

## Determining consumption preferences of consumers considering quality attributes of drinking water: case of Iğdır

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Received: 22 March 2021; Accepted: 15 July 2021; Published: 9 August 2021

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PAPER

### Abstract

The aim of the study was to determine the main factors affecting the consumption preferences of consumers by considering the quality characteristics of drinking water according to the regions where they reside. For this purpose, the data obtained from 400 consumers living in the central districts of Iğdır province were used for Factor Analysis and Two-Step Clustering Analysis. Research results reported that physiological needs of the consumers residing in region I were based on the physiological and physical quality of the water in their drinking water consumption preference, consumers in region II relied on the chemical quality of the tap water, and consumers in region III focused on the cost advantages of tap water depending on the chemical quality of tap water. Therefore, supplying differentiated bottled drinking water in hygienic conditions according to physical and physiological quality standards of drinking water for consumers in region I, ensuring the protection and access of local water resources suitable for chemical quality characteristics to consumers in region II, and maintaining the reliability of local water resources with good chemical quality and low cost of supply and sustainability of their use for consumers in region III can have positive effects on consumption satisfaction.

*Keywords:* drinking water consumption; factor analysis; two-step cluster analysis; water quality

### Introduction

Water is one of the most important natural resources for all living creatures that have no substitute as a natural resource. It is the second most important indispensable component after oxygen for the existence of human life on earth. Oceans and seas make up 97.5% of the world's water, while 2.5% is fresh water. About 87% of fresh water cannot be used without treatment (Yılmaz and Peker, 2013).

Water resources are scarce and the world population which constantly demands these resources is increasing rapidly. In addition, industrialization weakens the sustainability of natural resources and makes it difficult

for people to access safe drinking water (Tanellari *et al.*, 2015). Organizations such as the United Nations World Water Council (UNCWW), the World Resources Institute (IWR), and the World Health Organization (WHO) stated that in the 1950s, only a few countries had water problems; in the 1990s, 26 countries with 300 million people suffered from thirst; and by 2050, there will be severe water shortage in 66 countries where 2/3 of the world's population lives (Anonymous, 2015).

On the other hand, the recent global climate changes and global warming, as well as the developments in mining and waste recycling technologies, significantly reduce and pollute both the water resources used for agricultural purposes and the water supply resources

available to people. When countries are classified according to water availability, countries with less than 1000 m<sup>3</sup> of usable water per capita per year are considered “water poor,” countries with less than 2000 m<sup>3</sup> of water are considered “water scarce,” and countries with more than 8000–10,000 m<sup>3</sup> are considered “water rich” (DPT, 2007). According to the world average, usable annual amount of water per person is 7.600 m<sup>3</sup> (Anonymous, 2015). Turkey is seen as a country that suffers from water scarcity when approximately 1.519 m<sup>3</sup> of usable fresh water per person is taken into account. The total amount of usable water in Turkey is around 112 billion m<sup>3</sup>. The amount of water per person per day for drinking and use in Turkey is 216 L (TUIK, 2020). The water footprint of an individual, society, or line of business is the total amount of clean water resources used for the production of goods and services consumed by the individual or society, or used by the producer for the production of goods and services. According to the water footprint approach, it is stated that the daily direct and indirect water consumption of a person in Turkey is 5416 L (WWF Report, 2014).

The rapid increase in both the number and population of cities in Turkey has made it difficult to meet the water needs of the cities only from available sources and groundwater. For this reason, the water needs of rapidly growing cities are tried to be met by purification from rivers, dams, and lakes, as well as spring and groundwater (Özgüler, 1997). It may be possible that the water is supplied from an unhealthy source or the water transferred from a healthy water source is exposed to various microbiological contaminants before reaching the consumer. On the other hand, both natural resource destruction with chemical pesticides and genetic modifications, and improper practices in mining operations as well as factory waste and polluted air emissions cause intensive pollution of the environment and groundwater resources. It is imperative that these contaminated water resources reach usable drinking and utility water standards in terms of chemical, physical, and microbiological water quality (Li and Wu, 2019; Liu *et al.*, 2017; Zlatanovic *et al.*, 2017). The process of distillation and purification of heavily polluted drinking water with various technological approaches and the grading of drinking water with various quality characteristics and its presentation to consumers are of great importance. Limit values of usable fresh water are determined according to hygiene, toxic, technical, and aesthetic criteria. In addition, heavy metals, calcium, magnesium, and nitrate values must be reached to levels that will not harm human health (Kılıç, 2008).

