An-Najah National University

Faculty of Graduate Studies

SOCIOECONOMIC ASSESSMENT OF DRINKING WATER SOURCES IN RAMALLAH CITY

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Dedication

To everyone who helped and supported me in my studies, to my mother who is always beside me and supports me with her love for me, to my father who always supports me to my dear brother, my dear sisters, who encouraged and supported me during my studies

To my son Kinan, whom my heart saw before my eyes saw him, and to my dear husband who always support me in all aspects of my life.

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To my dear university, An-Najah National University

Sana' Assaf

Declaration

I, the undersigned, declare that I submitted the thesis entitled:

SOCIOECONOMIC ASSESSMENT OF DRINKING WATER SOURCES IN RAMALLAH CITY

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

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Signature: Sanaa

Date: 04 May 2023

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SOCIOECONOMIC ASSESSMENT OF DRINKING WATER SOURCES IN RAMALLAH CITY

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Abstract

Background: Water is the nerve of life and one of the important elements necessary for the survival of humans and other living beings. Safe and hygienic drinking water is the basic requirements for human wellbeing. Nowadays, there is a strong socio-economic attribute among people to buy bottled drinking water even though it does not meet the standard for different reasons such as being an alternative to tap water scarcity, contamination, and quality. Therefore, this study aims to find a relationship between the use of bottled water and socioeconomic factors in Ramallah city. This study contributes to the field by adding significant new data, useful information, an additional reference for interested parties, stakeholder, and researchers.

Methodology: The study followed the descriptive and analytical approaches through data collection by questionnaires, in addition to sampling bottled water and laboratory analysis for their contents. The study was conducted between August 2021 to December 2022 in Ramallah governorate. The questionnaire covered 381 respondents with a response rate of 100%. Chemical analysis was done for 21 different bottled water from commercial sources. Statistical analysis of results included these tests (Potential of hydrogen, Electrical conductivity, Sodium, Calcium, Magnesium, Chloride, Fluoride, Nitrate, Total hardness). All these tests were conducted in the laboratories of An-Najah National University.

Results and Conclusion: The study population consisted of 381 respondents. It included chemical analysis of samples from water companies. Twenty-one chemical analyzes were performed, and then they were analyzed statistically. According to the study findings, there is a significant statistical correlation between drinking water and gender and income. The study findings showed no statistical significant difference among age, education, and household. For chemical analyses, the study findings showed statistical significant differences between the label of the bottles and the chemical test contents (Electrical conductivity, Nitrate, Total hardness, Calcium, and Magnesium). Furthermore, another novel finding is that there are statistically no significant differences between the listed labels listed values and the contents of (Potential of hydrogen pH, Sodium, Potassium, Chloride, and Fluoride).

Keywords: Bottled Water; Drinking Water; Ramallah Governorate; Socioeconomic Factors; Water Quality; West Bank.

Chapter One
Introduction

1.1 Background

This thesis documents several key contributions in the water field of study. It is considered as nerve of life because its function is not limited to a specific aspect. It is essential for drinking, various industries, and a placewhere many marine organisms live. As a matter of fact, animals, plants, and humans can continue their cycle and remain alive. Water is one of the most important elements for human survival and all living organisms. (Sargen, 2019).

For communities to thrive, they must access safe and clean drinking water. Unfortunately, this is not the case for many of the world's poorest communities, which lack access to safe drinking water. (Brookers, J, 2017).

The following statistics worldwide showed the necessity to reach drinking water. According to the World Health Organization, 1.2 billion people lack access to safe drinking water, and contaminated water is responsible for 80% of diseases and 30% of deaths worldwide. Additionally, according to a United Nations study, insufficient water quality has led to the death of over 1.8 billion minors who are below the age of five (Khalil, 2019).

It is important to reach sustainable development based on a healthy and clean life for current and future generations, which starts with providing clean drinking water for all citizens and basic sanitation services. In total 82.6% of Palestinian families in the West Bank drinks tap water, while 17.4% of families depend on bottled water. (PCBS, 2022).

1.2 Research problem and questions

The main water source in Ramallah governorate is the water supplied by the Jerusalem Water Undertaking, which purchases more than 85% from (Makrot) to cover the population's drinking water needs.

According to several statistical Palestinian organizations, water should undergo several laboratory tests to ensure it is free from any components, such as pathogens, within legal limits. The Palestinian Ministry of Health carried out from time to time tests for chemical, physical, and biological parameters drinking water.

This research is mainly interested in exploring the possibility to access for clean water supplies. Likewise, it would be of special interest to identify the economic and social factors associated with it in Ramallah city.

The research problem is determined by answering the following main question:

Is there a relationship between the using improved drinking water and socioeconomic factors (education, income, gender, and household size)?

Are there statistical differences between labeled and testing for these parameters: the potential of hydrogen, electrical conductivity, nitrate, sodium, potassium, calcium, fluoride, and magnesium?

1.3 Hypothesis

- **Null hypothesis 1:** There is no statistically significant relationship at the level ($\alpha \leq 0.05$) between the using improved drinking water and socioeconomic factors (education, income, household size, house type).
- **Null hypothesis 2:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the potential of hydrogen in bottled water.
- **Null hypothesis 3:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the Electrical conductivity in bottled water.
- **Null hypothesis 4:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the Nitrate in bottled water.
- **Null hypothesis 5:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for sodium in bottled water.
- **Null hypothesis 6:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the potassium in bottled water.
- **Null hypothesis 7:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the chloride in bottled water.
- **Null hypothesis 8:** there is no statistical difference at the level ($\alpha \leq 0.05$) between

labeled and tested for the total hardness in bottled water.

- **Null hypothesis 9:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for calcium in bottled water.
- **Null hypothesis 10:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the fluoride in bottled water.
- **Null hypothesis 11:** there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for magnesium in bottled water.

1.4 Objectives of the research

The main aim of this thesis is to evaluate social and economic assessment of drinking water sources in Ramallah city.

The objectives of this research are to:

- Investigation relationship between the using drinking water and socioeconomic factors.
- Identify the citizens' satisfaction level with water services in Ramallah city.
- Identify statistical differences between labeled and tested water for the above-mentioned parameters?

1.5 Importance of the research

Scientific importance: This research adds new information data and is an additional reference for interested researchers in this field. An invitation to pay attention to this vital scientific research sector as this study examines the drinking water source, which is unique and lacking in local libraries.

Applied importance: This thesis aims to develop overarching findings and recommendations that benefit those in charge of the decision-making process to improve the drinking water in Palestine. The experiment aim to overcome challenges facing the decision-makers to reach a high level of services.

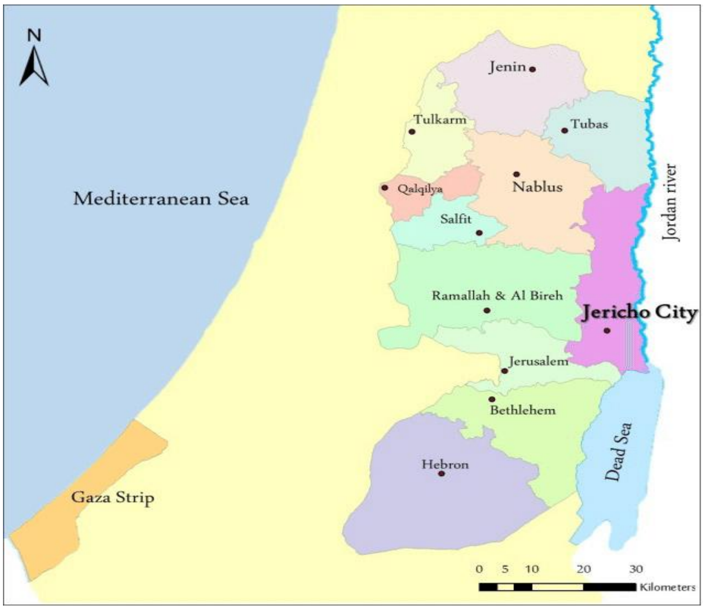
1.6 Study Area Description

Ramallah is a Palestinian city and the center of the Ramallah and Al- Bireh Governorate. It is located in the West Bank, about 15 km north of Jerusalem, and is 880 meters above sea level, with an area of 16.5 km^2 and a population of about (39490) people (PCBS,2017). Moreover, there is the Ramallah Basin-Jerusalem, an area of 610 km^2, from which about 25 million cubic meters (MCM) are extracted, and its recharge rate is between 50-70 MCM. The main water springs in Ramallah are Ein Al-Karzam or Ein Abu Al- Karzam. It is located northeast of Ramallah, specifically to the west of the district building and north of Khirbet Radana. The Ramallah municipality brought the water of this spring in 1913 AD for Ein Misbah to be supplied with water to strengthen it and provide a larger amount of water for the population as part of a municipality project that aimed to combat the drought that hit the area. In 1924, the municipality launched another project to reconstruct the water springs, including the reconstruction of Ein Al- Kurzam.

Moreover, another spring is Ain Munjid. It is a spring of pure water located at the bottom of some hills on the southern side of Ramallah. The eye is about two kilometers away from the center of the old town. The area surrounding the eye is called the Ain Munjid area. Further, Ayn al-Qasr is located at the foot of a mountain in the western and northwestern region of Ramallah, to the mountain road leading to the village of Ain Qinya. One of the most important features of this spring is that it does not dry out in summer and winter among the people of Ramallah.

Figure 1

Map of the West Bank including Ramallah and Al-Bireh Governorate



1.7 Determinants of the research

It is worth mentioning that the researcher conducted this research in the city of Ramallah from August 2021 to December 2022. Thereupon, the human determinant is the city's residents of Ramallah and the industrial water companies. The thematic determination is socio the economic assessment of drinking water sources.

1.8 Previous Research

Previous studies have been reviewed about the analysis of drinking water as follows:

Marieke J. Oskam (2021): Socio Economic Inequalities in Access to Drinking Water among Inhabitants of Informal Settlements in South Africa: This research examined socioeconomic disparities in drinking water usage in South African informal communities. "The baseline research for future effect evaluation for informal settlements intended for upgrading in South Africa" was utilized in the study. In all nine provinces of South Africa, households residing in informal settlements earmarked for upgrading were eligible to participate. Multinomial logistic regression analysis, concentration indices, and concentration curves were used to examine socioeconomic disparities. The findings revealed that property owners who used a piped tap were disproportionately concentrated.

B. K. ABellanthudawa (2021): Integration of social, economic, and environmental dimensions in designing rural water supply systems, A study in Sri Lanka: The goal of this study was to determine whether existing social and environmental determinants could be used to design and manage a water supply system in rural communities. It also aimed to introduce a novel approach that combined concepts from the social- environmental index with principal component analysis and water quality monitoring. The study identified ground-level strengths, weaknesses, opportunities, and threats to build a sustainable water delivery system in the research region. Random sampling procedures were used to examine socioeconomic, demographic, and environmental characteristics among water-deficient villages. The waterquality of water sources was checked as part of the water analysis. After that, PCA was performed.

Gebremichael et al. (2021): Determinants of water source use, quality of water, sanitation and hygiene perceptions among urban households in North-West Ethiopia: A cross-sectional study: The study aimed to investigate the determinants of water source use, water quality, sanitation, and hygiene perceptions among urban households in North-West Ethiopia, using a cross-sectional study conducted among households in 2019. The data was collected using a pre-tested and structured questionnaire. The study found that the participant's age, educational status, source of money, monthly income, availability of extra facilities, cleanness status, water scarcity, and family size all significantly impacted the household's drinking water sources.

Luuk Rietveld (2021): Financial, institutional, environmental, technical, and social (FIETS) aspects of water, sanitation, and hygiene conditions in indigenous - rural Indonesia: The intricacy of conditions in developing nations is becoming more widely recognized. This article delves into the complexities of using a qualitative technique to analyze a specific area's susceptibility to inadequate conditions. Inadequate institutional capacity, water shortage, and low socioeconomic conditions are the primary obstacles to improving WASH conditions in this area.

