International Journal of Multiphysics
Volume 18, No. 4, 2024
ISSN: 1750-9548

Assessing Water Consumption Behavior and Access to Clean Drinking Water in Punjab, Pakistan

Ayesha Hussain[1], Imama Ahmad[2], Airaj Riaz[3], Sara Khalid[4], Muhammad Ali Tarar[5], Saba Irum Malik[6]

1. Lecturer, Department of Economics, Govt. College Women University Faisalabad.
2. CMH Institute of Medical Sciences, Multan, Punjab, Pakistan.
3. Lecturer, Department of Sociology, National Law College, Lahore.
4. Lecturer, Department of Economics, Lahore College for Women University, Lahore.
5. Associate Professor, Department of Sociology, Ghazi University, Dera Ghazi khan.**
6. Lecturer, Department of Economics, Allama Iqbal Open University, Islamabad.

****Corresponding Author**: alitarar2000@yahoo.com

ABSTRACT

We can't deny the importance of water for human survival. Our bodies are 75% water, and we need it for many bodily functions. The scarcity of fresh water is a worldwide problem. Insufficient supply of clean water and improper management of water are causing a significant decline in freshwater sources. In the past, Pakistan was a country with excess water sources, but now we're marching towards insufficient fresh water. In 2007, water needed for non-irrigation purposes in Pakistan was approximately 8.5 billion, and the demand is estimated to grow 11.2 billion cubic meters by 2025. A 1.5% increase in water demand is attributed to overpopulation and an increase in industries. City areas of Faisalabad have the convenience of fresh water. 89% of drinking water is available (Bureau of Statistics Punjab). There is a need to observe water utilization habits so we can dodge the depletion of clean water. This study was organized to observe and analyze the clean water utilization habits of the masses. This study is Quantitative. A questionnaire of 50 questions was formulated to gather social and economic information and analyze the knowledge of the masses regarding clean water consumption. For online data collection, Google Forms were used. The sample size of this study was 150. Univariate, Bivariate, and Multivariate analyses were made with the help of SPSS. This study deduced there is an inverse relation between independent variables like (Family income, Number of individuals in a family, Type of family, and Amount of water consumed in different activities) and dependent variables (Accessibility to water). This research also concluded a direct relationship between Understanding Water consumption (independent variable) and access to clean water (independent and dependent variable).

Water is indispensable for human survival, comprising approximately 75% of the human body and facilitating various essential physiological functions. Despite its critical importance, freshwater scarcity is a growing global crisis, exacerbated by inadequate water management and insufficient clean water supply. Pakistan, once abundant in freshwater resources, now faces an impending shortage. In 2007, the country required approximately 8.5 billion cubic meters of water for non-irrigation purposes; this demand is projected to rise to 11.2 billion cubic meters by 2025, with a 1.5% annual increase driven by rapid population growth and industrial expansion. Urban areas, such as Faisalabad, have better access to drinking water, with 89% availability (Bureau of Statistics Punjab). However, conserving this resource remains essential to avoid further depletion.

Aligned with **Sustainable Development Goal (SDG) 6**, which seeks to ensure universal access to clean water and sanitation, this study investigates clean water usage habits to foster sustainable water management. Using a quantitative approach, data were collected through a 50-item questionnaire via Google Forms, sampling 150 participants to assess social, economic, and knowledge-based variables related to water consumption. Analysis was conducted with SPSS, applying univariate, bivariate, and multivariate methods. Findings indicate an inverse relationship between family income, family size, type of family, and water consumed in different activities (independent variables) and access to clean water (dependent variable). Additionally, a direct relationship was identified between individuals' awareness of water consumption and their accessibility to clean water. This study highlights critical insights for supporting SDG 6, emphasizing the need for improved water utilization habits to preserve Pakistan's freshwater resources.

Keywords: Water Scarcity, Clean Water, Water Consumption, SDG 6, Water Management

INTRODUCTION:

Adequate clean water resources are very crucial for the existence and growth of mankind. With our country leaning towards the shortage of clean water resources, it becomes integral to study the water utilization habits of the masses and their social and economic impacts. This study focuses on shedding light on the water utilization habits of people living in Faisalabad, Punjab, Pakistan. This study investigates how access to clean drinking water impacts water utilization behaviors.

Background: Pakistan is a country with a steppe climate, water accessibility varies with seasonal changes in Pakistan. Water reserves of Pakistan are rapidly depleting due to overpopulation, an increase in towns and cities, and drastic weather changes. Depletion of freshwater resources has become a serious issue in both village and city areas. Faisalabad is one of the biggest industrial cities in Pakistan, and it depicts how problems associated with water management in Pakistan are critical issues needing immediate interventions.

