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Attitudes and habits regarding drinking water in population of Tuzla canton

Selma Azabagic, Nadina Mokayes

Institute of Public Health of Tuzla Canton,
Tuzla, Bosnia and Herzegovina

Corresponding author:

Selma Azabagic, MD, PhD

Institute of Public Health of Tuzla Canton,
Tuzlanskog odreda 6, 75000 Tuzla, Bosnia and Herzegovina,
Phone: + 387 35 307 700

E-mail address: selma.azabagic@zjztk.ba

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Abstract

The safety and quality of drinking water are critical for human health and development. This study aims to assess the attitudes and habits of the general population regarding their choice of drinking water in Tuzla Canton, Bosnia and Herzegovina. This prospective cross-sectional study was conducted in September 2023. using a purpose-designed questionnaire. Participants from both urban and rural areas were selected through voluntary participation, ensuring anonymity. The statistical analysis was conducted using the SPSS software package, version 25. A comparative descriptive analysis was used. A total of 284 individuals participated from 13 cities within Tuzla Canton. Tap water is consumed by 55.3% of respondents, with 63.4% perceiving it as safe for drinking, while 43.3% of respondents re-

gard bottled water as the safest option. Sensory characteristics influence preferences, as 29.5% reported an unpleasant chlorine odor in municipal tap water, whereas 31% preferred the taste of bottled water. The majority (48.9%) identified the sanitary inspection authority as the primary institution responsible for ensuring drinking water quality. For health benefits, 38.7% of respondents view water from local springs and rural sources as the healthiest for drinking. The results underscore the need for programs to raise awareness about water quality, engage general public in water safety initiatives, and ensure comprehensive monitoring of drinking water quality.

Keywords: drinking water; water quality; attitudes; habits.

INTRODUCTION

Access to safe drinking water is essential for life and is recognized as a fundamental human right by the United Nations since 2010. According to WHO data, 10% of the global population lacks access to such resources [1]. Drinking water safety and quality are key indicators of public health, regardless of its use for drinking, food production, or recreational purposes. In 2022, at least 1.7 billion people were using water sources contaminated with fecal matter [2].

Among other diseases, waterborne infections cause diarrhea, resulting in nearly a million deaths each year, most of whom are children under five years of age. According to the Water Management Strategy of the Federation of Bosnia and Herzegovina (2010–2022), 60% of the population in this region receives water from public water supply systems, where continuous monitoring ensures its health safety. Coverage in urban areas is 94%, while in rural areas, it is significantly lower,

at 20%. The remaining population relies on individual, group, or local water supplies not managed by public utility companies. In many cases, sanitary (protective) zones for these sources are either inadequately established or absent, and chlorination is rarely practiced [3].

Drinking water resources are gradually diminishing, and availability is expected to decrease due to population growth, urbanization, and climate change [4]. Recent estimates by Mohsin et al. indicate that water quantities are significantly declining in developing countries in South Asia, the Middle East, and Africa [5]. Freshwater quality is rapidly deteriorating due to deforestation, soil erosion, rapid urbanization, and other forms of land degradation. Water quality perceptions are often based on sensory attributes such as appearance, taste, color, and odor. The actual quality of water has little influence on public perception. Consumers' opinions on water quality can significantly impact their water consumption habits. Consumers may choose between various water sources based on their perception

of water quality; for instance, they may prefer bottled water or public fountains over tap water at home. Besides the impact of water quality on human health, the amount of water consumed is also crucial. Water intake below the recommended level can lead to dehydration and is associated with metabolic health complications [6]. Factors such as age, sex, physical activity, body size, and environmental conditions (e.g. temperature) affect daily water intake. Low plain water intake is also associated with a higher prevalence of chronic kidney disease [7]. Furthermore, inadequate water intake is linked to an increased risk of developing hyperglycemia [8] and may elevate the risk of type II diabetes [9]. Prospective studies assessing the impact of increased water intake on the development of these diseases are still in their early stages [10]. Research shows that public opinion on water quality is crucial for water management [11]. Better understanding of factors affecting water quality can improve public awareness and help prevent water pollution. UNICEF's WASH (Water, Sanitation, and Hygiene) sector emphasizes that household water safety is a critical effort [11].

Public health surveillance of drinking water in the Federation of Bosnia and Herzegovina is not entirely satisfactory. A unified registry of local water supply facilities does not exist, preventing a comprehensive overview of the water supply system and measures for improving water supply quality. Local water supplies managed by public utilities and public health institutes generally have only the first sanitary protection zone defined, with regular monitoring and chlorination of drinking water. In most individual local supply facilities (wells, uncapped springs, cisterns, and water tanks), drinking water is not monitored for health safety, chlorination is generally not performed, and sanitary protection zones are not established.