Yuke-Lin Kong (2020): Socioeconomic Factors Related to Drinking Water Source and Sanitation in Malaysia: It is critical to have good water and sanitation. Data from a countrywide community survey was used to characterize the behaviors related to drinking water in Malaysia. Logistic regression was used to examine the factors. The results found that 58.3 percent of the 7978 dwelling quarters were in metropolitan areas. Non-improved water sources, non-improved toilet types, and inappropriate household waste disposal were found in around 2.4 percent, 0.5 percent, and 27.4 percent of LQs, respectively. The results found that 26.1 percent of people use open fires. Long dwellings (10.5 percent), squatters (8.5 percent), and shared residencesall have issues with water (4.0 percent). Squatters had 11.9 percent of non-improved toilets, while shared dwellings had 4.8 percent. Village homes (64.2%), long houses (54.4%), single dwellings (45.8%), and squatters had the highest rates of improper household waste disposal methods (35.6 percent). An increase in education or wealth was linked toan increase in.

Jordi Perdiguero (2019): Socioeconomic Factors Affecting Water Access in Rural Areas of Low- and Middle-Income Countries: Millions of people worldwide still lack access to safe drinking water, particularly in rural parts of low- and middle-income nations. However, work on the Millennium Development Goals, and Sustainable Development Goals has resulted in significant progress in recent years. Nonetheless, national features have frequently influenced this growth. This article investigates whether certain socioeconomic characteristics influence access to better water sources in developing country rural areas. For low- income, low-middle- income, and high-middle- income nations, research looks at access to 'total enhanced' piped-on premises and other improved access sources in rural regions. The findings imply that, female primary completion rate, agriculture, rural population growth, and governance indices, the result show the Gross national income (GNI) variables has been found to be significant variables explaining water access, population of rich countries have better access to water because rich countries have better economic resources and infrastructure.

Abhijit Mukherjee (2019): Impact of sanitation and socio-economy on groundwater fecal pollution and human health towards achieving sustainable development goals across India from ground- observations and satellite-derived nightlight: Approximately one billion people worldwide, especially in Africa and South Asia (e.g., India), lack access to safe drinking water and sanitation. As a result, improper fecal waste disposal from open defecation into surrounding drinking water sources endangers public health. Until recently, India had a large open- defecating population, resulting in poor public health due to water-borne illnesses such as diarrhea caused by eating filthy groundwater. However, sanitation development has been promoted in India recently to attain the Sustainable Development Goals, but the impact on groundwater quality and human health has yet to be assessed.

For the first time, it is measured that groundwater fecal coliform concentration and acute respiratory infections (>1.7 million) had increased over time in India, utilizing long- term, high-spatial-resolution data (>1.7 million) and analysis.

Luuk Rietvelda (2019): Understanding the effect of socio- economic characteristics and psychosocial factors on household water treatment practices in rural Nepal using Bayesian Belief Networks: In Nepal, around 20 million people (73%) still lack access to clean d rinking water, and 22 million people (79%) do not treat their drinking water before use. A limited number of research has looked at the interaction of socioeconomic and psychological elements that might explain such behavior probabilistically. The researcher utilized data from 451 homes in mid- and far-western rural Nepal to provide a unique technique for assessing household water treatment use. They created a Bayesian belief network model that considers socioeconomic aspects and five psychological components. The presence of young children, having previously been exposed to HWT promotion, degree of education, kindof water source utilized, access to technology, and affluence were among the socioeconomic features of families.

Alasdair Cohen (2018): The Impacts of Socioeconomic Development on Rural Drinking Water Safety in China: A Provincial-Level Comparative Analysis: For government organizations and researchers in China, establishing rural drinking water safety that is, access to a safe, cheap, adequate, and sustainable drinking water supply remains a major concern. This research examined the effects of socioeconomic development on drinking water safety in rural China using cross-sectional data at the province level. The data was categorized into state and pressure indicators using a theoretical framework called Pressure-State-Response (PSR). The association between the indicators at the province level was then investigated using Canonical Correlation Analysis. Significant disparities in drinking water safety were discovered among provinces. The findings imply that China's recent and rapid socioeconomic growth has significantly improved rural drinking water safety. However, rising groundwater over-abstraction reduces water availability, and other factors severely influence rural drinking water safety.

Chapter Two
Literature Review

2.1 Historical insight into the evolution of the water reality in Palestine

The importance of water in Zionist thought came to light after the first Zionist Conference, held in 1897, when Theodor Herzl stated at the time, "We laid the foundations of the Jewish State at its northern border, which extends to the Litani River."

Since then, Zionist colonial activity has begun, aimed at creating a Jewish homeland based on the combination of security and water. Occupier has been occupying and controlling areas of great importance and rich in water resources in Palestine, the West Bank, the Jordan Valley, and the Syrian Golan. Occupier continues toplace the issue of water at the top of its priorities. This importance was highlighted by Occupier proclamation in 1948 of the beginning of the preparation of plans and programs. The decision to nationalize water was adopted in August 1949 (Akram, 2021).

With Occupier of Palestinian territories in 1967, Occupier control of all Palestinian water sources resulted in Occupier issuing a series of military orders confirming that, in its nationalization decision, water could be used only with special permits granted by the military governor. To tame other resolutions, the most important of which was to restrict the operation of the existing Jerusalem Water Service and the West Bank Water Service.

These actions continued despite the new reality that broke into the political situation between the parties to the conflict and culminated in mutual recognition between the Palestine Liberation Organization and Occupier and the signing of the Declaration of Principles Agreement in September 1993. (Oslo 1 - Jericho I), under which the Palestinian National Authority was declared to be established in the liberated Palestinian territories, both in the West Bank and in the Gaza Strip, except in areas with settlements (Area C). In the West Bank and the areas under Occupier settlement, this interim agreement lasted five years, during which a just and comprehensive solution was to be found to the fundamental issues of the conflict: borders, refugees, settlements, Jerusalem, and water rights. Effectively related to

Palestinian water rights, dealt with in the Interim Agreement (Oslo II) in Annex III, section 40 (Protocol on Economic Cooperation to the Interim Convention entitled "Water and Sewage"), under which Occupier recognized Palestinian water rights in the West Bank; It deferred the understanding to final status negotiations. Under this heading, a total of 118 MCM of existing sources (springs and wells) in the West Bank were allocated to the Palestinian side; It was assumed that the Palestinian side would be able to drill wells, adding 80 MCM of the three West Bank basins to the total used (The Palestinian National information center,2022)

2.2 Water Status in Palestine

Water situation in Palestine is critical because of occupation. Palestinian citizens suffer from a water shortage and are denied from reaching. The need for clean water will continue to rise as the population, agricultural, industrial, and commercial sectors develop. Several physical, political, and socioeconomic factors prevent Palestinians from accessing clean and safe drinking water. Variable and unpredictable rainfall, a constant drop in the water table and high saline levels, contamination from chemical, solid waste, wastewater run-off, and filtering into ground water are all examples (ARIJ, 2015).

2.3 Water Resources in Palestine

The Palestinians depend on groundwater from underground wells and springs except for the Jordan River and the winter rains. They are unable to use water from the Valley. Nevertheless, because of the current situation on Palestinian land, Palestinian citizens face various problems getting water. The previous work showed that around twenty percent of them use water from groundwater

The daily water consumption per capita in Palestine is 66 liters. Water scarcity affects Palestinian communities and may be worsened by population size. (Abusafa A, 2012).

2.4 The three main aquifers in the West Bank

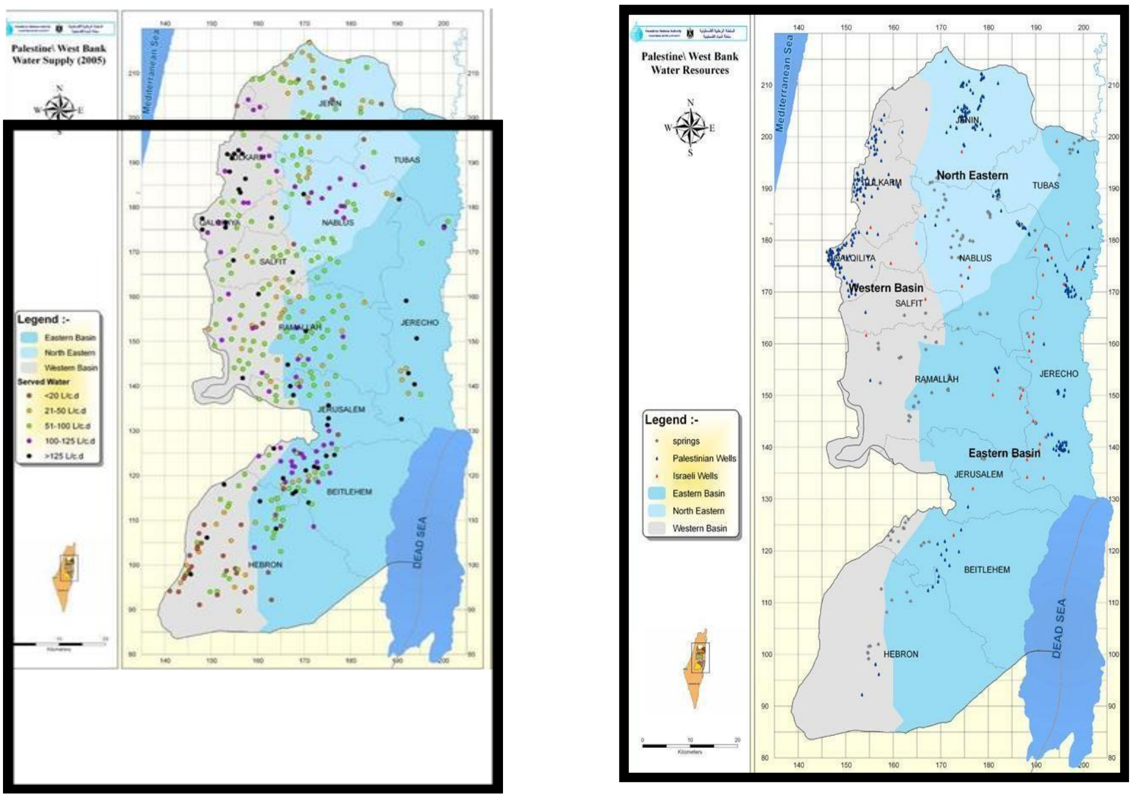
1. **The Western Aquifer:** The Western Aquifer is the largest and most important of the West Bank Aquifer basins. Its annual production is predicted to be between 362-400 MCM. However, the Occupier, as opposed to the Palestinians, aggressively utilize this area through wells. The upper and lower Cinemania aquifers are the primary

aquifer systems in this basin.

2. **The northeastern aquifer**: Most of this basin's recharge zones are inside West Bank borders, with an annual sustainable production of 100-145 MCM. The shallow Eocene Aquifer and the Upper and Lower Cenomanian Aquifers make up the aquifer system in this basin.
3. **The Mountainous Heights, Northeastern Tip, and Jordan Valley** are primary sub-aquifers in the eastern aquifer. The basin's annual sustainable output is anticipated to be between 145 and 185 MCM. (Han j, 2007).