Wells were drilled in the shallow aquifer (6–10 m) and in the deep aquifer during the studies carried out to obtain information about the groundwater in the Iğdır

Plain. In all wells drilled in a shallow aquifer, the EC and total salt values are above the permissible values. In addition, most of them have Ca, Mg, SO<sub>4</sub>, Cl, and hardness values above the permissible values. For this reason, shallow well waters were not found suitable for drinking, and chemical heavy metal analyzes are carried out by regularly taking water samples from Gaziler, Acıçay, Hamurkesen, Yazlık Village, Gürgöre, and Hıdırlı spring waters in the Iğdır province. Although there are no pollutants in the mentioned water resources, considering the heavy metal contents of the sources other than the Hamurkesen spring, they were not found suitable to be used as drinking and utility water. Therefore, this research area constitutes a rare micro-area used as drinking water in terms of underground resources in Turkey and is immediately accepted as the only sampling region at the national level (Anonymous, 2015).

Due to all these negative reasons, people living in Iğdır are trying to make the water usable safely by using personal purifiers in both apartments and houses in order to use the city tap water. However, various spring waters, which have a very high usage area, are far from meeting the needs of consumers, by means of purifiers. For this reason, consumers use well water as drinking water without objective measurements regarding the usability and safety of water as drinking water according to usable quality criteria. In addition to this, initiatives for ready water supply also constitute a very important domestic market in Iğdır. In this case, consumers, who have to meet their water consumption needs, exhibit different attitudes and behaviors in terms of their residential areas, taking into account the effects of both water resources and drinking water on health.

When the factors affecting the water consumption of consumers are examined, the number of households, the behavior of the consumers, the existence of the garden and swimming pool of the household, and the plant type in the garden are reported as important factors. At the same time, it has been determined that in regions where water scarcity is experienced, besides water price and income, social and demographic characteristics of consumers are effective (Domene and Saurí, 2007). In addition, it has been analyzed that body weight and temperature and physical activities have an effect on water consumption rates (Şen and Altunkaynak, 2009). In the study conducted by Arslan and Mendeş in 2004, it was reported that gender did not affect water consumption and that there was no conscious water consumption in the society (Arslan and Mendeş, 2004). Milton *et al.* (2006) reported that drinking water is exposed to various pollutants (such as arsenic, lime, and metal-based minerals), making it difficult to access healthy water supply sources, and therefore the amount of drinking water consumption is significantly reduced.

Consumers who believe that the drinking water provided by the local and administrative administrations in Iğdır is not at a sufficient level in terms of purification from harmful substances, hygiene, quality, and reliability, integrates purification devices into the water lines within the residence, tends to use bottled drinking water, and turns to neighborhood fountains or well waters that they find reliable. Among the factors that determine the behavior of consumers towards these alternatives, factors such as physiological effect; chemical, physical, and microbiological quality of water; hygiene; safety of water; access to spring or tap water; physical quality and preservation of tap water; and reliability of drinking water distribution networks are of great importance (Dönderici *et al.*, 2010; Li and Wu, 2019; Liu *et al.*, 2017; Zlatanovic *et al.*, 2017). Consumers residing in different regions of the province of Iğdır experience significant problems in accessing network, spring, and ready-made bottled drinking water with alternative usable physical and chemical quality. Therefore, in the research, the following question appears: Which quality characteristics determine the drinking water consumption of consumers residing in different regions of Iğdır province, ready-made water, tap water, tap water connected to the purification device, or spring (fountain) water? In addition to answering the question, this research has been planned in order to help local and administrative administrations and water supply retailers create strategic plans for target audiences.

## Materials and Methods

### Material

The primary data of the study were obtained from face-to-face surveys conducted with households residing in the city center of Iğdır in 2019 (Table 1). On the other hand, secondary data obtained from the various domestic and foreign researches and reports, from the public institutions and organizations such as Turkey Statistics Institution (TSI) and FAO, and Iğdır municipality and governorship records were also used.