Access to Water in Pakistan, Specifically Faisalabad: Pakistan suffers from an unequal dispersal of fresh-water resources, dry regions face greater water shortages. Faisalabad city, the center of economy and industry, encounters unique challenges regarding water scarcity. Previously main supply of Faisalabad city's water was man-made canal channels and underground aquifers. However, these sources can no longer fulfill the increasing demands of the population and industries.

The availability of clean drinking water to the residents of Faisalabad is a matter that needs immediate attention. The architecture of the city is old and fails to provide a solution for an increased water demand. Flawed infrastructure gives rise to issues like obstruction in water supply and substandard quality of water. Insufficient and contaminated water supply in some areas has accentuated the need for a deep dive into water availability and water utilization habits.

Water Quality Status of Faisalabad: Water quality affects the overall health and welfare of residents of Faisalabad. The water sources of the city are usually polluted with waste from industries, agriculture, and even sewage. High-risk substances like toxic metals and harmful bacteria can give rise to deadly diseases. Government and non-government organizations have taken steps to enhance the quality of water via chemical treatments and other measures, but despite these efforts, the results are subpar.

Water Consumption in Faisalabad: Water utilization habits in Faisalabad are affected by elements like access to water, water standards, and social and economic circumstances. In city areas where the availability of clean drinking water is unpredictable, people acquire clean drinking water from private companies or opt for bottled water, these alternatives are cost-prohibitive. The social and economic status of a family influences their water usage behaviors. Rich families have easy access to clean drinking water as compared to poor families with limited resources.

Fig1. Hierarchy of Minimum Water Requirements for Domestic Uses

Source: World Health Organization Report (2006).

To comprehend social aspects of water usage in Faisalabad we need to take a comprehensive approach. This entails analyzing the water usage habits of the population and how they are influenced by the availability of fresh water. Furthermore, we should investigate how water quality and availability affect water usage behaviors.

This study intends to analyze the social aspects of water usage in Faisalabad. The goal of the study is to understand water management within the city and how we can improve it to meet the needs of the growing population and industries. The study examines the connection between water usage patterns, water quality, and access to clean water.

RESEARCH OBJECTIVE:

- To analyze the social and economic rank of the candidates participating in this study.
- To assess the factors that impact freshwater usage behaviors.
- To examine the water consumption habits of the candidates participating in this study.
- To determine practical methods to facilitate reasonable freshwater utilization techniques.

THEORETICAL FRAMEWORK:

This research was carried out in the light of the Theory of Planned Behavior (TPB; Ajzen, 1988). According to TPB, a person's demeanor can be foretold by their intentions or willingness to perform a specific action. If one performs an action with strong intention, there is a greater likelihood that the behavior will be successful (Ajzen, 1991).

According to TPB, intentions are predicted by mindset towards the behavior, acceptance of behavior by others (subjective norms), and an individual's power over carrying out that behavior (perceived behavioral control; Ajzen, 1988, 1991). TPB has been remarkably used to foresee the water utilization behaviors of families (Clark & Finley,2007; Lam, 2006).

LITERATURE REVIEW:

Javed and Iqbal (2017) published a summary of social and traditional aspects that affect water usage in Faisalabad in 2017. Their study highlighted the traditional norms and social status that impact the water utilization habits of the residents of Faisalabad and helped us to comprehend the water usage habits of locals.

Shah and Zaman (2018) debated how traditional practices impact water consumption habits in Pakistan. They emphasized that social influence and local practices change one's water usage behavior. Their research gave a better understanding of the influence of social factors on water usage habits in Pakistan.

Niazi and Tariq (2018) investigated the mindsets of the general population about water management approaches in Faisalabad. Their research disclosed the sociological aspects that impact the general population's thoughts and

approaches to water management in Faisalabad. They gave us a deeper understanding of how the behavior of society molds water usage habits.

Ali and Jamil (2019) studied societal norms and traditions regarding water-saving behaviors in Faisalabad. Their study disclosed that awareness and education about water conservation and management helped impact the water consumption behaviors of the masses. This study emphasized how awareness about the subject can change water usage habits.

Mustafa and Raza (2020) examined the impact of clean water availability on the health and demeanor of people in Pakistan. Their research delved into how the availability of clean water affects people's physical health and behaviors, providing valuable insights into the social factors of water usage.