Figure 2

Aquifers in the West Bank

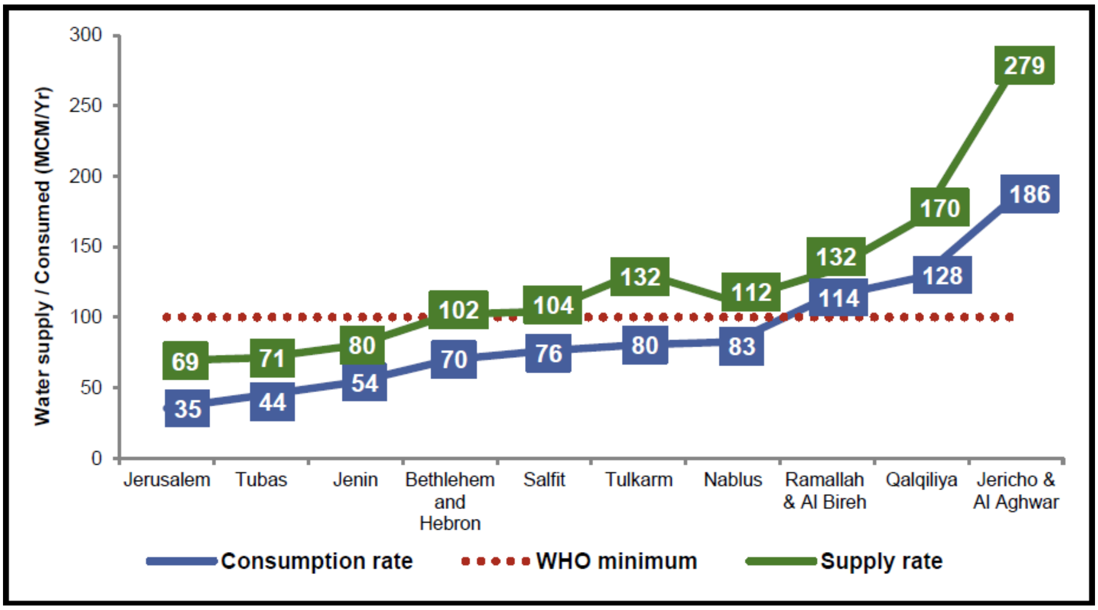


2.5 Supply and demand for water

Palestinian citizens are well acquainted with periodic droughts, water scarcity, and interruptions in the water supply. Obtaining the necessary quantity of potable water is a significant challenge in the present political situation. The water amounted to 139.6 MCM for 55 Palestinians in 2018, 88.3 million for domestic use, and 51.3 million for agricultural utilization. The following figure illustrates the water supplied and utilized per capita in the West Bank (see Figure 3).

Figure 3

Water supplied and demand in West Bank



2.6 Water sources in Palestine

It is clear that the most important water sources in Palestine are:

Surface Water Sources

- **The Jordan River:** The importance of the river is because it isthe only permanent source of surface water in Palestine, specifically in the West Bank, and its waters flow from the north at an altitude of 2,200 meters above sea level, reaching the Dead Sea at an estimated altitude of 350 meters below sea level. The river is about 350 km. Five countries share the Jordan River: Palestine, Jordan, Syria, and Lebanon, the occupying country. Its total area is about 43,500 km^2, including 12,000 km^2 in Palestine. Among the most important tributaries that feed the Jordan River are the Hasbani River and the Banias River, which both originate in the Golan Heights, and whose annual discharge is estimated at 157-140 MCM, respectively. The Dan River originates from the slopes of Jabal al-Sheikh in Syrian territory, and its annual discharge is estimated at 257 MCM. The Yarmouk River originates from Mount Horan in Syria, and its annual discharge is estimated at 475 MCM . In addition to the other side valleys. (Abd Al-Ghafoor,2011).
- **Lake Tiberias**: Lake Tiberias is the main water reservoir in the Jordan Basin. Its storage capacity is estimated at more than 4000 MCM, with a surface area estimated

at 169 km^2. It has a high salinity rate due to the presence of many saline springs at the bottom and sides of the lake, which lie under the control of the occupation that controls its waters through a main gate south of the lake known as the Dagania Gate.

- **Lake Hula** is a small lake located north of Lake Tiberias and on the course of the Jordan River. Its area is estimated at 14 km^2, and swamps surround it in an area of 60 km^2.

2.7 Underground sources

It is considered the main source of water in Palestine and is used for drinking, agriculture, and irrigation, where groundwater is found in karst gaps and waterways caused by fissures, cracks, and rocky breaks, in addition to the sandy geological formations on the northern strip. Most of these reservoirs are renewable and depend on rainwater for underground nutrition. Several underground reservoirs are fully exploited by the occupying country only and are utilized through the wells and springs in them. These basins are divided into:

- **Lake Tiberias Basin**: It extends from the north of Jenin to Lake Tiberias and the Golan in the north. Its production capacity is about 528 MCM annually.
- **Western Galilee Basin** extends from Afula in the south to the Lebanese border in the north. It consists of several aquifers that are fully exploited by the occupying power. Its production capacity is about 122 MCM annually.
- **The Carmel Basin** extends from the far northwest of Palestine to the bottom of the Carmel Mountains, with a production capacity of about 40 MCM annually.

As for the basins that are considered a major source of water in Palestine, specifically in the West Bank and Gaza Strip, in which both Occupier and Palestinians share in an unbalanced manner, they are three basins: the western, eastern, and northeastern basins. (Abd Al-Ghafoor theeb, 2011)

- **The North-Eastern Basin** is located in the northern region of the West Bank. The feeding quantities in this basin are estimated at 197 MCM annually. The number of wells in this basin is about 87, with an average extraction rate of 16 MCM annually. As for the Occupier wells are three, with an average extraction rate of 4 million. Cubic meters per year. The number of springs in it is about 37, constituting

28% of the total springs in the West Bank.

- **Western Basin**: It is considered one of the most important water basins in the West Bank. It extends from the mountainous heights of the West Bank in Raqqa to the coastal areas in the west and from the southern slopes of the Carmel Mountains in the north to within the Egyptian borders in the south. The feeding quantities in this basin amount to about 420 MCM. It also has 137 wells, with an average extraction rate of about 21 MCM.
- **Eastern Basin**: The area of this basin is about 2,900 km^2, and it is located within the borders of the West Bank from the eastern side. It is generally characterized by low rainfall except for the western part, which is located among the heavy rainy areas at the heights of the West Bank. Studies have shown that the feeding quantities in this basin are estimated at 197 MCM annually, and the number of wells is about 103, with an average extraction rate of 25 MCM annually (PCBS, 2015). Table (1) shows the amount of water extracted from underground aquifers in the West Bank for the year 2019 (PCBS,2019).

Table 1

Abstracted from Groundwater Aquifers in theWest Bank for the year *2019 in (MCM)*

Governorate	Eastern Basin production	Western Basin production	Northeastern Basinproduction	Total
West Bank	31.2	36.9	33.3	101.4
Jenin	-	-	8.2	8.2
Tubas	1.6	-	11.1	12.7
Tulkarm	-	21.6	-	21.6
Nablus	0.8	-	14	14.8
Qalqilya	-	15.1	-	15.1
Salfit	-	0.2	-	0.2
Ramallah and Al-Bireh and Jerusalem	1.8	-	-	1.8
Jericho and Al-Aghwar	15.1	-	-	15.1
Bethlehem and Hebron	11.9	-	-	11.9

2.8 Water Availability

Water has played a major role in determining the features of geography, especially since 1948, through the aggression of June 5, 1967, up to the current reality, which explained the path of the separation wall since its construction began in the summer of 2002 until 2015. More than 15% of the lands of the Palestinian Bank, with a total area of five thousand and eight hundred km^{2}, and at the same time, the most important Palestinian water basins in the West Bank will be confiscated from the western side of the wall in favor of leaving the Palestinians in a huge deficit and scarcity in light of a high population increase of more than 3.5% annually among them.

It will exacerbate the water crisis for the Palestinians and widen the problem of salinity, which in the Gaza Strip has reached more than 90%, which may expose the population to health, environmental and social problems, especially those related to malnutrition among children.

In this context, the reports of PCBS (2015) indicate that there is an inequality between Occupier and Palestine in the issue of water sharing and that the amount of water extracted from the coastal basin in the Gaza Strip in 2013 amounted to about 101MCM . This amount is considered unfair, as it must be. The safe pumping rate is between 50 to 60 million m^3, which aggravated the water reality as it became inconsistent with the standards of the World Health Organization. On the other hand, it was found that the amount of water extracted from the West Bank in 2013 was 53 million m^3 for the Eastern Basin, about 30 million m^3 for the western basin, and 21.6 million m^3 for the northeastern basin. (Shakir, 2007)

According to Table (2),it is clear that the amount of water available annually is 204.2 MCM at the level of the Palestinian territories. The annual pumping amount from underground wells occupies the largest rank, with an amount of water of about 187.6 MCM, followed by the amount of water purchased from the Occupier side (Mekorot), which is equivalent to about 12.5MCM. In comparison, the Desalinated water comes last at 4.1 MCM. It is only present in the Gaza Strip and comes in the context of the suffocating water crisis in the Strip.

Table 2

Selected Indicators for Water Statistics in Palestine, 2019

Pointer	Quantity
Amount of water available annually (million m^3/year)	204.2
Annual pumping amount from underground wells (million m^3/year)	187.6
Annual discharge of spring water (million m^3/year)	-
Desalinated drinking water	4.1
The amount of water purchased from the Occupier Water Company (Mekorot) (million m^3/year)	12.5

In the same context, it can be noted that a different reality from the rest of the countries in the region characterizes the Palestinian water situation. This is represented in the presence of the occupation, which extends its control over all the existing water sources and prevents the Palestinians from their right to access water sources. In addition, to obtain alternative sources, even though international law and covenants, especially the Charter of the United Nations, do not grant and encroach upon the right of the occupying state usurping the land any rights to water or sovereignty over the occupied lands. However, it is found that since the signing of the Oslo Agreement 2 in1995, the Interim Agreement on Water and Wastewater has been used (Article 40 of the Oslo Agreement 2) As a basis for developing plans for the water sector and implementing projects during the “interim period.” that followed the Declaration of Principles, where the decision on water rights was postponed to final status negotiations.

Analysts have stated that what was agreed upon in Oslo is nothing buta consolidation of the continuous and coercive Occupier hegemony presented in the form of cooperation represented in the Joint Water Committee, as Occupier has the right to veto everything, but it appears that Occupier is less oppressive of the rights of the Palestinians before the world and donors (Ghazi, 2003).

2.9 Water usage factors, per capita share, supply, and demand

The level of inequality between Occupier and Palestine in the participation in the mountain water basins in the West Bank is very clear, as the average per capita water use by Occupier in the West Bank is about seven times higher than that of the Palestinians.

According to another report issued by the Palestinian Economic Council for Development and Reconstruction "PECDAR," ThePalestinian Territories suffer from a shortage of water as a result of the occupation, which imposed its control over land and sky, so it seized water resources and transferred them to its advantage. Lookingat the water consumption for domestic use (municipal and industrial) in the Palestinian Territories, it is estimated at 22 cups of water per person (equivalent to a cubic meter) per year, approximately 60 liters per person per day. On the other hand, the Occupier individual's water consumption for the same purpose is estimated at 104 cups of water annually, i.e., 280 liters per day per person. That is, the consumption rate of the Occupier citizen is four and a half times more than Palestinian citizens. (PWA, 2011).

Suppose it takes into account the global rates. In that case, it appears that the consumption of the Palestinian citizen is less by about 40% of the global recommendations, where the World Health Organization and the US Agency for International Assistance recommend consuming a minimum of 100 cups of water per person per year, which includes home use, supplies to hospitals, schools, and shops and other public institutions. Table No. 3 shows the quantity of water supplied to the domestic sector, the total losses, and the population. The per capita daily share in the West Bank by governorate for the year 2019 shows that the average daily per capita quota consumed is equivalent to 85.6 liters per day, as the highest per capita share is in Jericho equivalent to 211 liters per day, followed by Tulkarm with an average of 118.8 liters, then Ramallah and Al-Bireh with 115.8 liters per day, while the lowest share is in the Tubas area, equivalent to 55.8 liters per day.

