Journal of Studies in Civil Engineering

EngiScience Publisher

Research Article

Evaluating Consumer Preferences and Perceptions of Packaged Drinking Water

Ahsan Abdalkhaliq Taha [1,*], Hindreen Abdullah Taher [2], Mohsen Isari [3], Tayeb Sadeghifar [4]

[1] Department of Statistics and Informatics, College of Administration and Economics, University of Sulaimani, Sulaymaniyah, 46001, Iraq

[2] Department of Information Technology, College of Commerce, University of Sulaimani, Sulaymaniyah, 46001, Iraq

[3] Department of Civil Engineering, Faculty of Engineering, University of Kurdistan, Sanandaj, 6617715175, Iran

[4] Department Physical Oceanography, Faculty of Marine Sciences, Tarbiat Modares University, Tehran, 14115, Iran

*Corresponding Author: Ahsan Abdalkhaliq Taha, E-mail: ahsan.taha@univsul.edu.iq

Article Info

Article History

Received Nov 20, 2024

Revised Dec 10, 2024

Accepted Dec 14, 2024

Keywords

Packaged Water Consumption

Consumer Preferences

Environmental Awareness

Sustainable Consumption

Abstract

The global consumption of bottled water is increasing, particularly in developing countries. This study aims to evaluate the quality of packaged water and examine the level of awareness regarding its consumption among residents of Sulaimani City in the Kurdistan region of Iraq, using a structured questionnaire that covers demographics, water quality perceptions, reasons for preference, and satisfaction or grievances. The results reveal that demographic factors such as age, gender, education, and family size significantly affect perceptions. Younger and older individuals view packaged water as more convenient, while middle-aged respondents are less favorable. Higher education correlates with greater environmental awareness, and larger families find packaged water less practical. Shops, social media, and word of mouth are the primary information sources, with males generally expressing more favorable views. The study emphasizes the need to address demographic-specific concerns and raise awareness about environmental impacts. Policymakers and businesses should develop tailored strategies to enhance consumer satisfaction and promote sustainable consumption.

1. Introduction

The global demand for packaged drinking water is rapidly increasing, driven largely by consumers' concerns about water safety, convenience, and associated health benefits. As urban populations grow and awareness of the risks posed by untreated or unreliable water sources increases, more people turn to packaged water as a safer, more convenient alternative to tap water [1]. It addresses health concerns and fits well into modern consumers' fast-paced, on-the-go lifestyles. However, the preference for packaged water stems from a range of factors, including health, safety, branding, packaging, pricing, and sustainability, all of which influence buying choices. Health and safety are the key priorities for consumers when selecting

packaged water, especially in regions where water contamination or limited access to clean water is a concern. Packaged water is generally considered more hygienic and of better quality, thanks to the stringent filtration and purification processes that many bottled water brands follow [2]. Specialized products like mineral, alkaline, and electrolyte-fortified water have become popular due to their promise of purity and added health benefits. As a result, packaged water is marketed not just as a necessity but as a premium health product aimed at health-conscious consumers [1,2].

Branding and packaging are crucial in shaping how consumers perceive packaged water. Many customers exhibit strong brand loyalty, associating well-known brands with quality, reliability, and trust. Marketing strategies often emphasize the purity and health benefits of the product, adding perceived value beyond just the water itself. Packaging design is also a powerful marketing tool, as it communicates important messages about the brand's environmental responsibility, water quality, and visual appeal. Environmentally aware consumers increasingly prefer brands that offer sustainable packaging, such as recyclable or biodegradable materials, aligning with the broader movement toward sustainability. These choices reflect a growing consumer focus on both the quality of the water and the environmental impact of packaging waste [3].

Price is another major factor influencing consumer preferences. The bottled water market caters to a wide range of consumers, offering products at different price points. In lower-income markets, affordability often outweighs concerns about brand or quality, with consumers opting for cheaper or generic options. In contrast, wealthier consumers in developed markets are more willing to pay extra for premium water, especially sourced from exclusive places like mountain springs. These premium brands market themselves as safer and purer and offer unique health benefits, targeting consumers who view water consumption as part of a broader health and wellness lifestyle. Despite the growing market, research suggests that many consumers remain unaware of the specific quality standards or composition of the water they buy. While most consider bottled water safer than tap water, few pay attention to details like mineral content or filtration methods listed on labels. This knowledge gap presents an opportunity for bottled water companies to better educate consumers and provide more transparent information about their products. By doing so, brands can stand out in a crowded market and foster greater trust with their customers [4].

Sustainability is becoming a critical consideration for both consumers and companies in the bottled water industry. The environmental impact of plastic packaging, in particular, has led to widespread concern,

with consumers demanding more eco-friendly options. Many companies have responded by exploring sustainable packaging solutions, such as biodegradable materials or reducing plastic use. Additionally, some brands have invested in recycling initiatives and promoting the recyclability of their packaging as part of their corporate responsibility efforts. Consumers in environmentally-conscious markets increasingly prefer brands that demonstrate a clear commitment to sustainability. This shift reflects broader societal changes, where ethical and environmental considerations play a more significant role in purchasing decisions [5].