### Method

#### Sampling method

Taking into account the 2018 Address Based Population Registration System (ADNKS), it was determined that the central population of Iğdır was 137.613 people (TURKSTAT, 2019), which was accepted as the main population. The sample size, which takes into account the probability of the population, whose main population has been determined, to benefit from the local drinking water source, was calculated using the Simple Random Sampling Method Based on Population Proportions,

with the help of following equation (Newbold, 1995; Şahin, 2019).

$$n = \frac{N_p(1-p)}{(N-1)\sigma_p^2 + p(1-p)}$$

In equation;

n: Sample size,

N: Iğdır city center population (person),

r: Deviation from the mean (margin of error) (5%),

$Z_{\alpha/2}$ : Z table value (1.96),

p: The proportion of those who prefer tap drinking water (50%),

$\sigma_p^2$ : Major population variance.

$$\sigma_p^2 = \left( \frac{r}{Z_{\alpha/2}} \right)^2 = \left( \frac{0.05}{1.96} \right)^2 = (0.0255)^2$$

It is calculated as,

$$n = \frac{137\ 613 \times 0.5 \times 0.5}{(137\ 612 \times (0.0255)^2) + (0.5 \times 0.5)} = 384 \text{ consumers}$$

In order to reach the maximum sample volume in the study, p: 0.50 and q: 0.50 were taken. On the other hand, taking into account the number of people in the neighborhoods to be surveyed in each region, how many surveys will be conducted in which neighborhoods with proportional method was determined and given in Table 1.

During data collection, face-to-face interviews were conducted with 404 consumers by increasing the number of questionnaires by 5% in order to compensate for errors caused by the respondent or the researcher. While counting and cleaning the survey data, the questionnaires containing incorrect and missing data were removed from the data set and the survey data of 400 consumers in total were coded and made ready for analysis in the digital environment.

#### Methods used in the preparation of the questionnaires

Participants of the survey were asked to respond to each statement indicating the significance level of their drinking water consumption preferences. A Likert-type scale was used (where 1 refers to the least important attribute, and 5 refers to the most important attributes). The questions related to the drinking water consumption preferences of the consumers consisted of 52 variables belonging to main factors such as physiological, physical, and chemical quality attributes, confidence, and advantages of tap water (Table 2). On the other hand, the questions with open and closed-ended scale types for the socioeconomic and demographic factors influencing their drinking water consumption preferences were used (Table 3 and Table 4).

**Table 1. Number of surveys conducted in the neighborhoods of Iğdır city center.**

Name of the neighborhood	Number of surveys
14 Kasım neighborhood	28
Ali Kamerli neighborhood	9
Atatürk neighborhood	14
Bağlar neighborhood	50
Cumhuriyet neighborhood	23
Emek neighborhood	36
Hakveyis neighborhood	4
Karaağaç neighborhood	30
Konaklı neighborhood	24
Özgür neighborhood	42
Pir Sultan Abdal neighborhood	17
Söğütlü neighborhood	27
Topcular neighborhood	37
Yeni neighborhood	6
Bahçelievler neighborhood	5
Özvatan neighborhood	6
Said Nursi neighborhood	7
Turgut Özal neighborhood	4
Yunus Emre neighborhood	8
Faruktoka neighborhood	4
Yeni neighborhood	4
Güneşli neighborhood	6
Mehmet Akif Ersoy neighborhood	5
Namık Kemal neighborhood	4
<b>Total number of surveys</b>	<b>400</b>

#### Methods used in the statistics analyses

After editing and coding, factor analysis (FA) was first used to determine the main factors related to the product attitudes affecting the consumers' drinking water consumption preferences and purchase patterns. FA is a data technique that reduces the number of variables used in analysis by creating new factors that combine redundancy in the data (Kurtuluş, 2004; SPSS, 20.0, 2020; Tekin, 2007). The first step in FA is to determine the number of relevant factors. This was conducted by FA using the Varimax Rotation Method under an orthogonal rotation method minimizing the number of variables that have high loading on each factor (Karagöz, 2017; Karpati and Szakal, 2009). FA was used initially to identify the underlying aspect explaining a correlation among a set of the drinking water attributes. The purpose of FA was to identify those attributes accounting for a relatively large proportion of the variance in the sample.

In the second step of the statistical analyses, the main factors obtained from FA were used for two-step cluster analysis. Two-step cluster analysis, which gives the ideal

number of clusters between the factors obtained and the consumption groups desired to be formed, is the most effective clustering technique (Doğan, 2008; Özdamar, 2004; Şekerler, 2008; Topcu and Baran, 2017). In the present study, therefore, the target consumers were separated to three homogenous clusters as regions I, II, and III by considering the relationships between the main factors obtained from FA and the location of the neighborhoods according to the distances to city center where the consumers who prefer clean drinking water resided in Iğdır Province.