This study aims to assess the attitudes and habits of the general population regarding their choice of drinking water in Tuzla Canton, Bosnia and Herzegovina.

METHODS

To assess the public perception of drinking water quality, a survey questionnaire titled "Attitudes Toward Drinking Water Quality" was created and distributed via the Google Forms platform from January to September 2023. The survey link was promoted through the Institute's website and Facebook page. The questionnaire comprised 11 questions, with 4 questions focused on demographic data and 7 questions addressing water consumption habits, perceptions of water quality, sensory characteristics, institutional responsibility, and drinking water safety. Statistical analysis was conducted using the SPSS software package, version 25, and a comparative descriptive analysis was applied.

RESULTS

The survey was completed by 284 citizens, of which 70.4% (200) were women and 29.6% (84) were men, 32.4% (92) aged between 18 and 25, and 32.4% (92) aged between 26 and 40, 7% (93), between 41 and 65 years 33.8% (96) and older than 65 years 1.1% (3) (**Table 1**). The ratio of urban to rural population is as follows: 74.3% (211):25.7% (73). Level of education: 64.4% (183) of respondents completed high school, 21.8% (62) completed secondary school, 13% (37) master's degree/doctorate and 0.7% (2) completed elementary school.

Table 1. Distribution by gender and age.

Gender	Age				Total	p
	18– 25	26–40	41–65	> 65		
Male	19	30	32	3	84	0,05
Female	73	63	64	0	200	
Total	92	93	96	3	284	

Water consumption habits were assessed based on three types of water sources: municipal tap water, bottled water, and local sources (natural springs/rural water systems/public fountains). Tap water is consumed by 55.3% (157) of respondents, while 18.3% (52) do not drink tap water. Regarding bottled water, 23.2% (66) drink it several times daily, 23.6% (67) several times per week, 15.1% (43) once weekly, 13.7% (39) several times per month, 15.1% (43) once per month, and 9.5% (27) do not drink bottled water. Consumption from local sources/springs/public fountains is as follows: 29.2% (83) several times daily, 5.3% (15) several times per week, 8.1% (23) once per week, 9.2% (26) several times per month, 16.2% (46) once per month, and 32.4% (92) do not drink water from these sources.

Most respondents, 63.4% (180), believe that tap water in their household is safe for drinking. When asked about monitoring practices, 77.8% (221) believe that municipal water quality is monitored, 78% (227) think bottled water quality is monitored, while 57.4% (163) believe that water from local sources/rural systems/public fountains is not monitored (**Table 2**). Sensory attributes of water reveal that tap water from the municipal supply is reported to have an unpleasant chlorine odor by 29.5% (84) of respondents, while bottled water is preferred in taste by 31% (88) of respondents. Furthermore, 22.5% of respondents perceive turbidity in water sourced from local springs. The response "I believe everything is fine" was most frequently associated with bottled water at 49% (139), followed by local springs, rural water sources, or public fountains at 28.2% (80), and municipal tap water at 18.3% (52).

Table 2. Monitoring public water supplies.

Monitoring public water supplies	Frequency	Valid Percent %	Cumulative Percent %
Yes	221	77,8	77,8
No	63	22,2	22,2
Total	284	100,0	100,0

Regarding the institution responsible for drinking water quality, the majority—48.9% (139)—identified the sanitary inspection authority. Concerning drinking water safety, most respondents consider bottled water to be the safest at 43.3% (123), followed by municipal tap water at 34.9% (99). In terms of health benefits, 38.7% (110) of the population perceives water from local springs, rural sources, or public fountains as the healthiest for drinking, while 30.3% (86) believe this applies to municipal tap water.

DISCUSSION

Satisfaction with drinking water quality has been assessed in several studies [13-14]. Residential location can influence access to various water sources and thus shape residents’ perceptions, as evidenced by a notable proportion (18.3%) of respondents who do not drink municipal tap water due to its unavailability.