A variety of interconnected factors, including health, branding, pricing, and sustainability, influence the growing consumer demand for packaged drinking water. As the industry evolves, companies need to stay responsive to these changing preferences by adapting their products and practices. The future of the packaged water market will likely depend on the ability of brands to innovate, not only in product quality and health benefits but also in sustainability and transparency. With increasing consumer awareness of environmental issues, brands that offer high-quality products while reducing their ecological footprint will have a competitive advantage in an ever-changing market[5,6].

This study aims to assess the quality and awareness associated with the consumption of packaged water among residents of Sulaimani City in the Kurdistan region of Iraq. Through a comprehensive questionnaire, the research captures the quality of the packaged water to address health concerns, explores the reasons behind residents' preference for packaged water over tap water, and assesses their satisfaction or grievances related to packaged water consumption. This approach aims to provide a holistic understanding of the factors influencing the preferences and concerns related to packaged water among the city's residents.

2. Methodology

2.1. Study Site

Located in northeastern Iraq, Sulaimani Province is one of the largest governorates under the jurisdiction of the Kurdistan Regional Government. The province sits at an elevation of approximately 830 meters above sea level, with geographic coordinates of 35°33'40"N and 45°26'14"E. It spans a total area of 17,023 square kilometers. A map illustrating the location of Sulaimani Province, including its various districts, can be found in Figure 1 of the referenced material. Located in northeastern Iraq, Sulaimani Province is one of the largest governorates under the jurisdiction of the Kurdistan Regional Government. The province sits at an elevation of approximately 830 meters above sea level, with geographic coordinates of 35°33'40"N and 45°26'14"E. It spans a total area of 17,023 square kilometers [6]. Figure 1 of the referenced

material contains a map that illustrates the location of Sulaimani Province, including its various districts.

Sulaimani experiences distinct seasonal variations. The summer months, from June to August, are characterized by dry and hot weather, with an average temperature hovering around 31.5°C. In contrast, the winter season, which extends from December to February, brings much colder conditions, with average temperatures around 7.6°C. Increased precipitation and windy conditions also characterize this period. Annually, the region receives rainfall ranging from 400 to 600 mm, starting with brief storms in October, intensifying in November, and continuing until May.

For this study, only participants residing in the city center of Sulaimani within the Kurdistan Region of Iraq were selected. This criterion was set to ensure a focused and relevant sample for the research objectives. Individuals meeting these residency requirements were deemed eligible to participate in the survey [7].

Figure 1. Study site, Sulaimani at Kurdistan Region of Iraq [6]

2.2. Participation and Sample Size

Estimates suggest that by 2020, Sulaimani City's population will reach approximately 1.893 million, constituting a significant portion of the Iraqi population. A simple random sampling technique was utilized to select participants due to the specific observational data and characteristics of the city [7]. The formula used to calculate the necessary sample size was as follows [1,8].

$$n = \frac{N}{1+Nd^2} \quad (1)$$

where n= required sample size, N= population size, and d= margin of error (considered d= 0.05). Based on this calculation, around 400 samples were deemed adequate for the scope of this study. To account for potential data loss, the survey sample was increased to 1120 individuals from the city. All residents of Sulaimani City were eligible to participate in this survey.

2.3. Questionnaire Design and Data Collection

This research focused on understanding the perceptions of Sulaimani City's residents regarding the consumption of packaged water and its effects on health awareness, water usage, and environmental risks. The study also explored the unintended consequences arising from the findings. Data collection was primarily conducted through questionnaires developed from a literature review. To collect data across various locations in Sulaimani City, the researchers conducted field interviews and used snowball sampling techniques facilitated by an online platform (e.g., Google Forms) [9, 10]. The survey included 15 questions, estimated to take between three and five minutes to complete. The researchers distributed the survey links throughout Sulaimani City using snowball sampling and personal interviews. The questionnaire was divided into four main sections and was available in both Arabic and Kurdish to accommodate the language preferences of all participants. Responses were recorded promptly in an MS Excel spreadsheet to maintain data accuracy and promptly address any discrepancies or unclear responses by revisiting the respondents the following day if needed.

2.4. Instrument

The questionnaire was divided into four primary sections. The first section gathered demographic data, providing insights into the general characteristics of the respondents. This information helped us to better understand the background of the participants, including their age, gender, education level, health status, daily activities, and household size. The second section assessed the quality of the packaged water to ensure the respondents' health concerns regarding water quality were addressed. The third part delved into the reasons respondents prefer packaged water over other types of water. The final section consisted of questions regarding the respondents' satisfaction or grievances concerning issues identified in the packaged water. This comprehensive approach allowed us to capture a holistic view of the participants' preferences and concerns related to packaged water consumption.

2.5. Statistical Analysis

To provide a concise summary of the findings of the study about each variable examined, statistical analysis was carried out. The weighted mean, standard deviation, count, and percent of variables were displayed. Whether the differences within items are statistically significant or not according to the responses was assessed by the Kruskal-Wallis test, and the difference between two independent items' responses was assessed by the Mann-Whitney U test. A multinomial logistic regression model was calculated to assess customer complaints while purchasing packaged drinking water. A p-value of 0.05 or less was used in the analysis, which led to the conclusion that the results were statistically significant. A p-value of 0.05 or lower was judged statistically significant across the board for all of the tests. We utilized version 27.0 of the SPSS program for Windows (SPSS for Windows) [9, 11].