Table 3

The quantity of water supplied to the domestic sector, total losses*, population number, and per capita daily share in the West Bank by governorate, 2019 (PCBS,2019)*

Governorate	Water supply for domestic sector (million m^3)	consumed water (million m^3)	Total Losses (million m^3)	Population end of 2019	Daily Consumption Rate per capita (liter/person/day)
West Bank (*)	119.2	85.2	34	2,725,318	85.6
Jenin	9.3	6.9	2.4	328,660	57.5
Tubas	2.7	1.3	1.4	63,810	55.8
Tulkarm	10.2	8.4	1.8	193,607	118.8
Nablus	13.0	11.4	1.6	403,883	77.3
Qalqilya	8.2	4.8	3.4	117,748	111.6
Salfit	23.3	2.7	0.7	79,303	93.2
Ramallah andAl-Bireh and Jerusalem	18.1	21.4	1.9	506,141	115.8
Jericho	6.8	4.0	2.8	51,883	211.1
Bethlehem andHebron	42.3	24.3	18	980,283	67.9

2.10 Challenges facing the optimum utilization of the available water resources

The main and strategic objective of the occupying power was and still is the domination of Palestinian economic resources, including water, whether by military force or imposing agendas in the process of political settlement, which resulted in agreements that restr icted Palestinian economic activity and its ability to optimally exploit the water resources and their available resources in the areas of the West Bank, specifically the Area (C). These Occupier military procedures and orders enabled the Occupier forces to tighten control over the Palestinian water resources to deprive the Palestinian people of their legitimate rights to water. This was represented in many measures, the most important of which are:

- Imposing restrictions on Palestinians' exploitation of their water rights in the West Bank.
- Restriction of drilling agricultural wells in the West Bank.
- Occupier has dug many wells inside Israeli settlements in the West Bank.

2.11 Digging a series of wells

It can be said that Occupier has established and is still violating international law and even the laws that it established. The number of Occupier withdrawals from the Western Basin increased by an average of 402 MCM annually, while the rate did not exceed 25 MCM annually for the Palestinians, which are the wells surrounding Tulkarm and Qalqilya. Thus, it is found that Occupier exceeds the limit agreed upon in Oslo by an average of 62 MCM per year, a quantity equivalent to three-quarters of the total current Palestinian production from all wells and springs in the West Bank, which is estimated at 82 MCM according to 2010.

According to the Oslo Agreement 2 (1995), the Palestinian side can extract 54 million m3 from the Eastern Basin and 78 million m^3 as sources that can be increased. As for the western basin, the Palestinian side has the right to extract 22 million m^3 from this basin. As for the northeastern basin, the Palestinian side has the right to extract 42 million m^3 from this basin.

If the side of the efforts considered that are being made in the Palestinian Authority areas to address the increasing water deficit, it must address the most important of these efforts, the most important of which is desalination, especially in the Gaza Strip. These efforts can be classified into formal and informal.

2.12 Official Efforts

The Palestinian Water Authority is taking the lead in this, as it supervises many projects aimed at containing the drinking water crisis in the West Bank. Such as digging artesian wells, constructing and rehabilitating several water networks for several used springs, restoring wells supervised by the Occupier water company "Mekorot" in the West Bank, and equitable division of aquifers' water between Palestinians and Occupier.

Municipalities and village councils: They work to increase the production efficiency of existing wells, dig new wells, and construct water reservoirs. These projects often encounter either Occupier obstacles ora lack of funding for implementation.

2.13 Unofficial Efforts

- **Projects of the International Committee of the Red Cross**: The Committee implemented several projects and a special program for the Hebron and Salfit areas. The aforementioned committee distributed water by tankers to approximately 5,000 families and some schools, especially during the years 2002-2003. The International Committee of the Red Cross also built rainwater collection wells for drinking. It contributed to building 98 wells and 70% of the total funding needed to build those wells.
- **Palestinian Hydrological Group**: The Palestinian Hydrological Group is working on implementing some special projects in the rural area, including educating the Palestinian citizen to reduce water depletion and pollution in water wells. The group also worked through a Water Harvesting project to dig 286 wells in 2003.

2.14 Water Quality

Studies showed that human beings are significantly affected by the water quality they use. According to the United Nations General Assembly, having clean and safe water is a human right (UNNC, 2010). On the other hand, many underdeveloped countries face chronic water shortages. The WHO stated that 1.2 billion suffer from the right to access water. In addition, polluted drinking water is responsible for 80% of illnesses and 30% of deaths worldwide.

According to UN research, 1.8 billion children under five have perished due to polluted drinking water.

2.15 Water Pollution

Therefore, testing the water source is critical, especially if "the water is not treated. (1) Escherichia coli and thermo-tolerant coliforms accepted as suitable substitutes, (2) chlorine residual (if Chlorination is practiced), (3) pH, and (4) Turbidity are the essential parameters that should be examined to ensure that water is safe and free of pathogens in order to reduce the likelihood of diseases, as recommended by WHO"(Henio, M 2012).

Most tap water in Palestine is supplied by a clean and safe-to-drink water supply (municipalities). However, in rare situations, drinking tap water might put your health at risk owing to pollution caused by faulty plumbing or a polluted water supply. The source water is frequently out of compliance with requirements. However, the concentration of free residual chlorine in distribution networks has decreased, implying that there is only slight protection against any microbiological contamination that may occur in pipelines. The likelihood of water contamination at taps is high, implying that gastrointestinal morbidity may occur and necessitate the addition of another dose of chlorine.

Based on the above, the water should be tested occasionally to ensure it is drinkable. Therefore, teaching institutions should have regular checks with their water supplier and come up with practical solutions in the event that any illness is found in the water. Therefore, they are advised to seek out alternate clean water sources or build a filtration system to eliminate impurities. (Bartram, 2007).

2.16 Purchased Water Quality

In many regions of the world, they are used to purchasing water from different suppliers for many reasons. Thereby, the quality of water differs from one supplier to another.

Tanker trucks are often used to transport and deliver purchased water. In fact, they are not allowed to carry anything else. When large volumes of water are transported, chlorine should be added to ensure that the free residual chlorine concentration at the pointof delivery is less than 0.5 mg/l. (Hutin et al., 2003).

Health Hazardous Associated with Contaminated Drinking Water the key variables that negatively influence human health and may lead to mortality are as follows: first, they do not have access to drinking, and second, water sanitation. Unsafe water and sanitation are the leading causes of mortality for 1.6 million people worldwide each year. (Haller L et al., 2007)

Infectious illnesses, the most prevalent and pervasive health concern, are caused by drinking water polluted by harmful bacteria, viruses, and parasites. The severity and incidence of pathogen-related sickness and the disease's prevalence indicate public health's severity. The illness consequence may be moresevere on the health of those living in poor circumstances anddistant places.

Human health may be jeopardized by diseases linked to polluted drinking water. For example, waterborne illnesses such as cholera and typhoid might become epidemics if they spread throughout communities. Water traveling via outdated water networks may include hazardous metals that affect humans and cause many illnesses. Many schools have issues with their drinking water since it does not originate from the communal network but from various sources.

It is common to find many problems in water carried out in old tanks, such as bacteria. Although some of them are not harmful to humans, many of them may cause serious health problems.

Due to poor water quality and cleanliness, various bacteria can be detected in the water. Some are risk-free, while others can lead to major health issues and infections, including many serious illnesses. (Bakir et al., 2015)

2.17 Water Quality Parameters

The World Health Organization (WHO) employs six primary criteria to evaluate the quality of drinking water, which are:

1. **"Temperature:** a high-water temperature promotes the growth of microorganisms, can alter the taste, odor, and color of water, and can cause problems such as corrosion. The water temperature in streams and rivers across the world ranges from 0 to 35 degrees Celsius.
2. **Color**: Drinking water must be aesthetically acceptable. Even if it is safe to drink, colored water does not appear ideal for drinking. The presence of color in water indicates the presence of organic components like algae or humic chemicals. Color has lately been utilized as a marker for the presence of potentially harmful poisonous chemical substances in water.
3. **Taste and Odor:** Taste and odor are important indicators of water quality. The taste and odor of drinking water might indicate pollution or a problem with the water treatment or distribution system. As a result, it might be a sign of the presence of potentially dangerous drugs.
4. **Turbidity**: Turbidity in drinking water sources is caused by suspended colloidal particle matter; for example, turbidity in ground water is caused by inert clay and

the precipitation of insoluble oxides. The presence of biofilm and silt in the distribution system causes turbidity. High turbidity levels impact the disinfection process' efficacy, resulting ina large chlorine dosage requirement and encouraging bacteria growth. As a result, turbidity serves as a warning sign of microbial contamination. (WHO, 2011)

5. **Chemical Parameters**: The chemical composition of drinking water impacts its quality; prolonged exposure to certain chemical elements can cause major health concerns.
6. **pH**: This is an essential indicator of water quality. To guarantee full disinfection, pH must be controlled at all phases of water treatment. Knowing the pH is vital since alkaline water necessitates a longer contact time or a larger chlorine dosage. To have enough disinfection at the end of contact time (0.4-0.5 mg/liter at pH 6-8, increasing to 0.6 mg/liter at pH 8-9: chlorination may not be successful at pH above 9). The ideal pH is generally between 6.5 and 8.5."

2.18 Possible scenarios

It was one of the most important priorities that followed the Declaration of Principles, where the decision on water rights was postponed to the final status negotiations, represented in empowering the Palestinians their share in the surface basins. The most important of which is the Jordan River basin and the main aquifers, and providing the Palestinians with an additional "urgent" amount during the five years that followed the signing of the Declaration of Principles. The agreement amounts to 28.6 MCM from new groundwater wells and the Occupier water company "Mekorot" to obtain additional water quotas during the transitional period, estimated at 70-80 MCM. Occupier prevented the Palestinians from taking their additional water quotas. The final status negotiations were also supposed to start at the end of the transitional period in 1999, but the failure of the Camp David negotiations kept the situation as it was. Due to Occupier measures that limited access to water and improved its services and sanitation, the percentage of water the Palestinians receive from water has been estimated. The aquifers are only 15%, while the Occupier get 85% of the water from these aquifers, in addition to the fact that Occupier continues to develop and exploit the common aquifers' water sources without referring to the Palestinian side on the pretext that the aquifers are inside Occupier and the conditions of Article 40 do not apply to them. (PCBS, PWA, 2015)

It appears from a study conducted by the Ibrahim Abu-Lughod Institute for International Studies at Birzeit University about water in Palestine that the possibility of Palestinians achieving their legitimate rights to water must pass after several stages to contribute to a way out of the water crisis, the most important of which is the need to reach an agreement with the Occupier side to re-allocate all the resources.

Fresh transboundary water, in accordance with the principle of "equitable and reasonable," prejudices custom and international law and thus removes the inequality in the current water distribution, which may lead to a significant increase in the amount of natural fresh water for the Palestinians. The second stage includes a mutual agreement during a transitional period during which water will be redistributed, which will give the Palestinians time to build the water infrastructure necessary to take the building on additional quantities of water, as well as work towards achieving more efficiency in water use and improving the performance of treatment and desalination plants. The third phase includes introducing new arrangements to ensure the cooperation and coordinated management of trans boundary water resources.

Although this scenario may have a balanced benefit on both sides, given Occupier complete control over Palestinian water resources and its adoption of the "prior use" principle, a clear conflict over water between the Palestinians and the Occupier emerges. Therefore, the biggest challenge is to convince the Occupier. On the issue of partnership and granting rights, what the occupying power considers an unacceptable alternative to the current situation, which motivates the Palestinians to redouble efforts on a broader international and regional scale and to involve neighboring Arab countries on the issue of water to develop a collective stance to obtain legitimate rights.(Birzeit Strategic Studies).