A 2016 study conducted on 400 residents of Gonabad, Iran, found that negative perceptions of water quality were often attributed to undesirable taste (60.7%), turbidity (27.8%), foaming (11.1%), or other reasons (0.4%). This study also highlighted a relationship between demographic factors and perceived safety of tap water, showing that educated women in Iran expressed higher satisfaction with tap water quality [15]. The Iranian study suggests that characteristics influencing individuals’ decisions about drinking water quality are not linked to race or other cultural and geographical differences [15]. A high level of education among most consumers can positively influence awareness of water quality, as shown in studies conducted in China [16]. Perception of water quality depends on multiple factors. A review of the literature indicates that perceptions of water quality often rely on organoleptic parameters (appearance, taste, color, and odor). Negative perceptions of tap water quality frequently lead people to consume bottled water, thereby spending money on filters or choosing sweetened, unhealthy beverages instead of water. Those who use bottled water are more likely to express unfavorable attitudes toward tap water.

Some studies show that people dissatisfied with tap water quality from centralized sources often turn to bottled water [17-18], similar to findings in our research, where 43% of consumers choose bottled water for safety reasons. Despite the widespread belief that bottled water is safer and tastes better than tap water, an assumption examined by numerous studies, this belief is not necessarily accurate [19-20]. Research also shows that the sale and consumption of bottled water can have adverse environmental and social impacts [21-22]. Studies from Europe link water quality perception to the entities managing the water supply. It has been found that water sources managed by public enterprises correlate with higher satisfaction regarding water quality, compared to private sources, as seen in countries like Spain and Italy. In these countries, one of the most significant findings is that privatized water facility management has led to a decrease in user satisfaction with water quality [23].

Microbial contamination is the leading cause of waterborne diseases worldwide. However, chemicals in water supplies may also pose health risks. Some studies warn that pregnant women consuming water with high concentrations of trihalomethanes may face a greater risk of low birth weight for gestational age and premature birth [24]. The majority of 48.9% (139)—identified the sanitary inspection authority as responsible for drinking water quality. Similar awareness was noted among consumers in studies by Crampton and colleagues [25]. Trust in local water management authorities was expressed by one-third of respondents, contrasting with consumer opinions regarding municipal water in Australia and New Zealand [26-27].

CONCLUSION

Water is essential for human health and life. Access to safe water supplies is a matter of public health concern and of importance to every consumer. Future research on public perceptions regarding water quality and drinking habits could focus on how information about water quality is communicated to the population and how this affects their perceptions and habits. Exploring these aspects could provide valuable insights for improving water supply, developing educational campaigns on water safety, and better understanding consumers’ needs regarding drinking water. Such research can also be beneficial for informing policy decisions and investments in the water supply sector.

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Stavovi i navike stanovništva Tuzlanskog kantona u korištenju pitke vode

Selma Azabagic, Nadina Mokayes

Zavod za javno zdravstvo Tuzlanskog kantona,
Tuzla, Bosna i Hercegovina

Kratak sadržaj

Sigurnost i kvalitet vode su fundamentalni za ljudski razvoj i dobrobit. Cilj rada je procijeniti stavove i navike opšte populacije kada je u pitanju izbor vode za piće u Tuzlanskom kantonu, Bosna i Hercegovina. Upitnikom kreiranim za ovu

svrhu provedena je studija među opštom populacijom urbanih i ruralnih sredina u septembru 2023. godine. Izbor ispitanika je baziran na dobrovoljnom anketiranju uz poštivanje anonimnosti svakog ispitanika. Statistička obrada podataka je urađena u programskom paketu SPSS verzija 25. Korištena je komparativna deskriptivna analiza. Ukupan uzorak ispitanika je uključio 284 ispitanika, iz 13 gradova/opština Tuzlanskog kantona. Vodu iz gradskog vodovoda konzumira 55.3% ispitanika, od kojih 63.4% smatra da je sigurna za piće, dok 43.3% ispitanika flaširanu vodu smatra najsigurnijom opcijom. Senzorske karakteristike utiču na preferencije, pa je 29.5% prijavilo neugodan miris hlora u vodi iz gradskog vodovoda, dok 31% preferira ukus flaširane vode. Većina ispitanika (48.9%) identificirala je sanitarnu inspekciju kao glavnu instituciju odgovornu za osiguranje kvaliteta vode za piće. Zbog zdravstvenih koristi, 38.7% ispitanika smatra da je voda iz lokalnih izvorišta, seoskih vodovoda ili javnih česama najzdravija za konzumaciju. Rezultati istraživanja podstiču programe koji će poboljšati svijest o značaju vode, informisanje i uključivanja samih stanovnika u programe, kao i monitoring kontrole kvaliteta pitke vode.

Ključne reči: voda za piće; kvalitet; stavovi; zdravlje.