3. Result and Discussion

3.1. Demography

Table 1 presents a demographic breakdown of a sample of 1,120 individuals across several categories. The majority of the population is young, with over 64% in the 18–25 age range, and most of the sample is between 18 and 35 years old. There is a significant gender imbalance, with more females (61.6%) than males (38.4%) in the sample. The majority of individuals (44.1%) are jobless, followed by those working in the private sector (37.4%), and the least number is in government jobs (18.5%). Most families consist of 5-7 members (47.2%), followed closely by families with 2-4 members (45.6%). Larger families with more than 7 members are relatively rare (7.1%). A significant portion of the sample (90%) reports having no health problems, while only a small percentage have long-lasting health issues (7.7%) or are pregnant (2.3%). The majority of individuals (51.8%) have a Bachelor's degree, followed by those with a diploma (21.4%) and secondary school education (17.5%). Only a small number are illiterate or have completed primary school. Finally, health issues are not very common, with most individuals reporting no health problems. Education is relatively high, with over half of the sample having a Bachelor's degree.

3.2. Awareness and Complaining About Packaged Water

Table 2 presents data on "where individuals heard about packaged water," listing different sources and their associated frequencies, as well as ranks based on the frequency. The most common source of information about packaged water is through shops, with 549 individuals (49%) hearing about it this way, making it the most significant source. Friends and magazines are the least common sources in this dataset.

Shops are the most influential channel for learning about packaged water, with other informal sources like social media and word of mouth (friends, other sources) playing lesser but still important roles [12].

Table 1. Descriptive statistics of respondents' Demographic variables

Variables	Classes	Frequency	Percent
Age group	Less than 18	48	4.3
	18-25 years	718	64.1
	Years 26-35	255	22.8
	Years 36-45	51	4.6
	46-55 years	24	2.1
	More than 55 years	24	2.1
Gender	Male	430	38.4
	Female	690	61.6
Type of work	Government	207	18.5
	Private	419	37.4
	Jobless	494	44.1
Number of family member	2-4 member	511	45.6
	5-7 member	529	47.2
	More than 7	80	7.1
Health problem	Long lasting health issue	86	7.7
	Pregnancy	26	2.3
	None	1008	90
Education level	Illiterate	16	1.4
	Read and write	25	2.2
	Primary school	21	1.9
	Secondary school	196	17.5
	Diploma	240	21.4
	Bachelor	580	51.8
	Higher education	42	3.8
Total		1120	100

Table 2. The sources of awareness about packaged water.

Item	Source	Frequency
From where you heard about packaged water?	Friends	57(5.1)
	Magazine	55(4.9)
	Other source	181(16.2)
	Radio and Television	129(11.5)
	Shop and Store	549(49)
	Social Media	149(13.3)
Total		1120(100)

Table 3 presents information on two categories of responses: "Reasons for issues with water" and "Complaints about packaged water." The table enumerates the issues along with their respective percentages and ranks them according to their frequency of mentions. Traveling (45.5%) is the primary reason people face water-related issues. When it comes to packaged water, quality (51.9%) is the leading complaint. Other significant concerns for general water issues include pollution of normal water (34.9%) and packaging (14.2%), whereas price and taste appear to be less critical [12].

Table 3. Reasons for using packaged water and Customer's complaints against packaged water.

Item	Options	N (%)
Reason	Polluting normal water	391(34.9)
	Packaging	159(14.2)
	Quality	31(2.8)
	Price	13(1.2)
	Test	16(1.4)
	Traveling	510(45.5)
Complaining about packaged water	Packaging	247(22.1)
	Quality	581(51.9)
	Price	132(11.8)
	Taste	160(14.3)
Total		1120(100)

3.3. Satisfaction About Packaged Water

Table 4 presents responses to three different statements about packaged water, evaluating how much people agree with each statement. It includes counts, percentages, and descriptive statistics (weighted mean, standard deviation, and mode) to summarize the overall sentiment toward packaged water. The majority of respondents (50%) are neutral to somewhat agreeing with the statement about packaged water, as indicated by the mode of 3 (A Bit Agree). The mean of 3.242 suggests a mild agreement on the subject. The standard deviation (0.91723) indicates moderate variability in responses, showing some divergence in how strongly people feel about packaged water. A significant proportion of respondents (45.4% + 32.3%) agree that packaged water makes their lives easier. A strong majority (54.7% + 13.5%) agree or strongly agree that packaged water is harmful to the environment, making this the most negatively perceived aspect. The mean of 4.0339 reflects a strong agreement, indicating that respondents are highly concerned about the environmental impact of packaged water. The standard deviation of 1.26714 is the highest, suggesting a wider

spread of opinions, possibly indicating some people strongly disagree with the environmental impact claim, though they are a minority [13].