Chapter Three
Methodology

Describes the study method, sample and society, the study tool, and its truth and reliability. It also includes a description of the procedures to codify the study tool and its application, describing the statistical procedures used to analyze data and extract results.

3.1 Study method

The study used the descriptive analytical approaches due to suit the study's purposes, A questionnaire was set to collect data related to the topic, data were analyzed statistically to extract the results and compare them to literature. In this thesis, chemical analysis of bottled water was analyzed though sampling and laboratory procedures, and then compared them with the labels on bottled water cans. Followed by a statistical analysis of the laboratory result.

3.2 Study population

The study community consists of all individuals who live in Ramallah city during the year 2022-2023, and their number is (39,490) people. (PCBS, 2022)

3.3 Period of study

It was implemented in the period from August 2021 to December 2022.

3.4 Sample size and method

3.4.1 Questionnaire

The study sample was selected randomly, and counted to -381- person (see Appedix 1.) This is the limit required for the static analysis of the questionnaire.

The questionnaire was distributed randomly to the resident of Ramallah city only.

3.4.2 Bottled water

Water bottles of some certain companies that are most used in the city of Ramallah were randomly took from different supermarkets. The bottled water were analyzed the in the laboratory and compared the laboratory results with the results written on the bottled water.

3.5 Response rate

The response rate was 100%.

3.6 Study instrument for questionnaire

The questionnaire was conducted only through a social network site for Ramallah city residents (see Appedix 2).

3.7 Construction of the questionnaire

A questionnaire draft was prepared and then presented to the supervisors for discussion and making appropriate and final modifications.

The questionnaire was translated into Arabic under the supervision of an Arabic language teacher to make it easier for residents to answer it, knowing that it is the dominant language in Palestine.

The questionnaire includes the following parts of questions:

- The first part included items related to personal data.
- The second part Special in network water and main network water quality
- The third part special in bottled water
- The fourth part is compression between the network and bottled water.

3.8 Content validity of the questionnaire

The questionnaire was reviewed by experts from An-Najah National University from the College of Engineering and Information Technology and the College of Economics and

Administrative Sciences, in addition to PWA (see _Appedix 3), some adjustments were made as required. Content validity deals with the representation and comprehension of the items in the scale. It was assessed by examining the process by which the scale items were generated. The content validity in this study should be relatively acceptable since the various parts of the questionnaire were all based on the literature review and on the opinion of several experts who will examine the items.

3.9 Reliability of the questionnaire

The reliability coefficient (Cronbach's alpha) was calculated as an indicator of the homogeneity of the level of the instrument. Cronbach's alpha coefficient equals for all items 87% and an acceptable level would be more than (70%).
(Nannaly&Bernstein,1994)

3.10 Data collection

3.10.1 Questionnaire

The data was collected from the residents of Ramallah city via Google Drive and filled out this data on the Excel program to perform the statistical analysis.

3.10.2 Bottled water

Different samples of bottled water were collected from different supermarkets. The supermarket owners were asked about the best-selling companies in Ramallah city and the most consumed by the population. Eleven companies were selected, and packages for the same company were taken from more than one place to compare the results.

3.11 Data analysis

- Data analysis was done using the SPSS 26 program and Excel software with the assistance of a statistician.
- Data analysis was done using, means, stranded deviation, chi-square test and paired sample T.Test.

3.12 Inclusion criteria

- All adults aged more than 20 years old who are living in Ramallah governorate.

3.13 Characteristics of the sample

Table 4

The distribution of the independent variables of the people in Ramallah city

Variable	Categories	Frequencies	Percentage
Gender	Male	70	18.5%
	Female	311	81.5%
Age	19-25	32	8.4%
	26-35	232	60.9%
	greater than 35	117	30.7%
academic qualification	tenth grade	10	2.5%
	Secondary	38	10.2%
	University	325	85.3%
	Student	8	2%
nature of work	government sector	134	35.1%
	private sector	122	31.9 %
	NGOs	49	12.9%
	Unemployed	76	20.1%
income level	Low	35	9.3%
	Medium	321	84.2%
	High	25	6.5%
family size	2-4	208	54.6%
	4-6	143	37.5%
	More than 6	30	7.9%
	Total	381	100%

Table 4: The table shows samples of characteristics regarding the population size of the people in Ramallah in which (81.5%) are females, 60.9% are aged between 26-35, 85.3% have University degree, 84.2% have medium income, and 54.6 %have family size from 2-4 person.

3.14 Limitation of the study

- The lack of previous studies in this research, especially in bottled water.
- Poor cooperation of people in answering the questionnaire.

3.15 Experimental Analysis

The researcher conducted chemical tests for bottled water by looking at the results written on the bottled water label and comparing these results. See The Result (Annex 4)

Chemical tests for bottled water

The potential of hydrogen "pH": value the researcher measured the pH with a pH meter.
Electrical conductivity: measured the electrical conductivity with a device Electrical Conductivity Meter

Total dissolved solids: There is a small handheld TDS meter that measures the conductivity of a solution per ppm

Nitrate: Nitrate measured by UV Spectrometer
Sodium (Na^+): measured Sodium with a Flame photometer.
Potassium: measured potassium with a Flame photometer.

Chloride: measured chloride by titration of $AgNO_3$ with 25 ml water and two drops of $K_2Cr_2O_7$ reagent. The color shift to radish brown.

Calculation: the volume from titration \2.5*52

Calcium: measured calcium by titration of EDTA with 25 ml water, NaOH buffer, and hydroxy naphthol blue. The color shift from purple to blue.

When EDTA is added to water containing calcium and magnesium, it combines with calcium, and magnesium precipitates in the form of magnesium hydroxide.
Calculation: the volume from titration\2.5*40

Magnesium: Magnesium is calculated from the previous titration and after precipitation of the elemental magnesium in the form of magnesium hydroxide.

Hardness: calculated the Hardness by titration of EDTA with 1 ml ammonium hydroxide with half a spoonful of Eriochrome Black T reagent.
The color convert from the color changes from pink to blue

Fluoride: calculated the fluoride using a fluoride electrode, adding 10 ml of water with 2 ml of Fluoride reagent.

Chapter Four
Study Analysis and Result

This chapter illustrates the present study's result from the data analysis. The descriptive statistics in terms of utilizing frequencies, means, standard deviations ,and percentages of the socio-demographic data analysis characteristics and variations among participants were presented.

4.1 Network Drinking Water

Table 5

Network water and the quality of network water

Variable	Categories	Frequencies	Percentage
Are there problems in accessing drinking water from networks?	No	259	68.1 %
	Yes	122	31.9 %
In your opinion, how good is the water quality of the networks (in terms of hygiene and taste)?	High	45	11.8%
	Medium	240	63.0%
	Low	96	25.2%
Do you feel any difference in the networks water in terms of	Smell	13	3.4%
	Taste	313	82.1%
	Color	55	14.5%
Do you think the drinking water from the networks is	Unclean and undrinkable	68	17.9%
	Clean and drinkable	152	39.9%
	Clean and undrinkable	161	42.2%
Do you regularly check the cleanliness of your home's drinking water tanks?	No	147	38.7%
	Yes	234	61.3%
What is the daily household consumption rate of drinking water sourced from the networks?	2 liters	102	26.8%
	4 liters	99	26.0%
	6 liters	71	18.7%
	More than 6 liters	109	28.5%
What is the rate of monthly household consumption of water in general from the networks (all daily uses)	100 Nis	165	43.4%
	50 Nis	125	32.7%
	More than 150	91	23.9%
Have you checked the cleanliness of the water?	No	263	69.1%
	Yes	118	30.9%
Is there a need for purifying tap water?	No	66	17.3%
	Yes	315	82.7%
Do you have a filter to purify tap water?	No	296	77.7%
	Yes	85	22.3%

Table (5) showed that 63.0% of the people think that networks water quality is medium good in terms of hygiene and taste. It shows that 82.1% of the people noticed a change in the taste of the network's water. Also, it shows that 42.2% of the people noticed that drinking water from the networks was clean but undrinkable. It was considered that the water in the grids contains chlorinated substances and has a higher salinity, making water taste undrinkable. On the other hand, only 61.3% of people clean their drinking tanks at home. It shows that 28.6% of household consume more than 6 liters daily. Above all, 69.1% of the people do not check the water for cleanliness. After all, 82.7% of the people think there is a need to purify tap water, and 77.7% do not have filters to purify tap water.

Most people ensure the drinking water is clean, but they do not check samples for hygiene and portability, and they do not use filters to purify from excess salt, so drinking bottled water protects them from the risk of contamination, especially if tanks are not washed and sanitized periodically.

4.2 Review the results of chemical water tests from the laboratories of the Jerusalem Water undertaking

The results of drinking water tests from the Jerusalem Water undertaking, the main supplier of drinking water in Ramallah Governorate (JWU,2002)

Table 6

Drinking water test result from Jerusalem water undertaking

Test	The potential of hydrogen	Electrical conductivity	Nitrate	Chloride	Fluoride	Total Dissolve Salt
2019-2020	7.58	434	5.70	19.49	0.06	214
2021-2022	8.12	408	0.50	20	0.1	203

After reviewing the results of chemical water tests from the laboratories of the Jerusalem Water undertaking, found that all chemical tests According to Palestinian standard institution is acceptable, pH for example, according to the results, has a value range from (7.5-8.5) and this is identical to the standards and Nitrite It should not exceed About 50 mg / liter, as well as all other chemical elements. Therefore, the water from the networks in the city of Ramallah is Ramallah is clean and drinkable. (PSI, 2005).

4.3 Bottled Drinking Water

Table 7

The use of bottled drinking water for household

Variable	Categories	Frequencies	Percentage
Bottled water consumption rate (daily)	4 liters	128	33.5%
	6 liters	52	13.7%
	8 liters	36	9.5%
	More than 8 liters	24	6.2%
	not using.	75	19.6%
	1 liter	66	17.5%
Number of times you buy bottled water	Weekly	174	45.5%
	Annually	3	0.8%
	Monthly	54	14.3%
	I buy only in rare cases	110	28.9%
	Daily	40	10.5%
What is the cost rate of monthly household consumption of bottled drinking water	100 Nis	120	31.4%
	150 Nis	34	8.8%
	200 Nis	21	5.4%
	50 Nis or less	111	29.6%
	200 Nis or more than	21	5.4%
	I don't pay any costs.	74	19.3%
The use of bottled water for drinking is mostly due to	The need for it in terms of health	266	69.9%
	Ease of Use	97	25.3%
	Social Habit	18	4.7%

It is noticed that 33.5% of people consume 4 liters per day, and 45.5% buy bottled water every week as 69.9% of them buy it due to health reasons

To conclude, social habits are not a reason for drinking water, as 31.4% of households pay 100 Nis per month for bottled water consumption.

4.4 The Price of Bottled Water

Table 8

How much do you think the price should be?

Variable	Categories	Frequencies	Percentage
AR-W for each 1.5 liter	1 NIS	129	33.9%
	2 NIS	199	52.2%
	3 NIS	53	13.9%
JE-W for each 1.5 liter	1 NIS	121	31.8%
	2 NIS	186	48.9%
	3 NIS	74	19.3%
NE-W for each 1.5 liter	1 NIS	91	23.9%
	2 NIS	193	50.6%
	3 NIS	97	25.6%
VI-W for each 1.5 liter	1 NIS	155	40.7%
	2 NIS	183	48.0%
	3 NIS	43	11.3%
GH-W for each 1.5 liter	1 NIS	158	41.4%
	2 NIS	188	49.4%
	3 NIS	35	9.1%
AQ-I-W for each 1.5 liter	1 NIS	161	42.4%
	2 NIS	183	48.1%
	3 NIS	37	9.5%
AQ- P-W for each 1.5 liter	1 NIS	155	40.7%
	2 NIS	189	49.6%
	3 NIS	37	9.7%
MA-W for each 1.5 liter	1 NIS	173	45.3%
	2 NIS	178	46.8%
	3 NIS	30	7.9%

From the above table, it is clear that 50% of the study sample priced these mineral water products at NIS 2 for 1.5 litter, as the rest of the ratios spread between the other two options. These results indicate no fundamental differences between these products from the customer's point of view.

