer to the following questions regarding economic consequences.
3. Have you suffered health problems due to the consumption of water in your community?
o Yes
o Yes o No
4. How much do you spend on medical care when you get sick from drinking your community's water?
o High (20 and more)
o Medium (10 to 20
o Low (5 to 10)
o I don't go to the doctor, I self-medicate.
5. Do you buy bottled water?
o Yes
o Yes o No
6. If you selected yes in the previous answer, what type of bottled water do you buy?
o Bottled water
o Gallon of water
o Bottled water
7. Do you believe that land value appreciation is affected by poor water quality?
o Yes
o No
8. With contaminated water, will there be a loss of labor productivity?
o Yes
o Yes o No
o Maybe

IV. Select the correct answers according to the social consequences.
9. Have you experienced a poor quality of life because of poor quality drinking water?
o Yes
o Yes o No

10. Do you think that poor drinking water quality could lead people to move to another place to live?

o Yes Why?

o No Why?

V. Select the correct answers according to the diseases.

11. Did you know that drinking poor quality drinking water can cause the following diseases: Hepatitis, Cholera, Diarrhea and Typhoid Fever?

o Yes

o Yes o No

VI. Select an answer to the following questions which are related to contamination.

12. Do you believe that water pollution affects our health when we drink it?

o Yes

o Yes o No

13. Did you know that drugs and antibiotics in drinking water are not completely eliminated and resistant bacteria are found?

o Yes I did.

o I was not aware.

14. Have you noticed any changes in the water due to animal feces?

o Yes

o Yes o No

15. Did you know that water without good water treatment may contain the following contaminants: antibiotics, pharmaceuticals, nitrates, phosphates, organic compounds and pathogenic microorganisms?

o Yes

o Did not know of their existence

o Did you know of any

VII. Select an answer in the following questions which are related to health impact.

16. Do you consider that it is risky for the health of humans and animals to ingest contaminated water?

o Yes, because it causes disease

o No

o Maybe

Thank you for your collaboration.

Leaflet




PROBLEMA
En el sector de Belisario existe un mal mantenimiento de agua potable ya que existe casos donde el agua llega a las viviendas con una tonalidad turbia e incluso de olor café, causando enfermedades como: leptospirosis, cólera, hepatitis A y gastritis estas enfermedades pueden ser considerados como un grave problema de salud para el ser humano. La realización de este proyecto es viable ya que contamos con recurso humano e información bibliográfica que necesitamos y no necesitamos una inversión económica para hacerlo.
PREVENCIÓN
La prevención del agua potable busca beneficiar a toda la comunidad de Belisario Quevedo incluyendo niños, mujeres embarazadas, personas de edad avanzada y personas con sistemas inmunológicos debilitados ya que ellos consumen diariamente el agua potable y puede esto es crucial para su salud y es por lo cual queremos investigar lo que piensan los moradores del sector y brindarles información de cómo pueden estarles afectando este suceso a su salud.
EL AGUA PURA ASEGURA
LA MEJOR CALIDAD
BENEFICIOS
Los beneficios que buscamos es mejor la gestión del agua y evaluar el análisis los cuales ayudaran a los moradores a o futuro investigadores a ver el problema que contiene dicho sector
Los beneficios son muchos ya que mejorara la calidad de vida de las personas sobre la importancia de la calidad de agua potable y nos ayudara a darnos cuenta de lo estamos bebiendo en el transcurso de nuestras viadas lo cual será muy beneficio para todos y se verá una problemática que quedara para resolver para futuros profesionales.