Table 4. Customer satisfaction with three different statements about packaged water

Items	Strongly Disagree	Dis Agree	A bit	Agree	Strongly agree	Weighted Mean	Standard Deviation	Mode
	Count %	Count %	Count %	Count %	Count %			
How much you agree about packaged water	62 5.5	95 8.5	560 50	316 28.2	87 7.8	3.242	0.91723	3
How much do you think packaged water make things easy to you?	33 2.9	36 3.2	509 45.4	362 32.3	180 16.1	3.5536	0.9002	3
Do you think packaged water Would be harmful for our Environment?	86 7.7	47 4.2	223 19.9	151 13.5	613 54.7	4.0339	1.26714	5

Table 5 compares responses based on gender (male and female) to three different survey questions about packaged water. It provides the mean, standard deviation (SD), p-value, and rank for each group. Agreement about packaged water: There is a statistically significant difference (p-value = 0.037), with males more likely to agree about packaged water than females. There is no statistically significant difference (p-value = 0.89) between males and females regarding how much they think packaged water makes things easier. There is no statistically significant difference (p-value = 0.63) between males and females regarding their concerns about the environmental impact of packaged water. Gender differences are present only in terms of agreement about packaged water; males are more likely to have a positive view compared to females. However, gender does not significantly affect perceptions of the convenience or environmental harm associated with packaged water.

Table 5. Responses to three separate assertions about packaged water differed by gender

Items	Gender	N	Mean	SD	Rank	P-value*
How much do you agree about packaged water	Male Female	430 690	3.3023 3.2043	0.95675 0.89035	584.01 545.85	0.037
How much do you think packaged water makes things easy for you?	Female female	430 690	3.5488 3.5565	0.9516 0.86732	561.96 559.59	0.89
Do you think packaged water would be harmful to our environment?	Male Female	430 690	4.0302 4.0362	1.31745 1.23571	565.79 557.2	0.63

*: Mann Whitney U test

Table 6 compares responses from different age groups on three survey items related to packaged water. The data includes mean scores, standard deviation (SD), and p-values to assess the statistical significance of differences across age groups. There is a significant difference across age groups ($p < 0.001$), with younger people and older adults (over 55) expressing stronger agreement about packaged water, while middle-aged groups (26–45 years) are less agreeable. There is also a significant age-related difference (p-value < 0.001), with younger people (especially 18-25) finding packaged water more convenient and older individuals (46-55) viewing it as less convenient. Age influences people's agreement with and perception of convenience related to packaged water, with younger adults and older adults showing stronger agreement and convenience perceptions. However, age does not significantly affect people's concern about the environmental impact of packaged water. Figure (2-7) provides more detailed explanations about the differences between age groups regarding packaged water [2].

Table 6. Responses to three separate assertions about packaged water differed by age

Items	Age Group	N	Mean	SD	p-value*
How much do you agree about packaged water	Less than 18	48	3.5208	0.89893	<0.001
	18-25 years	718	3.2967	0.85799	
	Years 26-35	255	3.0745	0.97928	
	Years 36-45	51	3.0196	0.96933	
	46-55 years	24	3	1.02151	
	More than 55 years	24	3.5417	1.35066	
How much do you think packaged water makes things easy for you?	Less than 18	48	3.5208	0.87494	<0.001
	18-25 years	718	3.6643	0.83182	
	Years 26-35	255	3.451	0.94564	
	Years 36-45	51	3.1569	0.94599	
	46-55 years	24	2.75	0.89685	
	More than 55 years	24	3.0417	1.36666	
Do you think packaged water would be harmful to our environment?	Less than 18	48	3.9583	1.23699	0.065
	18-25 years	718	4.1128	1.23063	
	Years 26-35	255	3.9216	1.35221	
	Years 36-45	51	3.8627	1.29645	
	46-55 years	24	3.7083	1.23285	
	More than 55 years	24	3.7083	1.33447	