Mullan and Wong (2020) investigated how social norms and practices impact water usage behaviors. Their study emphasized that water usage behaviors are influenced by traditional practices, availability of water, and awareness about water shortage. These important discoveries should be considered when creating of laws regarding water consumption practices.

Khan and Ahmed (2021) studied the influence of freshwater shortage on social and economic elements in Punjab, Pakistan. The study revealed that socioeconomic activities in rural areas are drastically influenced by the restricted availability of freshwater. Their study discloses the influence of clean water storage on social activities in Faisalabad.

Haider and Khan (2022) investigated the impact of water availability variations on water usage behaviors in residents of the city of Faisalabad. Their research shows a positive link between water supply levels and transformations in water consumption habits, providing practical data relevant to our research.

METHODOLOGY:

For this research, we collected data online via Google Forms. All individuals participating in this study lived in Faisalabad and got their water supply through WASA. Data was collected from 150 participants. Obtained data was then analyzed with the help of Statistical Package for the Social Sciences (SPSS). Univariate, bivariate, and multivariate methods were used to analyze and interpret important points from collected data.

RESULTS AND DISCUSSIONS:

Uni-Variate Analysis

Approximately 66% of the participants were male. The majority of these males were highly qualified and had an MPhil or Master's degree. Most of these individuals were bachelors and lived in a household with 5 to 8 family members. All of the participants were earning more than 80,000 per month.

The majority of these individuals lived in 5 Marla or smaller houses and belonged to a nuclear family setup. Only a few were living in the joint family system. The majority of participants obtained water supply from a municipal system, and some of them had electronic pumps to retrieve groundwater. Participants who were dependent on WASA for water supply complained that they get water supplied for only half an hour a day. The majority reported that the water tasted salty, only a small group said the water in their homes had a sweet taste. There was an overall disappointment regarding water availability and quality among respondents.

The majority of respondents disclosed that they receive their water supply from WASA only two times in day for about 30 or 40 minutes. 50% of the respondents said the color of the water in their homes was fine, while some claimed the color was not up to the mark. While the majority complained that the water pressure they receive is

not good enough, a small portion of respondents claimed it was adequate. 33% of the participants reported that the public water is not clean enough for drinking purposes.

When participants were inquired about their perceived reasons for water scarcity, more than 50% claimed it was due to overpopulation, some groups believed it was due to poor water management techniques, and some stated that it was due to improper water utilization habits. The majority of participants claimed they have never come across any awareness campaigns about water saving, and never interacted with government or non-government organizations regarding water consumption. 50% of the participants disclosed that they use bottled water for drinking purposes and the other half utilized water supply from WASA for cooking and other household chores. More than half of the respondents claimed that they don't use the water supply from WASA for gardening and in their washrooms. The majority claimed they try their best to save water by turning off the tap while brushing and doing laundry. In conclusion, most of the respondents claimed to have responsible water consumption behaviors.

Bi-Variate Analysis

- **Hypothesis #1: More the Household Income Less will be the satisfaction about the Availability of Water**

Household Income of the respondent. (Monthly)* Availability of Water Cross tabulation							
Household Income of the respondent. (Monthly)		**Availability of Water % (Frequency)**					
		Excellent	**Very Good**	**Good**	**Poor**	**Very Bad**	**Total**
1	**up to 20,000**	38.1(8)	42.9 (9)	0.0 (0)	(4.8) 1	(14.3) 3	**100.0 (21)**
2	**40,000**	0.0 (0)	7.1 (2)	60.7 (17)	14.3 (4)	17.9 (5)	**100.0 (28)**
3	**60,000**	0.0 (0)	0.0 (0)	36.4 (12)	54.5 (18)	9.1 (3)	**100.0 (33)**
4	**80,000**	0.0 (0)	0.0 (0)	0.0 (0)	82.4 (28)	17.6 (6)	**100.0 (34)**
5	**Above 80,000**	0.0 (0)	0.0 (0)	0.0 (0)	94.1 (32)	5.9 (2)	**100.0 (34)**
Total		**5.3 (8)**	**7.3 (11)**	**19.3 (29)**	**55.3 (83)**	**12.7 (19)**	**100.0 (150)**
Chi-Square: 174.483, Sig. Level: 0.000, Gamma: -0.600, Sig. Level: 0.000							

Research has shown that upper and middle-class families tend to consume and waste more water as compared to low-income families. In areas where high-income families live, there is often greater water scarcity due to improper water usage behaviors. Wealthier households tend to have a lifestyle that does not prioritize water conservation.