The researcher believes that customers rely on this pricing for this package-shaped pricing, how much they see these products in the supermarket, and also on the taste of this water.

Variable	Categories	Frequencies	Percentage
SAFIA for each 1.5 liter	1 shekel	181	47.4%
	2shekel	172	45.3%
	3shekel	28	7.3%
MURJAN for each 1.5 liter	1 shekel	190	49.9%
	2shekel	165	43.3%
	3shekel	26	6.8%

How much do you think the price should be?

Variable	Categories	Frequencies	Percentage
HAR-W for each 1.5 liter	1 shekel	184	48.2%
	2shekel	172	45.2%
	3shekel	25	6.6%
JAN-W for each 1.5 liter	1 shekel	179	47.1%
	2shekel	172	45.0%
	3shekel	30	7.9%

From the above table, it is clear that 50% of the study sample priced these mineral water brands at 1 NIS, as the rest of the ratios spread between the other two options. The researcher believes these brands were priced less because they were seen less on supermarket shelves, and some were somewhat salty.

4.5 Level of satisfaction with bottled water brands

Table 9

Level of satisfaction with bottled water

	Mean	Std. Deviation	Level
Level of satisfaction with the product of bottled water (AR-W)	3.37	0.823	Medium
Level of satisfaction with the product of bottled water (JE-W)	3.50	0.926	High
Level of satisfaction with the product of bottled water (NE-W)	3.60	0.870	High
Level of satisfaction with the product of bottled water (VI-W)	3.36	0.853	Medium
Level of satisfaction with the product of bottled water (SA-W)	3.05	0.806	Medium
Level of satisfaction with the product of bottled water (MU-W)	3.05	0.835	Medium
Level of satisfaction with the product of bottled water (GH-W)	3.21	0.851	Medium
Level of satisfaction with the product of bottled water (AQ-I-W)	3.06	0.856	Medium
Level of satisfaction with the product of bottled water (AQ-P-W)	3.08	0.880	Medium
Level of satisfaction with the product of bottled water (HA-W)	2.99	0.824	Medium
Level of satisfaction on bottled water	3.26	0.628	Medium

Table (9) shows the medium level of satisfaction on bottled water brands, (NE-W) brand is the highest average level of satisfaction with the product of bottled water, then (JE-W). The rest of the brands show moderate satisfaction. (HA-W) is the lowest average for satisfaction with bottled water products.

4.6 Reasons for using bottled water

Table 10

Reasons for using bottled water

	Mean	Std. Deviation	Level
Bottled water is considered better than networks water for drinking in terms of health	4.03	0.942	High
Water bottles are easy to use since you can cool it directly	4.16	0.814	High
Bottled water taste is better than networks water taste	4.06	0.906	High
Bottled water prices are convenient compared to networks water	3.11	1.078	Medium
Bottled water contains elements for human health	3.59	0.929	High
There is inspection on bottled water and networks water quality	3.25	0.929	Medium
The bottled water brand is important for the consumer	3.81	0.942	High
I read the natural components on the bottled water	3.42	1.070	High
All bottled water has the same taste	2.58	1.125	Low
Bottled water quality in terms of (taste and hygiene) is acceptable for all brands name	3.16	1.053	Medium

From Table (10), it was concluded that the most important reason for drinking bottled water is the ease of use. Water bottles are easy to use since they can be cooled directly. The second reason is that bottled water tastes better than network water tastes. Also, bottled water brands have various tastes. It can be said that to increase satisfaction with bottled water; the taste should be improved.

The sample study shows an interest in drinking water for health reasons, so companies have to focus on providing the minerals needed for the human body in proportion to create a competitive advantage for the brand name.

4.7 Hypothesis

Q1: Is there a relationship between using improved drinking water and socioeconomic factors (gender, Age, education, income, nature of work, and household size).

Null hypothesis 1: There is no statistically significant relationship at the level ($\alpha \leq$

0.05) between using improved drinking water and socioeconomic factors (gender, Age, education, nature of work, income, household size).

The chi-square test was applied to the sample response **to test this hypothesis**. The results are shown in table (8).

Through results from table (11) in appendix (e), it is noticed that the p-value is greater than (0.05); thus, it is not possible to reject the null hypothesis, which means there is no statistically significant Relationship at the level of ($\alpha \leq 0.05$) between using improved drinking water and socioeconomic factors (Age, education, nature of work, household size). On the other hand, there is a statistically significant relationship at the level of ($\alpha \leq 0.05$) between using improved drinking water and socioeconomic factors (gender, income) since the p-value is less than (0.05).

This result was consistent with the study (Gebremichael et al., 2021), which showed that the families who used improved water were middle and high earners but differed because they found a relationship between drinking water and age, education, and the number of families members. As a result, this study agreed with our study.

Comparing with a recent study (Gomez et al., 2019), the results of which also showed a relationship between gender and water drinking found that females used it more, as showed a relationship between income and the use of such water.

4.8 Water Quality Analysis

Q2: are there statistical differences between labeled and testing for these parameters (potential of hydrogen, Electrical conductivity, Nitrate, sodium, potassium, calcium, fluoride, magnesium)?

The paired sample T. Test was applied **to test these parameters**. The results are shown in tables (12-21).

Null hypothesis 2: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the potential of hydrogen in bottled water.

According to the Palestinian Standard institution (PSI), the permissible limit of pH is

6.5-8.5 Although pH affects palatability and usually has no direct health impacts, it is an important operational water quality parameter (Ahmed et al., 2014).

From the table, the pH value lies in this range which is with the preferable limit, and if the p-value is larger than (0.05), then the null hypothesis is accepted, which means there is no statistically significant difference between labeled and tested for the potential of hydrogen in bottled water.

This result agreed with (Rahman et al., 2017) the bottled water pH's value ranged between 6.5 and 8.5, but this study (Rahman et al., 2017) had a different perspective as it showed there is a significant difference at ($P \leq 0.05$) than the lower or upper limits of EPA-MCL, even though the values remain within the range.

Null hypothesis 3: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the Electrical conductivity in bottled water.

It is noticed that the p-value is less than (0.05), so the null hypothesis is rejected, which means there is a statistically significant difference between the labeled and tested for the Electrical conductivity in bottled water. The tested sample is larger than the labeled value.

This study agreed with (Rahman et al., 2017) that conclude the distribution of EC values in the different bottled waters marketed in Bangladesh ranged from 1.99 to 443 µS/cm, and 50% of the sample had Ec > 100 µS/cm but contradicted with (Rahman et al., 2017) that concluded the average EC of the bottled waters and the regulatory value is not significantly different.

WHO has not recommended any guideline value for EC. However, according to the United States Public Health Service, EC in drinking water should not exceed 300 µS/cm. The EC of water has a direct relationship with TDS. With increased dissolved salts in water (salts of sodium, calcium, magnesium, bicarbonate, chloride, and sulfate), EC also increases (Ahmed et al., 2014). In this study, the EC value for tasted samples is 287.29.

Null hypothesis 4: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the Nitrate in bottled water.

Results from the above tables show that the p-value is less than (0.05), then reject the null hypothesis. It can be concluded that there is a statistically significant difference between labeled and testing for Nitrate in bottled water. The tested sample is larger than the labeled value.

According to the Palestinian Standard institution (PSI), the maximum limit of NO_3 -is 50 mg/l (PS69,2005), and the cumulative total value of the ratios of concentration/GV is suggested to be ≤ 1 mg L–1 (WHO, 2011c).

This study agreed with (Rahman et al., 2017) that there is a statistically significant difference since the nitrate content in bottled waters is below the regulatory limits.

This result agreed with (Brika et al., 2022), in which the findings showed significant differences between the concentration of chemical elements and label insertion on the bottles.

Null hypothesis 5: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested sodium in bottled water.

Sodium is a very reactive metal; therefore, it does not occur in its free form. High sodium intake can have adverse effects on humans. The average taste threshold for sodium is about 200 mg/l. Based on this, WHO has prescribed 200 mg/l as a limit for sodium in drinking water (Singh, 2016).

It is noticed that the p-value is larger than (0.05), so the null hypothesis is accepted, which means there is no statistically significant difference between labeled and testing for sodium in bottled water.

The sodium found in drinking water is responsible only for a small percentage of a person’s overall sodium intake, but it is beneficial to retain water in the body (Brika et al., 2022).

Null hypothesis 6: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for potassium in bottled water.

Potassium is an essential element in humans and is seldom if ever, found in drinking water at certain levels. It could be a concern for humans' health. Adverse health effects due to potassium consumption from drinking water are unlikely to occur in healthy individuals (Singh, 2016).

Potassium is found in the body as a major intracellular cation, and its low concentration may lead to glucose metabolism impairment (Brika et al., 2022).

It is noticed that the p-value is larger than (0.05), so the null hypothesis is accepted, which means there is no statistically significant difference between labeled and tested potassium in bottled water.

Null hypothesis 7: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the chloride in bottled water.

Some common chloride compounds found in natural water are sodium chloride ($NaCl$), potassium chloride (Kill), calcium chloride ($CaCl_2$), and magnesium chloride ($MgCl_2$). Taste thresholds for the chloride anion depend on the associated cations, and the concentration ranges from 200 to 300 mg/l, according to who prescribed 250 mg/l as the acceptable limit (Singh,2016). The chloride concentration in the samples was an Average of 47.70-50.66 mg/l.

It is noticed that the p-value is larger than (0.05), so the null hypothesis is accepted, which means there is no statistically significant difference between labeled and testing for the chloride in bottled water. This result agreed with (Rahman et al. 2017), in which the findings of the chloride content in bottled water is in the range of 0.32 to 61 mg L.

Null hypothesis 8: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for the total hardness in bottled water.

Hardness is one of the parameters used to measure drinking water quality. It is often evaluated without differentiating between the concentrations of "Ca^{+2} and Mg^{+2}" (Khalil,2019). It is noticed that the p-value is less than (0.05). Thus reject the null hypothesis, which means there is a statistically significant difference between the labeled and tested for the total hardness in bottled water. The total hardness for the tested sample is less than the labeled value, according to who standard. The maximum permissible limit of TH for drinking usage is 500 mg/l, and the most desired limit is 100 mg/l (Ibrahim,2019).

This result agreed with (Brika et al., 2022), which found a significant difference between measured and labeled values, being the labeled values being the greatest, and showed that the Measured total hardness (TH) in all samples was below 60 mg/L which is within the permissible (TH) levels. However, it was also observed that around 65% of the samples violated the Libyan standards in which they wrote the total hardness on their labels.

Null hypothesis 9: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for calcium in bottled water.

According to the PSI, the minimum value is 30 mg/l, and the acceptable limit is 100 mg/l as PSI standard **(**Ibrahim,2019**).** It is noticed that the p-value is less than (0.05), so the null hypothesis is rejected, which means there is a statistically significant difference between labeled and tested calcium in bottled water. The tested sample is larger than the labeled value.

The Ca^{+2} concentration in local brands of bottled water (11.4 ± 9.8) is lower in comparison with imported brands (51.7 ± 18.7) and natural water (47.4 ± 58.5) and is statistically significant (Vani et al., 2016).

Null hypothesis 10: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for fluoride in bottled water.

According to the PSI, the maximum permissible limit of F^- is 1 mg/l. In this study, the value of fluoride is less than 1.5mg/l. It is noticed that the p-value is larger than (0.05), so it accepted the null hypothesis, which means there are no statistically significant differences between labeled and testing for the fluoride in bottled water.