*: Kruskal Wallis test

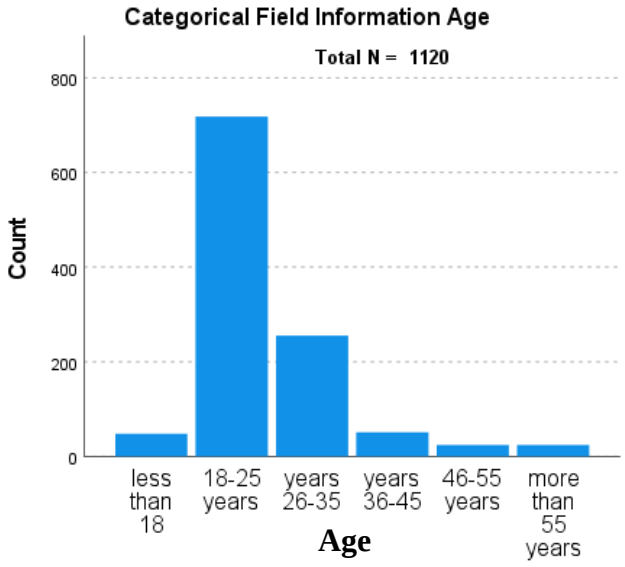


Figure 2. Age groups

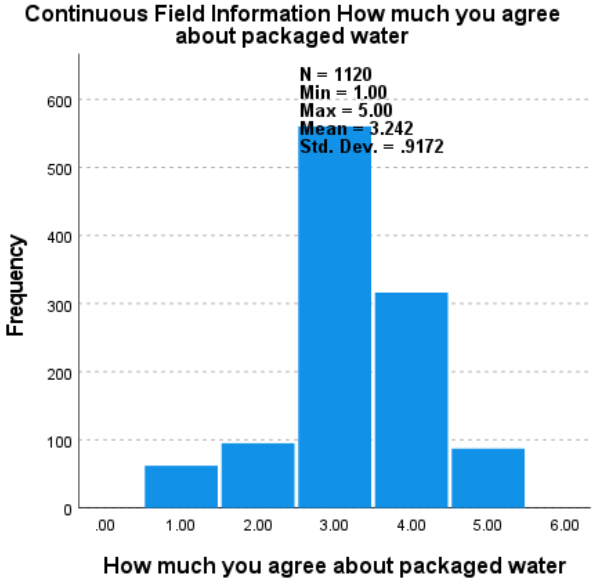


Figure 3. Agreement level

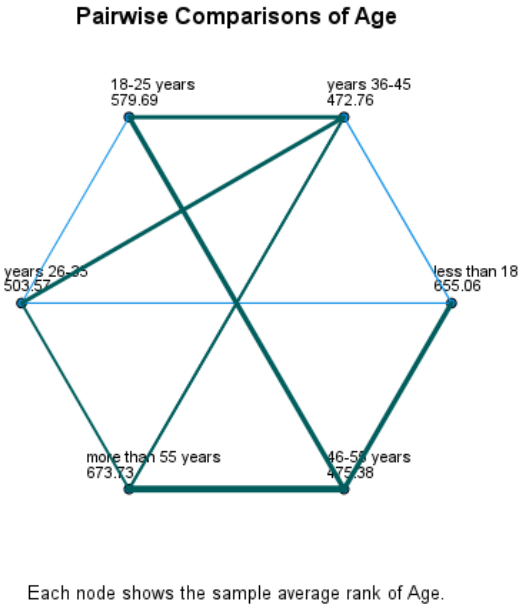


Figure 4. Pairwise comparison in the level of agreement about packaged water across the age groups

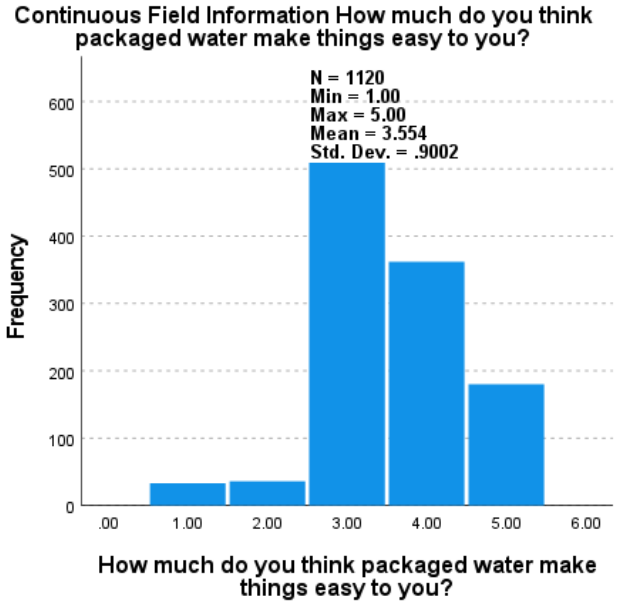


Figure 5. Convenience level

Table 7 presents survey results on attitudes toward packaged water, categorized by education level. There is no significant difference in agreement about packaged water across educational groups. There is a significant difference across educational groups regarding how much they believe packaged water makes things easier. Higher education levels are associated with a stronger belief that packaged water makes things easier. There is a strong, significant difference across educational groups concerning the perceived environmental harm of packaged water. Higher education levels are linked to greater concern about the environmental harm caused by packaged water. Figures (8-10) show more explanations about the differences between education levels of packaged water.

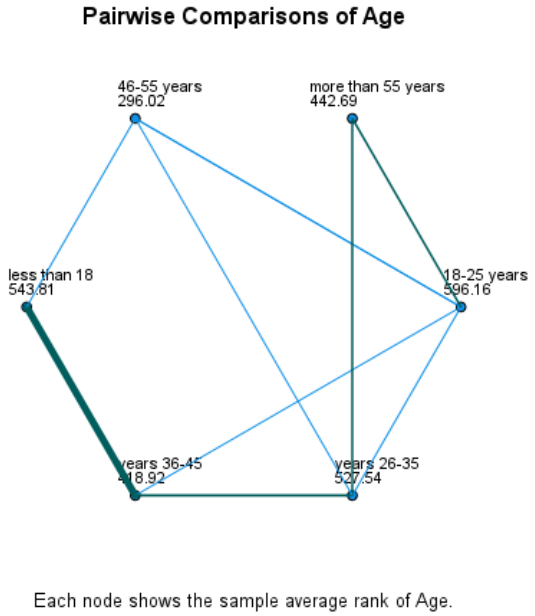


Figure 6. Pairwise comparison in the level of convenient about packaged water across the age groups