R. J. Renwick and S. M. Green published research in **2023**, depicting that wealthier households are associated with more water wastage and poor water consumption habits. This is probably due to the use of water-consuming machines and elevated lifestyle. This ultimately leads to water scarcity per unit population, concluding that wealthier households are linked to greater water consumption resulting in water shortage.

Hypothesis #2: **large family size negatively affects the Availability of Water**

Total number of family members living in home *Availability of Water Cross tabulation						
Total number of family members living in home	**Availability of Water**					
	Excellent	**Very Good**	**Good**	**Poor**	**Very Bad**	**Total**

1	**1-4**	46.7 (7)	0.0 (0)	0.0 (0)	40.0 (6)	13.3 (2)	100(15)
2	**5-8**	1.06 (1)	11.7 (11)	30.8 (29)	50 (47)	6.38 (6)	100 (94)
3	**Above 8**	0.0 (0)	0.0 (0)	0.0 (0)	73.2 (30)	26.8 (11)	100(41)
Total		**5.3 (8)**	**7.3 (11)**	**19.3 (29)**	**55.3 (83)**	**12.7 (19)**	**100.0 (150)**
Chi-Square: 115.364, Sig. Level: 0.000, Gamma: -0.704, Sig. Level: 0.000							

During our research, we found that number of family members living in a house and the number of taps and faucets in a house could give an idea of water usage in that particular house. So the number of people living in a house and the faucets in a house were directly related to water usage in that house. It was also observed that the literacy level of individuals in a house was inversely related to the amount of water consumption in that house.

The results of our research were in agreement with the research performed by **K. D. V. Boswell et al. in 2022**, stating that bigger houses with more taps and faucets, and a large number of family members were associated with increased water consumption. **K. D. V. Boswell** concluded in their research that a large number of family members and faucets in a house lead to increased water usage. Moreover, it was also seen that the literacy levels of individuals inhabiting a household were an important factor in water conservation, showing that highly educated individuals participate in mindful water consumption and practice water-saving techniques.

Hypothesis #3: Large Size of House (in Marla) Negatively affects the Availability of Water

Size of House (in Marla)							
Size of House (in Marla)		**Availability of Water**					
		Excellent	**Very Good**	**Good**	**Poor**	**Very Bad**	**Total**
1	**Up to 5**	10.4 (8)	14.3 (11)	37.7 (29)	28.6 (22)	9.1 (7)	**100 (77)**
2	**6-10**	0.0 (0)	0.0 (0)	0.0 (0)	81.0 (47)	19.0 (11)	**100 (58)**
3	**11 and above**	0.0 (0)	0.0 (0)	0.0 (0)	93.3 (14)	6.7 (1)	**100 (15)**
Total		**5.3 (8)**	**7.3 (11)**	**19.3 (29)**	**55.3 (83)**	**12.7 (19)**	**100 (150)**
Chi-Square: 69.331, Sig. Level: 0.000, Gamma: -0.736, Sig. Level: 0.000							

Our research indicated that factors like the number of family members and the age of the main provider of the family played an important role in the water consumption habits of that house. Moreover, we found that houses that had gardens and watered them regularly had a higher usage of water.

The results from our research were in correlation with a study carried out by **H. K. Larson et al.** in **2016**, both concluding that the size of the house, number of individuals living in the house, and age of the main provider of the house all had a huge influence on the water consumption of the household. Their research also revealed that houses including a garden area were consuming more water in comparison to houses without gardens. Moreover, the size of the garden and how often the garden is being watered also played a significant role in the water usage

of that house. Our research also supports the fact that the size of the house and whether there is a garden in the house, are both significant factors in the water consumption of that house. It also emphasizes how these factors interplay to affect the overall water usage of the house.

- **Hypothesis #4**: **Traditional Family Type of Respondent negatively affects the Availability of Water**

Family Type of Respondent. * Availability of Water Cross tabulation							
Family Type of Respondent.		**Availability of Water**					
		Excellent	**Very Good**	**Good**	**Poor**	**Very Bad**	**Total**
1	**Nuclear**	9.9 (8)	13.6 (11)	35.8 (29)	32.1 (26)	8.6 (7)	**100.0 (81)**
2	**Joint**	0.0 (0)	0.0 (0)	0.0 (0)	82.8 (48)	17.2 (10)	**100.0 (58)**
3	**Extended**	0.0 (0)	0.0 (0)	0.0 (0)	81.8 (9)	18.2 (2)	**100.0 (11)**
Total		**5.3 (8)**	**7.3 (11)**	**19.3 (29)**	**55.3 (83)**	**12.7 (19)**	**100.0 (150)**
Chi-Square: 60.328, Sig. Level: 0.000, Gamma: -0.768, Sig. Level: 0.000							

The table above indicates that a large number of family members residing in a household is associated with increased water consumption, which can ultimately lead to water scarcity. These findings align with numerous studies that have explored the effect of larger families on water usage.