Johnson & DeBiase (2003) found that only 12.3% of the tested brands contained an optimal level of fluoride (0.6 to 1.2 parts per million); 95% of bottled water analyses did not list fluoride. Only three brands contained a fluoride concentration consistent with that listed on the label or as identified by the manufacturer.
Vani et al. (2016) found that the F content in a local brand (0.9 ± 0.1) is in the optimum range and significantly higher than the imported brands (0.4 ± 0.6) constant change by demineralization and remineralization process.

Null hypothesis 11: there is no statistical difference at the level ($\alpha \leq 0.05$) between labeled and tested for magnesium in bottled water.

Magnesium also is an additional parameter that has been analyzed in this study. It is important and acceptable according to the PSI value of 100 mg/l **(**Ibrahim,2019). It is noticed that the mean for the tested sample is 11.13 mg/l, and the p-value is less than (0.05), so rejecting the null hypothesis, which means there is a statistically significant difference between labeled and testing for the magnesium in bottled water. The tested sample is less than the labeled value.

This result agreed with (Vani et al., 2016) that the local bottled water has suboptimal Mg^{+2}. However, imported bottled water and natural water have sufficient Mg^{+2}.

Chapter Five
Conclusion and Recommendations

5.1 Conclusion

The relationship between the socioeconomic factor and drinking water is a descriptive study research design. This study included the design of a randomly distributed questionnaire to the residents of Ramallah city. The sample consisted of 381 questionnaires, and the response rate was 100%. It also included a chemical analysis of the bottled water and then analyzed it statistically.

This study helps in improving the water sector in Palestine and adding new and important information in the water sector. To reach the results, the questions of the hypotheses that were assumed at the beginning of the research were answered.

- The study findings showed a statistically significant relationship between (gender and income) and drinking water. Therefore, the results showed that females consume bottled water more than males. The percentage of females who used bottled water was 54.1% compared to men, and low-income people consumed bottled water less. The percentage of low-income people who use bottled water reached 45.9% compared too high and medium incomes.
- The study findings showed that there is statistically No significant between (age, education, and household).
- The study findings showed a statistically significant relationship between chemical tests (Electrical conductivity, Nitrate, total hardness, calcium, and magnesium). The result showed the P- value significantly less than (0.05). Thereupon, the high rate of electrical conductivity affects the taste of water and its validity, and high nitrates can lead to cases of suffocation, especially in infants who use a bottle and the high level of nitrates affects people who suffer from diseases of the stomach and colon.
- The study findings showed that there is statistically No significant between (the potential of hydrogen, sodium, potassium, Chloride, and fluoride). The result showed the P- value significantly more than (0.05).

5.2 Recommendations

Based on the results and by referring to the questionnaire and the chemical and statistical analysis, the researcher recommends the following:

1. Bottled water companies must conduct a periodic inspection of bottled water, document the results, and keep them on record.

2. The competent authorities must monitor the performance of the bottled water companies and impose a law stipulating the conduct of periodic water checks.

3. The competent authorities must conduct periodic inspections of these companies, take water samples randomly and analyze them, and ensure that the companies adhere to quality standards.

4. According to the findings, bottled water companies must improve performance because the level of people's satisfaction with bottled water is low.

5. Bottled water companies must change the label at each laboratory test of bottled water.

6. The competent authorities should make awareness leaflets for citizens about the importance of conducting laboratory tests for the water from the networks that come from the tap, particularly examining the main tank and ensuring that it is cleaned periodically.

7. Every citizen must take a sample of tap water and have it tested in a laboratory, and he must ensure that the tank is always clean.

8. The competent authorities shall conduct a periodic examination of the network water, monitor it, analyze it in the laboratory, and document the results.

9. The competent authorities shall improve the quality of the water networks and drinking water and conduct periodic checks of the main water networks.

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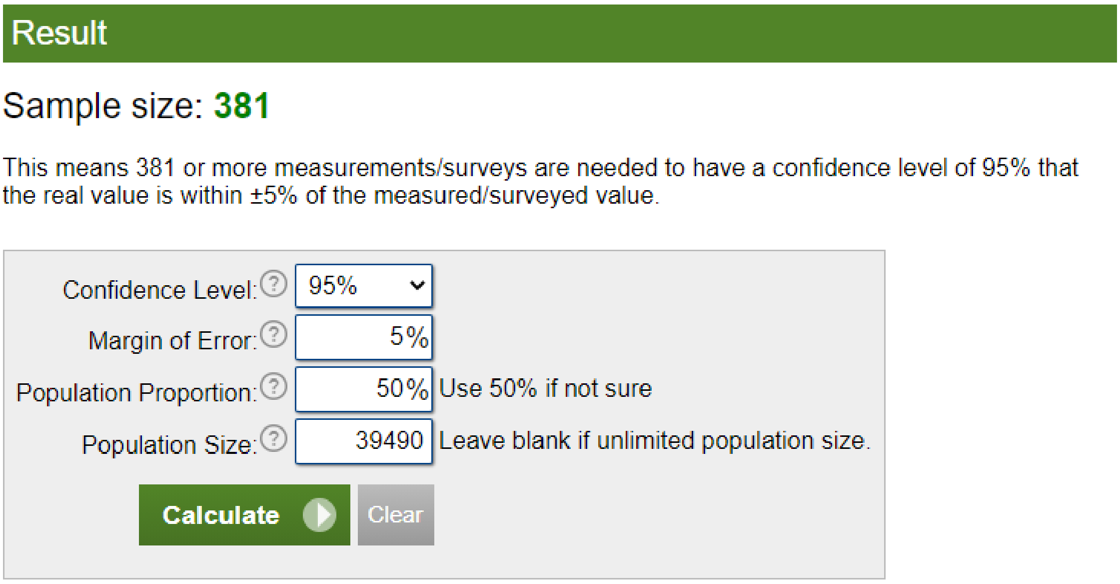
Appendices

Appedix A

Sample Size Calculator



Appedix B

Questionnaire

عزيزي المواطن

تحية طيبة وبعد؛

تقوم الباحثة سناء عساف بدراسة ميدانية بعنوان: **"التقييم الاجتماعي والاقتصادي لمصادر مياه الشرب في مدينة رام الله"**. وذلك استكمالاً لمتطلبات نيل درجة الماجستير من كلية الدراسات العليا، تخصص العلوم البيئية من جامعة النجاح الوطنية.

لذا أرجو من حضرتكم التكرم بالإجابة عن جميع الفقرات المبينة ضمن مجالات الاستبانة بصدق وموضوعية وأمانة، علماً بأن المعلومات التي ستحصل عليها الباحثة ستكون في سرية تامة، ولن تستخدم إلا لغرض البحث العلمي، لذا أرجو التكرم بقراءة كل فقرة والإجابة عليها من وجهة نظركم.

تفضلوا بقبول فائق الاحترام والتقدير

استبانة حول المياه المعدنية المعبأة ومياه الشبكات

القسم الأول: معلومات شخصية

الجنس:

- ذكر
- أنثى

العمر:

- 25-19
- 35-26
- أكبر من 35

المؤهل العلمي:

- أساسي
- إعدادي
- ثانوي
- جامعي

طبيعة العمل:

- طالب
- قطاع حكومي
- قطاع خاص
- مؤسسات أهلية

مستوى الدخل:

- منخفض
- متوسط
- مرتفع

عدد أفراد الأسرة:

- 2-4
- 4-6
- أكثر من 6

تعتمد الأسرة في الشرب على مياه مصدرها:

- الشبكات
- مياه معدنية معبأة
- فلتر منزلي

القسم الثاني: **خاص في مياه الشبكات وجودة مياه الشبكة الرئيسة**

هل يوجد مشاكل في وصول مياه الشرب من الشبكات:

- نعم
- لا

ما مدى جودة مياه الشبكات (من حيث النظافة والطعم):

- عالية
- متوسطة
- قليلة
- قليلة جداً

هل تشعر في اختلاف في مياه الشبكات من حيث:

- طعم الماء
- اللون
- الرائحة

هل تعتقد أن مياه الشرب التي مصدرها الشبكات:

- نظيفة وصالحة للشرب
- غير نظيفة وغير صالحة للشرب
- نظيفة لكن غير صالحة للشرب

هل تقوم بالتأكد من نظافة خزانات الشرب في المنزل:

- نعم
- لا
- أحياناً

ما هو معدل استهلاك الأسرة اليومي من المياه بشكل عام التي مصدرها الشبكات (للاستعمالات اليومية جميعها):

- 200 لتر
- 400 لتر
- 600 لتر
- أكثر من ذلك

ما هو معدل استهلاك الأسرة اليومي من مياه الشرب التي مصدرها الشبكات:

- 2 لتر
- 4 لترات

- 6 لترات
- أكثر من ذلك

ما هو معدل تكلفة استهلاك الأسرة الشهري من المياه بشكل عام التي مصدرها الشبكات (للاستعمالات اليومية جميعها):

- 50 شيقلاً
- 100 شيقل
- 150 شيقلاً
- أكثر من ذلك 150 شيقلاً

هل قمت بفحص المياه للتأكد من نظافتها:

- نعم
- لا

هل هناك حاجة وضرورة لتنقية مياه الحنفية:

- نعم
- لا

هل يوجد لديك فلتر لتنقية مياه الحنفية:

- نعم
- لا

4. القسم الثالث: خاص بالمياه المعبأة (استخدام المياه المعبأة)

3. 1. معدل استهلاك المياه المعبأة **(يومي):**

1. 2 لتر 2. 4 لترات 3. 6 لترات 4. 8 لترات 5. أكثر من 8 لترات 6. لا استخدم المياه المعبأة

3 . 2. عدد مرات شرائك للمياه المعبأة:

1. يومياً 2. أسبوعياً 3. شهرياً 4. سنويا 5. لا أشتري إلا في حالات نادرة

3 . 3. ما هو معدل تكلفة استهلاك الأسرة الشهري من مياه الشرب المعبأة:

1. 50 شيقلاً أو أقل 2. 100 شيقل 3. 150 شيقلاً 4. 200 شيكل 5. أكثر من 200 شيكل 6. لا أدفع أي تكاليف

3. 4. استخدام المياه المعبأة للشرب في الغالب هو بسبب:

1. الحاجة لها من ناحية صحية 2. عادة اجتماعية 3. سهولة الاستخدام

3 . 5. كم السعر الذي تعتقد أنه يستحق لكل منتج؟

1. اسم المنتج: أروى (ARWA) , السعر ( ) شيقل.
2. اسم المنتج: جاريكو (JERICHO) ، السعر( ) شيقل.
3. اسم المنتج: نستله (NESTLE), السعر( ) شيقل.
4. اسم المنتج: فيفيين (VIVIANE), السعر( ) شيقل.
5. اسم المنتج: صافية (SAFIA), السعر( ) شيقل.
6. اسم المنتج: مرجان (MURJAN), السعر( ) شيقل.
7. اسم المنتج: غدير (GHADEER), السعر( ) شيقل.
8. اسم المنتج: اكوا آيس (AQUA ICE) , السعر( ) شيقل.
9. اسم المنتج: اكوا بيور (AQUA PURE),السعر( ) شيقل.

10. اسم المنتج: مافي (mavi),   السعر (   ) شيقل.

11. اسم المنتج: هارمون ,   السعر (   ) شيقل.

12. اسم المنتج: جنزور   السعر (   ) شيقل.