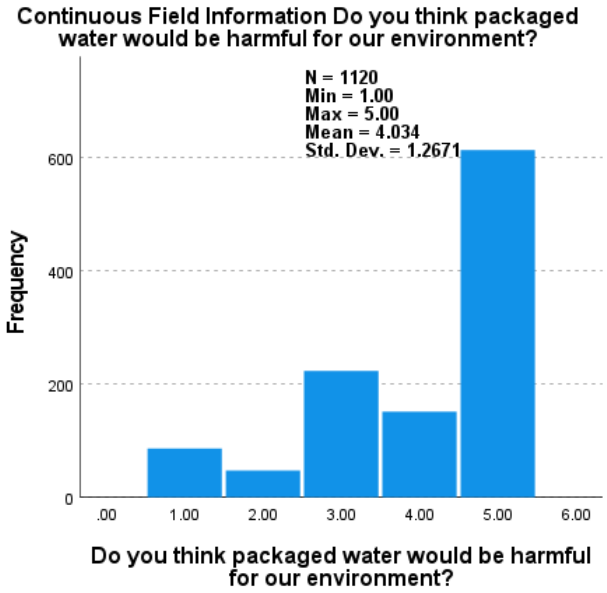
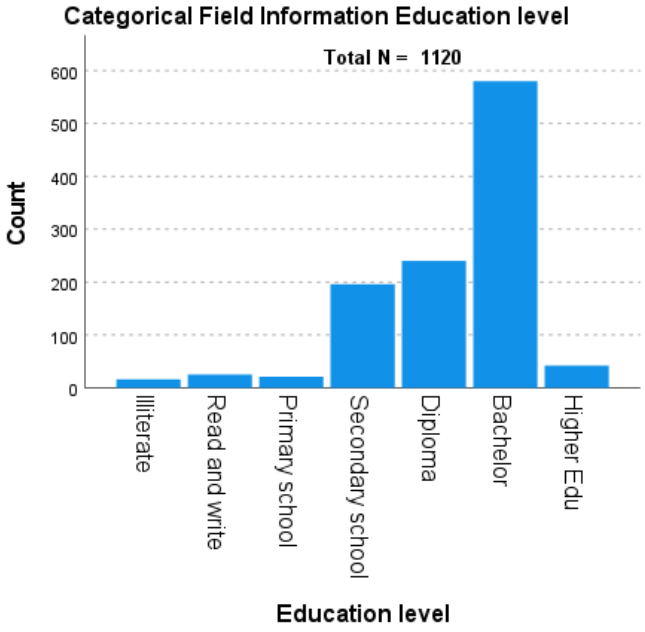


Figure 7. Considering Environmental

Table 7. Responses to three separate assertions about packaged water differed by Edu. Level

Item	Edu group	N	Mean	SD	P-value*
How much do you agree about packaged water	Illiterate	16	3.375	1.5	0.07
	Read and write	25	3.32	0.85245	
	Primary school	21	3.0476	0.86465	
	Secondary school	196	3.3367	0.95481	
	Diploma	240	3.325	0.81986	
	Bachelor	580	3.1638	0.90043	
	Master	42	3.4048	1.1906	
How much do you think packaged water makes things easy for you?	Illiterate	16	3	1.31656	0.026
	Read and write	25	3.6	0.95743	
	Primary school	21	3.0476	1.20317	
	Secondary school	196	3.5051	0.97926	
	Diploma	240	3.6833	0.84322	
	Bachelor	580	3.5414	0.8456	
	Master	42	3.6429	1.03173	
Do you think packaged water would be harmful to our environment?	Illiterate	16	3.9375	1.06262	<0.001
	Read and write	25	3.92	1.38203	
	Primary school	21	3.4762	1.53685	
	Secondary school	196	3.8163	1.31926	
	Diploma	240	3.8958	1.28134	
	Bachelor	580	4.1897	1.22237	
	Master	42	4.0714	1.15596	

*: Kruskal Wallis test



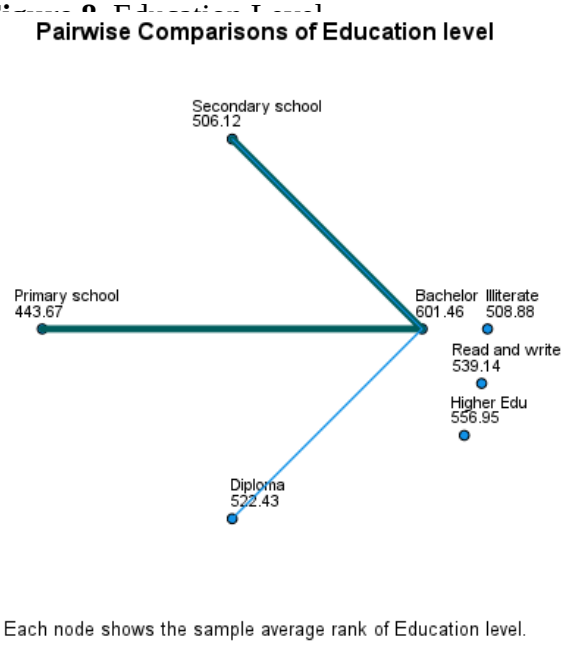


Figure 9. Pairwise comparison in the level of concerning the environmental harm of packaged water across Edu Level