In the final step of the statistical analysis, descriptive statistics such as compare means, crosstabs, descriptive and frequencies were used to determine demographic and socioeconomic profiles of three consumer clusters segmented by two-step cluster analysis.

All analyses were run in sequence with the SPSS 20.0 statistical software. These techniques were frequently used to analyze the product attributes playing the important roles on the consumers' consumption preferences in marketing studies (Drugova *et al.*, 2020; Egbueri *et al.*, 2020; Harwood *et al.*, 2020; Kusa *et al.*, 2020; Topcu, 2006; Topcu and Baran, 2017).

## Results and Discussion

### The results of FA related to consumers' drinking water consumption preferences

Kaiser Normalization (KMO), which compares the observation and partial correlation coefficients, including the consumers' attitudes and behavior towards drinking water consumption preferences, was calculated as 0.723. On the other hand, Bartlett's Sphericity test statistics was calculated as 2529.433 ( $P = 0.000$ ). These two statistics evaluating the sample data showed that the data related to the factors affecting the consumers' drinking water consumption preferences was at a good level for FA.

Of the 52 variables, 33 were excluded from the data set, and 19 variables were used in FA. Because the 33 variables had not the sufficient loads to explain the common variance, overlap and factor dimensions on the consumers' drinking water consumption preferences. Considering Eigen-values greater than 1 and the explanatory variance rates in the factor dimensions created by 19 variables effecting their preferences, 5 main factors were obtained, which explained approximately 62% of the total variance (Table 2).

Physiological quality of water as the first preference factor explained 15.72% of the total variance. It indicated that people should drink at least 2 L water a day

Table 2. The results of FA and fit statistics

Factor interpretations and variables	Factor and variable loads*				
	F1	F2	F3	F4	F5
<b>Physiological quality of water</b>					
Effect of water on digestion	<b>0.786</b>	0.102	-0.023	0.011	0.011
Drinking water aids weight loss and enhances skin	<b>0.786</b>	0.087	-0.035	-0.013	0.049
Physiological functions of water in the body	<b>0.782</b>	0.064	-0.021	-0.030	0.079
Drinking water removes toxins and cleanses the blood	<b>0.659</b>	0.039	0.124	0.021	-0.022
At least 2 L water should be consumed daily for health.	<b>0.573</b>	0.019	-0.032	0.003	0.153
Men and women should daily drink 3 and 2.5 L water, respectively	<b>0.558</b>	0.033	-0.014	0.019	0.005
<b>Physical quality of water</b>					
Muddy water after tap water outage	0.068	<b>0.773</b>	-0.002	-0.046	0.034
Purified water tastes better and doesn't contain harmful chemicals.	0.080	<b>0.725</b>	-0.304	-0.191	0.079
Packaged waters are clearer and cleaner	0.118	<b>0.707</b>	-0.111	-0.142	0.123
Tap water is sometimes yellow and smells bad	0.049	<b>0.700</b>	0.074	0.129	-0.005
<b>Confidence in tap water</b>					
We purify the tap water and drink it more safely	-0.039	-0.038	<b>0.875</b>	-0.026	-0.123
Purified water is much healthier than bottled water	0.016	-0.090	<b>0.817</b>	-0.011	-0.034
Purified tap water tastes more pleasant	0.032	-0.063	<b>0.786</b>	-0.084	0.008
<b>Chemical quality of water</b>					
The amount of calcium in quality water is close to 250 mg	0.012	-0.198	-0.005	<b>0.881</b>	0.100
The amount of magnesium in quality water is close to 75 mg	-0.074	-0.234	0.041	<b>0.855</b>	0.156
The PH of treated water is basic	0.083	0.290	-0.201	<b>0.672</b>	0.029
<b>Advantage of tap water</b>					
Low cost and availability of tap water	0.094	-0.016	-0.072	0.094	<b>0.876</b>
The fact that the tap water is cold in summer and winter	0.031	0.033	-0.024	-0.011	<b>0.865</b>
Transfer difficulty of tap water	0.116	0.201	-0.055	0.193	<b>0.656</b>
<b>Factorization statistics</b>					
Eigen-value	2.987	2.370	2.230	2.090	2.051
Explained variance (%)	15.719	12.475	11.737	10.999	10.796
Cumulative explained variance (%)	15.719	28.194	39.932	50.931	61.727
<b>Fit statistics</b>					
KMO (Kaiser–Meyer–Olkin) statistic	0.723				
Bartlett's test of sphericity	[Chi-square ( $\lambda_{2df}$ ): 2529.43] ( $P = 0.000$ )				
Number of samples ( $n$ )	400				