3. 6. الرجاء الإجابة على الأسئلة التالية:

السؤال	أوافق بشدة	أوافق	محايد	معارض	معارض بشدة
المياه المعبأة تحتوي على عناصر مفيدة لصحة الإنسان مقارنة بمياه الشبكات					
هناك رقابة على جودة المياه المعبأة ومياه الشبكات					
العلامة التجارية للمياه المعبأة مهمة للمستهلك					
أقوم بقراءة المكونات الطبيعية على علبة المياه المعبأة					
جميع المياه المعبأة لها نفس الطعم					
جودة المياه المعبأة (من حيث النظافة والطعم) مقبولة لجميع الشركات					

الرجاء إعطاء علامة لمستوى الرضا عن المنتج (مياه المعبأة)

العلامة (1 – 10)	اسم المنتج
	أروى(ARWA)
	جاريكو (JERICHO)
	نستله (NESTLE)
	فيفيين (VIVIANE)
	صافية (SAFIA)
	مرجان (MURJAN)
	غدير (GHADEER)
	اكوا آيس (AQUA ICE)
	اكوا بيور (AQUA PURE)
	هارمون
	جنزور
	مافي (mavi)

القسم الرابع: مقارنة بين النوعين

الرجاء الاجابة عن الأسئلة التالية:

معارض بشدة	معارض	محايد	أوافق	أوافق بشدة	السؤال
					تعتبر المياه المعبأة أفضل من مياه الشبكات من الناحية الصحية للشرب
					قناني المياه المعبأة تسهل من عملية تداولها وإمكانية تبريدها بشكل مباشر
					طعم المياه المعبأة أفضل من طعم مياه الشبكات
					أسعار المياه المعبأة مناسبة مقارنة مع أسعار مياه الشبكات

Appendix C

Expert's Name

Expert's name	Specialization	Place of job
Dr. Nael Mousa	Department of economy	AN-Najah national university
Dr. Amer Elhamouz	Chemical engineering department	AN-Najah national university
Dr.MOHAMMED OTHMAN	Industrial Engineering Department	AN-Najah national university
Dr.subhi samhan	Director for Research and laboratory Unit	Palestinian water Authority

Appedix D

Chemical laboratory tests for bottled water

#	company	Test																			
		PH		EC		NO3		NA		K		Cloride		Total Hardness		CA		Fluoride		MG	
		Label	Test	Label	Test	Label	Test	Label	Test	Label	Test	Label	Test	Label	Test	Label	Test	Label	Test	LAB	TEST
1	2-G-A	6.6	6.91	163	187.5	1.2	2.5	3	4.5	0.1<	0.4	72	84	18	12.1	20	32	0.1<	0	18	12.15
2	1-B-A	6.6	7.28	163	179	1.2	2.5	3	4.5	0.1<	0.4	72	84	18	12.1	20	32	0.1<	0.02	18	12.15
3	3-UN-A	6.6	7.15	163	186	1.2	3.9	3	5.1	0.1<	0.5	72	83	18	9.7	20	32	0.1<	0	18	9.72
4	2-G-J	8	7.6	367	436.4	30	35.4	23	22	2.9	2.4	49	52	25	14.5	73	88	0.2	0.2	25	14.58
5	1-BR-J	8.05	7.86	390	439.6	30	35.7	23	22	2.9	2.2	50	56	28	13.5	75	86	0.2	0.2	25	15.5
6	3-B-J	8	7.46	367	408	30	34.7	23	22	2.9	2.4	49	50	25	14.5	73	84.4	0.2	0.17	25	16.5
7	1-Q-V	8	7.81	350	393.6	16	30.8	26	22.2	1.1	0.6	52	44	24.3	25	55	72	0.4	0.36	25	24.3
8	2-AL-V	8	7.8	350	394.8	16	30.8	26	22.1	1.1	0.6	52	42	24.3	25	55	70	0.4	0.36	25	22.356
9	1-UN-GH	7.7	7.33	110.6	88.9	_	2.006	0.1	0	9	12	35	52	7	8.5	20	24	_	0.2	7	9
10	2-UN-GH	7.7	7.3	110.6	88.9	_	2.007	0.1	0	9	12	35	52	7	8.5	20	24	_	0.2	7	9
11	2-G-N	7.2	7.9	180	160.6	0.27	0.24	0.9	0.1	28.5	22	37.1	41.6	9.9	9.7	21.01	20	0	0.2	7	9.72
12	1-B-N	7.2	7.3	180	172.8	0.27	0.24	0.9	0.1	28.5	22	37.1	41	9.9	9.7	21.01	22	0	0.2	7	9.72
13	1-UN-AI	7.15	6.47	280	136	4.5	16.2	13	7	4.9	0.3	25	13.2	12	2.9	16	24	0	0	17	0.9
14	2-UN-AI	7.15	6.74	280	138	4.5	16.2	13	7.01	4.9	0.3	25	14.9	12	2.9	16	24	0	0	17	0.9
15	3-UN-AIB	7.3	7.3	240	770	22	56.2	15	40.3	0.7	7.5	40	62.4	17	9.6	32	80	0.13<	0.21	17	9.7
16	1-SO-AQB	7.3	6.98	220	367	1	1.4	30.3	3	0.1<	0.8	72	72.8	18	4.8	20	24	0.1<	0.1	18	4.86
17	2-SO-AQB	7.3	6.98	220	369	1	1.5	3	30.6	0.1<	0.8	72	72.8	18	4.8	20	24	0.1<	0.1	18	4.86
18	1-G-SAF	7.49	7.72	220	300.8	0	55.39	13.1	26.3	0.46	0.9	0	62.4	11.6	14.5	38.6	120	0.5	0.39	11.6	14.5
19	1-J-Mav	7.75	7.11	142	177.1	Non	2.5	2.6	4.6	0.1<	0.2	6.9	12.4	11.8	5	33.5	32	0.2	0	11.8	6.86
20	1-j-Har	7.3	7.15	non	266	22	34.9	15	13.7	0.7	16	40	31.2	17	19.4	32	40	0.13	0	17	14.5
21	1-J-jonz	6.91	7.52	150	373	0	0.9	25	21.7	1.2	1.2	61	52	NON	4.86	non	32	0	0	18	12

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Tables

Table 11

Relationship between using improved drinking water and gender

Gender	Networks	Home Filter	Bottled mineral water	P-value
Female	30.6%	15.3%	54.1%	0.000
Male	37.8%	9.5%	52.7%	
Age				
19-25	29.4%	11.8%	58.8%	
26-35	30.5%	12.6%	56.5%	0.738
greater than 35	34.7%	16.9%	48.4%	
Education				
tenth grade	40.0%	10.0%	50.0%	
Secondary	31.7%	17.1%	51.2%	0.989
University	31.5%	13.6%	54.5%	
Student	27.3%	18.2%	54.5%	
government sector	28.4%	12.3%	59.3%	
private sector	28.8%	12.8%	57.6%	0.928
Unemployed	36.1%	14.3%	49.6%	
NGOs	30.8%	17.3%	51.9%	
Income				
Low	43.2%	8.1%	45.9%	
Medium	30.7%	14.3%	54.9%	0.045
High	30.8%	15.4%	53.8%	
household size				
2-4	29.1%	12.7%	57.7%	
4-6	35.8%	12.6%	51.7%	0.350
More than 6	31.3%	25.0%	43.8%	

Table 12

Paired sample T. Test between labeled and tested for the potential of hydrogen in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
pH	Label	7.395	0.478	0.423	Non
	Tested sample	7.318	0.385		

Table 13

Paired sample T. Test between labeled and tested for the Electrical conductivity in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
EC	Label	221.248	102.409	0.049	Significant
	Tested sample	287.286	163.405		

Table 14

Paired sample T. Test between labeled and tested for the Nitrate in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
NO_3 -	Label	11.321	12.0452	0.004	Significant
	Tested sample	18.949	17.921		

Table 15

Paired sample T. Test between labeled and tested for the sodium in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
Na^+	Label	12.476	10.529	0.743	Non
	Tested sample	13.277	11.910		

Table 16

Paired sample T. Test between labeled and tested for the potassium in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
K^+	Label	4.729	8.353	0.773	Non
	Tested sample	5.024	7.279		

Table 17

Paired sample T. Test between labeled and tested for chloride in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
Cl^-	Label	47.705	18.547	0.211	Non
	Tested sample	50.665	22.0556		

Table 18

Paired sample T. Test between labeled and tested for the Total hardness(TH) in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
TH	Label	16.590	6.342	0.001	Significant
	Tested sample	11.335	6.363		

Table 19

Paired sample T. Test between labeled and tested for the calcium in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
Ca^{2+}	Label	34.056	20.509	0.005	Significant
	Tested sample	47.720	30.469		

Table 20

Paired sample T. Test between labeled and tested for the fluoride in bottled water

Parameter		Mean	Std. Deviation	P-value	Significant
F^-	Label	0.147	0.147	0.512	Non
	Tested sample	0.132	0.136		

Table 21

paired sample T. Test between labeled and tested for the magnesium in bottled water

Parameter	Mean		Std. Deviation	P-value	Significant
Mg^{2+}	Label	16.781	6.249	0.000	Significant
	Tested sample	11.132	5.950		

جامعة النجاح الوطنية

كلية الدراسات العليا

التقييم الاجتماعي والاقتصادي لمصادر مياه الشرب في مدينة رام الله

إعداد

سناء ياسر محمد عساف

إشراف

د. عبد الفتاح الملاح

د. عبد الله العمري

قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير في هندسة العلوم والبيئية، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس– فلسطين.

2023

التقييم الاجتماعي والاقتصادي لمصادر مياه الشرب في مدينة رام الله

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الملخص

يعد الماء من نعم الحياة، وعوامل استمراريتها فلا حياة دونه ولا بقاءَ من غيره، فهو أساس الحياة وعصبها، ومن الضروريات لبقاء الإنسان والكائنات الحية الأخرى، فهو يشكل ما نسبته 60% من جسم الإنسان، ومن غيره لا يمكن اكتمال العملية الحيوية. ولا تتوقف أهمية الماء عند هذا الحد فقط، فقد تجاوزت كونها مكوناً أساسياً في الصناعات المختلفة، فالماء من الموارد التي لا غنى عنها في أية صناعة مهما كانت، وهو أساسي في عملية الزراعة أيضاً.

فجاءت هذه الدراسة لتضيف بيانات جديدة ومهمة ومعلومات مفيدة، ولتكون مرجعاً إضافياً للجهات المتخصصة والباحثين في قطاع المياه. كونها تبحث في طبيعة العلاقة بين استخدام مياه الشرب والعوامل الاجتماعية والاقتصادية في مدينة رام الله.

المنهجية: اتبعت الدراسة المنهج الوصفي والتحليلي من خلال جمع البيانات عن طريق تصميم استبيان، وجمع عينات من المياه المعبأة والتحليل المخبري لهذه العينات. وأجريت هذه الدراسة في فترة آب 2021 إلى كانون الاول 2022 في محافظة رام الله، وتم جمع البيانات عبر 381 استبيان بنسبة استجابة 100%، وتم إجراء تحليل كيميائي لـ24 عينة مياه معبأة مختلفة من مصادر تجارية متنوعة في مدينة رام الله.

النتائج والاستنتاجات: أظهرت نتائج الدراسة وجود فروق ذات دلالة إحصائية بين(الجنس، مصدر الدخل) ومياه الشرب. كما أظهرت عدم وجود فروق ذات دلالة إحصائية بين(العمر، التعليم، حجم الأسرة). أما

بالنسبة للتحاليل الكيميائية فقد أظهرت النتائج وجود فروق ذات دلالة إحصائية بين (التوصيل الكهربائي، النترات، عسر الماء، الكالسيوم، المغنيسيوم) بين الملصق الموجود على العلبة ونتائج التحليل الكيميائي، وأظهرت أيضاً عدم وجود فروق ذات دلالة إحصائية بين (مقياس الرقم الهيدروجيني، والصوديوم، بوتاسيوم، الكلوريد ، فلوريد).

الكلمات المفتاحية: المياه المعبأة، العوامل الاجتماعية والاقتصادية، جودة المياه، مياه الشرب، محافظة رام الله، الضفة الغربية.