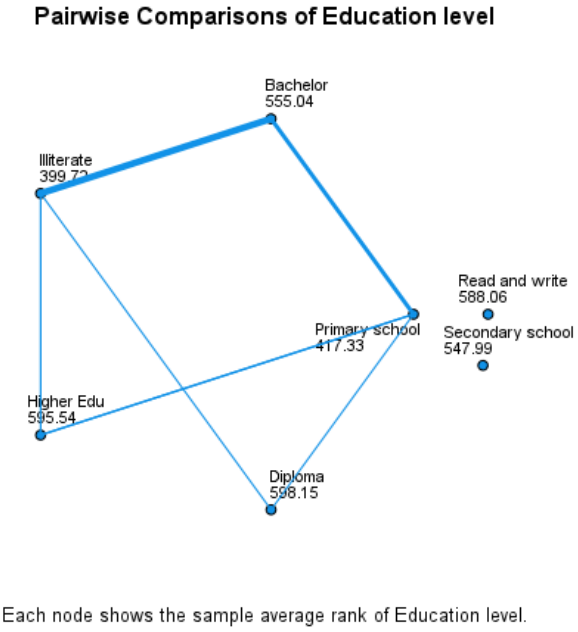


Figure 10. Pairwise comparison in the level of convenient about packaged water across the Edu. Level

Table 8 presents survey results on the perception of how much-packaged water makes life easier, categorized by family size. It includes the number of family members (2-4 members, 5-7 members, more than 7 members), Family size appears to influence the perception of the convenience of packaged water. Larger families (more than 7 members) tend to find packaged water less convenient compared to smaller to medium-sized families (2-7 members). Figures (11 and 12) show more explanations about the differences between family sizes about packaged water convenience.

Table 8. Responses to convenience about packaged water differed by family Size

Item	No of family	N	Mean	SD	P-value*
How much do you think packaged water makes things easy for you?	2-4 member	511	3.5675	0.88939	0.016
	5-7 member	529	3.5898	0.87903	
	More than 7	80	3.225	1.04306	

*: Kruskal Wallis test

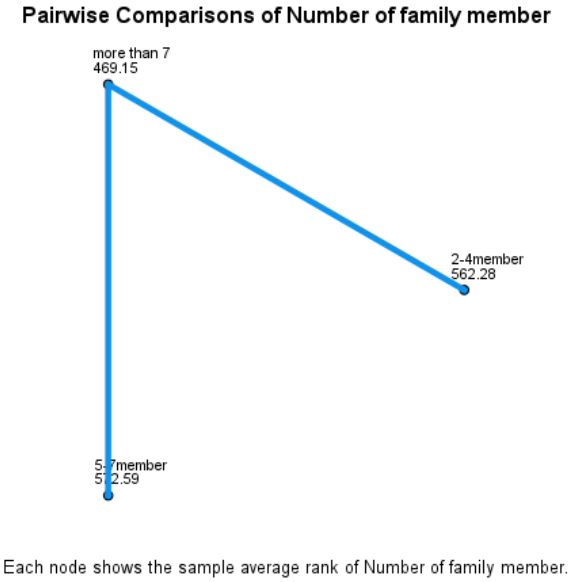


Figure 11. Pairwise comparison in the level of convenient about packaged water

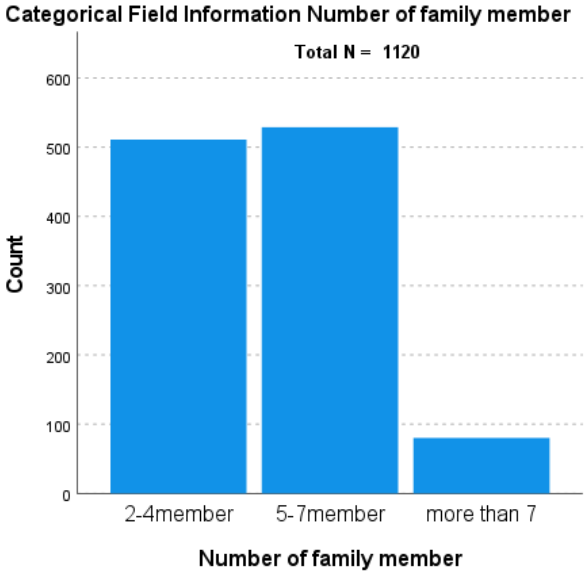


Figure 12. Family Size

3.4. The Influence of Demographic Characteristics

Table 9 presents the results of a logistic regression analysis that examines the likelihood of people complaining about packaged water based on different factors, such as age, education level, and gender. Older individuals are less likely to complain about packaging, but age does not significantly affect complaints about quality or price. Higher education is positively associated with complaints about quality, but not with packaging or price. Males are more likely to complain about packaging, but gender does not significantly influence complaints about quality or price. Age is negatively related to complaining about packaging. Education level is positively related to complaints about quality. These results suggest that demographic factors like age and gender have a more prominent effect on complaints about packaging, while education level is more relevant to complaints about quality. In summary, the model has low explanatory power, and further refinement or additional variables might be needed to improve its fit.

Table 9. Customer's complain in relation to their demographic characteristics.