\*Bold numbers indicate the largest loading for each variable

for a healthy and balanced diet, because water helps the digestive system to work better and cleans the blood by removing harmful chemicals and toxins from the body, is the main substance and vitality source in all physiological functions in the body, makes the skin beautiful, and helps people to lose weight. Previous researches, therefore, declared that men and women should drink 3 and 2.5 L water, respectively (Cuvelier and Bartell, 2021; İbrahim *et al.*, 2021). Explaining the physiological effects of drinking water on human health in all its dimensions, Mukate *et al.* (2019) evaluated the direct and indirect effects of

various problems of unsuitable drinking of water in human physiology with many dimensions.

On the other hand, water's physical quality as the second factor explained 12.48% of the total variance. It consisted of variables such as the water provided by the treatment processes not affecting drinking water's chemical quality, the packaged water from the source, the tap water's turbid flow, and sometimes being yellowish after being interrupted and not being as pure and clean as it appeared (Table 2). The consumers, therefore, gave much

Table 3. Final cluster center scores and sample numbers in each cluster

Main factors	Drinking water consumption preference groups*		
	Region I	Region II	Region III
Physiological quality of water	<b>0.08***</b>	0.06***	-0.17***
Physical quality of water	<b>0.26***</b>	-0.08***	0.03***
Confidence in tap water	-0.11***	<b>0.07***</b>	-0.05***
Chemical quality of water	-0.12***	<b>0.09***</b>	<b>0.07***</b>
Advantage of tap water	-0.01***	-0.06***	<b>0.08***</b>
Number of samples in each segment	148	132	120
Sample percent in each cluster (%)	37	33	30

\*Bold numbers indicate the largest final cluster center scores for each factor.

\*\*\*According to F statistics, the final cluster center scores were found very importance ( $p < 0.01$ ).

Table 4. Demographic and socioeconomic characteristics of the participants in each cluster.

Demographic and socioeconomic factors		Drinking water consumption preference groups			Total
		Region I	Region II	Region III	
Gender	Male	57	66	<b>74</b>	197
	Female	63	66	<b>74</b>	203
Occupation	White-collar	36	35	<b>44</b>	115
	Worker	23	<b>24</b>	18	65
	Self-employment	6	10	<b>14</b>	30
	Housewife	<b>28</b>	27	26	81
Household (person)	Student	15	<b>19</b>	<b>19</b>	53
	Mean	<b>4.06</b>	3.93	3.90	3.96
	<i>n</i>	120	132	148	400
Age (year)	<i>Std. Deviation</i>	1590	1514	1446	1512
	Mean	37.52	34.27	<b>37.71</b>	36.51
	<i>n</i>	120	132	148	400
Education (year)	<i>Std. Deviation</i>	15.13	13.06	14.06	14.13
	Mean	10.58	11.05	<b>11.21</b>	10.97
	<i>n</i>	120	132	148	400
Income (TL)	<i>Std. Deviation</i>	4415	4136	4355	4299
	Mean	4295.59	4218.03	<b>4697.01</b>	4418.52
	<i>n</i>	120	132	148	400
Food expenditure (TL)	<i>Std. Deviation</i>	2226.88	2096.33	2411.85	2260.86
	Mean	<b>672.92</b>	645.83	659.32	658.95
	<i>n</i>	120	132	148	400
Total expenditure (TL)	<i>Std. Deviation</i>	265.52	296.61	268.76	276.84
	Mean	2389.04	2333.63	<b>2417.74</b>	2381.37
	<i>n</i>	120	132	148	400
Water consumption (liters)	<i>Std. Deviation</i>	1020.85	1000.31	927.38	978.50
	Mean	7.13	7.39	<b>7.47</b>	734
	<i>n</i>	120	132	148	400
	<i>Std. Deviation</i>	2631	2.48	2428	2505

\*Bold numbers indicate the highest socioeconomic and demographic variable values and frequencies

importance to drinking water hygiene. Similar to these results, it was been reported that hygiene was an important factor in the consumption of packaged and purified drinking water in India (Suganthi, 2014). In addition, it was pointed out that quality attributes such as taste and flavor, smell, clarity, and hygiene revealing the consumers' drinking water preferences was similar to the results found by Tümer *et al.* (2011) and Doria (2006).