Mehta and Sharma (2018) also agreed that the water consumption of a household is greatly influenced by the availability of water and the presence of a functioning garden in the house. Additionally, the water consumption habits of a household are also significantly affected by how old is the head of household and how many family members are living in that house. Mehta and Sharma (2018) also investigated how the demography of a household and water management techniques can affect water availability overall. It was abundantly clear from their research that households with more family members and older household heads complained of decreased water availability. The reason is poor water management techniques and increased water usage.

Awareness regarding water * Availability of Water Cross tabulation							
Awareness regarding water		**Availability of Water**					
		Excellent	**Very Good**	**Good**	**Poor**	**Very Bad**	**Total**
1	**Not all**	50.0 (5)	10.0 (1)	10.0 (1)	30.0 (3)	0.0 (0)	**100.0 (10)**
2	**To a Small Extent**	1.9 (1)	14.8 (8)	46.3 (25)	37.0 (20)	0.0 (0)	**100.0 (54)**
3	**To a Large Extent**	2.3 (2)	2.3 (2)	3.5 (3)	69.8 (60)	22.1 (19)	**100.0 (86)**
Total		**5.3 (8)**	**7.3 (11)**	**19.3 (29)**	**55.3 (83)**	**12.7 (19)**	**100.0 (150)**
Chi-Square: 100.983, Sig. Level: 0.000, Gamma:0.823, Sig. Level: 0.000							

- **Hypothesis 5#**: **More the Awareness regarding water shortage more will be the Availability of water**

The table above illustrates a positive correlation between awareness and education about water scarcity issues and water availability. The chi-square value of 100.983 ($p < 0.001$) indicates a strong relation and a Gamma value of 0.823 ($p < 0.001$) demonstrates a direct relation between awareness and education about the issue (independent variable) and water availability (dependent variable).

Grafton et al. (2011) supported this conclusion in their study, they discovered that by educating the masses about water scarcity issues and water conservation techniques, water availability and management can be drastically improved. Grafton et al. reported in their research that educating and spreading awareness about water scarcity and how to conserve water ultimately leads to higher water availability and more mindful water consumption. Significant evidence shows that more educated and informed masses practice mindful water consumption and adopt water conservation practices ultimately leading to better water availability.

- **Hypothesis #6**: **More the use of WASA supplied water other than Drinking purposes less will be the Availability of Water**

Household use WASA water for (Drinking, Cooking Laundering, Bathing Toilet Flushing, Flower Watering, Motor bike/Car Washing, Home Sanitation) * Availability of Water Cross tabulation							
Household use WASA water for (Drinking, Cooking Laundering, Bathing Toilet Flushing, Flower Watering, Motor bike/Car Washing, Home Sanitation)		**Availability of Water**					
		Excellent	**Very Good**	**Good**	**Poor**	**Very Bad**	**Total**
1	**Never**	7.5 (6)	11.3 (9)	25.0 (20)	47.5 (38)	8.8 (7)	**100.0 (80)**
2	**Occasionally**	5.1 (2)	2.6 (1)	10.3 (4)	82.1 (32)	0.0 (0)	**100.0 (39)**
3	**Always**	0.0 (0)	3.2 (1)	16.1 (5)	41.9 (13)	38.7 (12)	**100.0 (31)**
Total		**5.3 (8)**	**7.3 (11)**	**19.3 (29)**	**55.3 (83)**	**12.7 (19)**	**100.0 (150)**
Chi-Square: 38.544, Sig. Level: 0.000, Gamma: -0.453, Sig. Level: 0.000							

The table given above indicates that there is a strong negative association between water availability and water consumption. A chi-square value of 38.544 ($p < 0.001$) denoted a substantial relation between these two variables i.e. water availability and water usage. A Gamma value of -0.453 ($p < 0.001$) denotes an antagonistic relationship between these two variables. The table denotes that more water consumption for household chores and bathing activities consequently leads to decreased water availability.

These results are aligned with the study of Chao and Huang (2020), in which they analyzed the influence of water usage habits on water reserves. Their study revealed how increased consumption of water for diverse activities causes a reduction in water reserves. It also confirmed the antagonistic association between water consumption and water availability. Moreover, they stressed that better water management techniques can solve water scarcity issues to a great extent.