Complaining about packaged water	Variables	B	Se	Wald	Sig.
Packaging	Age	-0.287	0.114	6.386	0.012
	Education level	0.11	0.087	1.609	0.205
	[Gender=1.00]	0.561	0.216	6.72	0.01
Quality	Age	-0.148	0.097	2.349	0.125
	Education level	0.204	0.077	7.106	0.008
	[Gender=1.00]	-0.08	0.194	0.167	0.683
Price	Age	-0.071	0.121	0.345	0.557
	Education level	-0.027	0.095	0.079	0.779
	[Gender=1.00]	0.245	0.252	0.951	0.33
Cox and Snell	0.033				
Nagelkerke	0.036				
McFadden	0.014				

4. Conclusion

Understanding the factors influencing perceptions of packaged water is crucial for addressing consumer preferences and concerns. This study explores the impact of demographic variables such as age, gender, and education level on how individuals perceive and experience packaged water. As a result, the findings outlined below offer valuable insights into the nuanced role these factors play in shaping consumer attitudes and behaviors.

In conclusion, the findings from the data highlight the significant role that demographic factors, such as age, gender, and education level, play in shaping individuals' perceptions and experiences with packaged water. Shops are the dominant source of information about packaged water, followed by informal channels like social media and word of mouth. Gender differences were found primarily in terms of agreement about packaged water, with males showing more favorable views, though this did not extend to perceptions of convenience or environmental concerns. Age differences were more pronounced, with younger and older individuals generally more agreeable towards packaged water and perceiving it as more convenient, whereas middle-aged individuals were less favorable. Education level was also a key factor, with higher education correlating with greater concern about the environmental impact and stronger beliefs in the convenience of packaged water. Additionally, family size appeared to influence perceptions of convenience,

with larger families finding packaged water less convenient. Overall, while demographic factors shape opinions and complaints regarding packaged water, they have varying degrees of impact, with age and education being particularly influential in shaping perceptions of convenience and environmental harm.

Funding: The authors declare that this research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest: The authors declare that they have no known competing of interest.

References

[1] Nareeman, B. J., Ahmed, K. O., & Karim, P. H. (2023). Assessment of Water Supply System: A Questioner Study. *Eurasian Journal of Science and Engineering*, *9*(2), 217-230. https://doi.org/10.23918/eajse.v9i2p17

[2] Tilahun, M., & Beshaw, M. (2020). Customer's Perception and Preference towards Packaged Drinking Water in Addis Ababa. The Scientific World Journal. DOI: [10.1155/2020/6353928] (https://doi.org/10.1155/2020/6353928.

[3] Statista. (2023). Global Bottled Water Market Overview: Market Insights & Consumer Trends. Retrived from (https://www.statista.com) Aug 2024.

[4] Kapoor, N., & Sen, S. (2023). Shifting Preferences: A Study on Packaged Drinking Water Consumption and Sustainability. International Journal of Consumer Studies. DOI: 10.1111/ijcs.12720.

[5] Kaur, H., & Verma, P. (2023). Consumer Behavior Towards Eco-Friendly Packaged Drinking Water Products. Journal of Environmental Management, 312(4), 102565.

[6] Saleh, S. A., Ismael, R. S. ., & Abas, B. S. . (2024). Effect of Soil Stabilization on Structural Design of Flexible Pavement. *Journal of Studies in Civil Engineering*, *1*(1), 36–54. https://doi.org/10.53898/jsce2024113

[7] Ahmed, K. O., Taha, A. A., Bahrami, J. ., Hama Karim, P. ., & Sabri, S. H. . (2024). Assessing the Carbon Footprint: Key Principles and Local Case Studies Based on Questionnaire Data. *Journal of Studies in Civil Engineering*, *1*(1), 55–72. https://doi.org/10.53898/jsce2024114.

[8] Haji, H. A., Hamza, A. A., & Ahmed, K. O. (2021). The Effectiveness of Social Media on Engineers Related Tasks. *Journal of Studies in Science and Engineering*, *1*(2), 50–62. https://doi.org/10.53898/josse2021124

[9] Ahmed, K. O., Amini, A., Dadkhah, K., Bahrami, J., Kavianpour, M. R., Rahim, E. K. H., ... & Mafakheri, S. (2024). Assessment of Hygiene Practices, Awareness, and Water Consumption Regarding Covid-19 Among Children in a Refugee Camp. *Maternal and Child Health Journal*, *28*(3), 545-556. https://doi.org/10.1007/s10995-023-03833-y

[10] Othman Ahmed, K., Hama Karim, P., Golukcu, F., Qarani Aziz, S., Sadeghifar, T., Hashim Noori, S., & Dana Bahaulddin, N. (2023). Impact of the Covid-19 Pandemic on awareness, risk level, hand washing, and water consumption for hospital staff in Sulaimaniyah city of Iraq. *Journal of Studies in Science and Engineering*, *3*(1), 13-29.

[11] Othman Ahmed, K., & Ahmed Hussein, T. (2022). Contemporary trends toward environmental issues in the Kurdistan Region of Iraq. *Prace i Studia Geograficzne*.

[12] Stoler, J., Weeks, J. R., & Fink, G. (2012). "Sachet drinking water in Ghana's Accra-Tema metropolitan area: past, present, and future." *Journal of Water, Sanitation and Hygiene for Development*, 2(4), 223-240

[13] Wardrop, N. A., Dzodzomenyo, M., Aryeetey, G., Hill, A. G., Bain, R. E., & Wright, J. (2017). Estimation of packaged water consumption and associated plastic waste production from household budget surveys. *Environmental Research Letters*, *12*(7), 074029.