The third factor explaining 11.74% of the total variance represented confidence in tap water. The factor covered in the variables such as city tap water preserving through treatment, and believing being safer than alternative drinking water supply sources. Pointing to the issue of treating the tap water in various ways and supplying it through reliable and healthy distribution systems, Liu *et al.* (2017) and Zlatanovic *et al.* (2017) highlighted that the water source and network distribution systems and their elements were effective on the physiochemical and microbiological quality of water.

The chemical quality of water, the fourth preference factor, explained 10.99% of the total variance. Good-quality potable water should include 250 mg calcium and 75 mg magnesium per liter; however, not only these ratios but also the PH levels for treated drinking water were lower. Similarly, the research conducted by Li and Wu (2019) emphasized that continuity of standardized essential nutrients and mineral substance amounts in drinking water's chemical quality was of great importance and had major effects on public health. Dönderici *et al.* (2010) also reported that drinking water's physical and chemical quality attributes had great importance in order to determine potable water resources deteriorating under the effect of various environmental factors. On the other hand, the fifth preference factor under tap water advantage explained 10.80% of the total variance, and thus the biggest advantage of fountain water was of a drinkable temperature without a real purchase cost versus a remarkable transfer cost. Indeed, it does not require an

effective cost by providing procurement cost advantage on the consumer demands due to the water being at a drinkable temperature and always accessible throughout all year. However, it could be exposed to significant problems through various storage and transport vehicles with various microbiological contaminations. Exploring these issues in detail, McGuinness *et al.* (2020) highlighted that transportation methods with closed systems from safe water sources should be investigated instead of using transportation and storage vehicles to be able to prevent various microbiological contaminants.

### The results of cluster analysis

Target consumer masses were segmented to three homogenous groups such as regions I, II, and III by considering the relationships among five main factors based on the consumers' drinking water consumption preferences and their residence neighborhoods. The distributions of their five preference factors in each homogeneous cluster were given in Table 3.

The ratios of the consumers residing in regions I, II, and III of Iğdır province were determined as 37% (148 households), 33% (132 households), and 30% (120 households), respectively (Figure 1).

The consumers residing in region I shaped the purchasing models responding to their physiological needs under drinking water's physical and physiological quality attributes. The consumers, therefore, aimed to maintain a healthy life with optimal drinking water consumption meeting their physiological needs by considering its physical and physiological qualities. For all these reasons, there was a significant demand for bottled water with higher physical quality and for purified tap water. In order to increase the water consumption satisfaction of the target group, therefore, it should expand the supply of bottled drinking water with high physical and

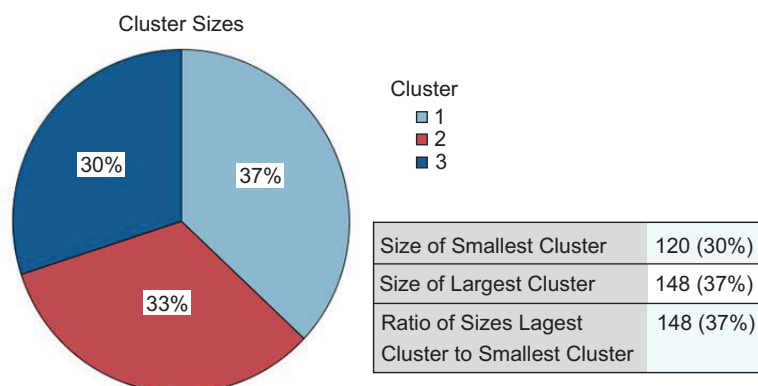


Figure 1. Cluster sizes and distributions.

physiological qualities, and focus on the sales of water with these quality attributes by retailers.

On the other hand, the consumers dwelling in region II formed their drinking water consumption preference patterns by considering the reliance on tap water depending on the chemical quality of water. They took an approach that prioritizes the consumption of treated tap water by taking into account the chemical quality parameters of drinking water. If tap water's chemical quality analyses could be frequently made, and the precautions to maintain its standard quality attributes could be taken by the local governments, the consumers' water consumption satisfaction could be increased dramatically.

Similarly, the consumers living in region III developed their preference models with the basic advantage of fountain water depending on water's chemical quality. They attributed a bigger importance to water temperature being a physical quality parameter, and tried to supply drinking water from fountains providing spring water with the higher quality features by accounting for its chemical quality parameters. Being lower of its supply costs, therefore, and providing alternative selection possibility to their consumers according to chemical quality attributes could create the significant advantages to target consumers. Being exposed to various microbiological contaminants of the vehicles used during transportation and storage of fountain waters, however, could cause a vital threat. Delivering to the target consumer masses through various closed mains lines of fountain waters with high chemical quality attributes could considerably increase their drinking water consumption satisfaction.

### The results of the consumer cluster profiles

Demographic and socioeconomic characteristics of three different homogenous consumer masses such as regions I, II, and III segmented by cluster analysis in Iğdır province are given in Table 4. The results of the frequency statistics showed that considering the gender demographics of the participants, men and women accounted for 49% and 51%, respectively. While the distribution of the women and men in regions II and III were equally analyzed, the proportion of the women in region I was determined as 52%.

When the consumers' occupational statuses in the research regions were analyzed, the ratios of the white-collar, housewives, workers, and students were determined as 29%, 20%, 16%, and 3%, respectively. While the white-collar predominate in all consumption regions, however, the housewives in region I, the workers in region II, and the students in regions II and III were of a bigger density.

On the other hand, the results of the descriptive statistics indicated that the average family size of the consumers residing in region I was 4.06 individuals and their average monthly food expenditure was 672.92 TL. They ranked the first, therefore, in terms of these results. Besides, the average age and education duration of the participants in region III reached the highest values with 37.71 and 11.21 years, respectively, average monthly income and total expenditure with 4697.01 and 2417.74 TL, respectively, and monthly water consumption amounted to 7.47 L. Those dwelling in region II were at the lowest levels, however, in terms of all socioeconomic factors (Table 4).

### Conclusion

The lack of substitution for water as a natural resource makes it an indispensable element for all living creatures throughout human history. In addition to the scarcity of water resources, increasing world population, industrialization, and intensive use of water in agriculture, as well as the negative effects of climate change on water resources make it difficult to access safer drinking water for people. Water consumption regimes, therefore, are regulated for crop and animal production in agricultural production, and alternation systems saving water are adopted. On the other hand, various saving and quality-enhancing measures have been implemented to make drinking water possible to people, and significant changes have occurred, therefore, in their attitudes and behaviors towards drinking water.

This study was planned to determine the factors affecting the attitude and behaviors of the consumers considering drinking water's quality characteristics toward its consumption, and to determine the consumption preferences of homogeneous consumer masses in Iğdır. In order to achieve this goal, the data obtained from face-to-face surveys with 400 consumers residing in Iğdır were used in FA and cluster analysis.

The research results indicated that the consumers with middle income, high food expenditure, and lower education levels under the lowest water consumption amount in region I tried to meet their physiological needs in a healthy way from bottled ready water and purified tap water by considering the microbiological and physical quality of drinking water. Similarly, it was determined that consumers in region II including mostly workers with water consumption amount at moderate levels under low income and food expenditure realized their drinking water consumption by considering the chemical quality parameters under the critical confidence interval values. It should be delivered sanitary drinking water to their residences by using the effective treatment systems at the tap water collection and distribution centers,



therefore, and thus it could be increased their consumption satisfaction by qualified drinking water by accounting the chemical quality parameters in the region II.

On the other hand, it was understood that the consumers with white collars consuming high-leveled water under high income and food expenditure in region III tended to supply sources according to tap water's chemical and physical quality attributes, and thus they could also provide the quality and cost advantages. These consumers could constantly be exposed to various microbiological contaminations depending on various transportation and storage modes utilized for transporting fountain waters with high physical and chemical quality. The local and administrative authorities could provide a bigger impact on consumption satisfaction of drinking water with high chemical and physical quality attributes under reliable and healthy mains lines, and thus various risk factors could also minimize. The research results, at the same time, could provide important information to relevant policy makers, especially local authorities, drinking water supply providers, and contributors to the planning of future water resources and supply.

## Acknowledgement

This work is supported by the Scientific Research Project Fund of Iğdır University under the project number 2019-FBE-A01.

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