- **Hypothesis #7: More the water Consumption on following activities (Brushing teeth, taking a shower, washing clothes, Dish washing) Less the Availability of Water**

More the water Consumption on following activities (Brushing teeth, taking a shower, washing clothes, Dish washing * Availability of Water Cross tabulation							
Consumption Behavior of water on following activities (Brushing teeth, taking a shower, washing clothes, Dish washing)		**Availability of Water**					
		Excellent	**Very Good**	**Good**	**Poor**	**Very Bad**	**Total**
1	**Close the tap**	12.8 (6)	21.3 (10)	51.1 (24)	10.6 (5)	4.3 (2)	**100.0 (47)**
2	**Both, it depends**	2.0 (1)	0.0 (0)	5.9 (3)	82.4 (42)	9.8 (5)	**100.0 (51)**
3	**Let water run all the time**	1.9 (1)	1.9 (1)	3.8 (2)	69.2 (36)	23.1 (12)	**100.0 (52)**
Total		**5.3 (8)**	**7.3 (11)**	**19.3 (29)**	**55.3 (83)**	**12.7 (19)**	**100.0 (150)**
Chi-Square: 93.982, Sig. Level: 0.000, Gamma: -0.746, Sig. Level: 0.000							

The table above indicates that elevated water usage is associated with decreased water availability per capita. It also shows how water usage differs with the size of the house, the number of family members in a household, and their water consumption behavior. Taking a bath was the single most water-consuming activity in independent households. The results of our research are compatible with a study conducted by Verhoeven et al. (2020), which claimed that bigger houses have a higher rate of water consumption as compared to smaller houses or apartments. Their study also verified that taking a shower or bath is the most water-wasting activity.

Moreover, the results of our research also correlate with studies done by Goss, Alford, and Olsson in 2019, all demonstrating how water usage is affected by the type of house, size of house, number of individuals in a household, and water availability. Their research also claims that bigger houses consumed drastically more water per unit, especially for activities like bathing and gardening. Hence, the size of the house affects water consumption a great deal. These water consumption behaviors ultimately lead to decreased water availability per unit.

Hypothesis #8: Behavior of More water Consumption for the following purposes (Dish Washing, Bathroom Cleaning, House Cleaning, Cloth washing, Washing Vehicles, Watering Plants, Watering Lawns) less will be Availability of Water

Consumption Behavior of water for the following purposes (Dish Washing, Bathroom Cleaning, House Cleaning, Cloth washing, Washing Vehicles, Watering Plants, Watering Lawns) * Availability of Water Cross tabulation	
Consumption	**Availability of Water**

Behavior of water for the following purposes (Dish Washing, Bathroom Cleaning, House Cleaning, Cloth washing, Washing Vehicles, Watering Plants, Watering Lawns)		Excellent	Very Good	Good	Poor	Very Bad	Total
1	**Thrice a day**	66.7 (2)	0.0 (0)	0.0 (0)	33.3 (1)	0.0 (0)	**100.0 (3)**
2	**Once a day**	21.1 (4)	52.6 (10)	15.8 (3)	0.0 (0)	10.5 (2)	**100.0 (19)**
3	**Few times a week**	0.0 (0)	0.0 (0)	79.3 (23)	13.8 (4)	6.9 (2)	**100.0 (29)**
4	**Few times a Month**	1.1 (1)	0.0 (0)	1.1 (1)	85.7 (78)	12.1 (11)	**100.0 (91)**
5	**Never**	12.5 (1)	12.5 (1)	25.0 (2)	0.0 (0)	50.0 (4)	**100.0 (8)**
Total		**5.3 (8)**	**7.3 (11)**	**19.3 (29)**	**55.3 (83)**	**12.7 (19)**	**100.0 (150)**
Chi-Square: 217.723, Sig. Level: 0.000, Gamma:0.684, Sig. Level: 0.000							

The table above clearly denotes that income levels have a close link with readiness to pay for higher water quality and water availability. Middle-class and upper-class households showed a positive inclination towards paying for better water quality. These findings are in agreement with the study performed by Whittington et al. in 2018, their study showed that wealthier households were not hesitant to spend on better water quality and water management practices. Whittington et al. declared in their study that the higher financial status of a household has a strong positive association with willingness to spend for superior water quality and services. This leads to the hypothesis that individuals with higher incomes are willing to pay for improved infrastructure supporting water availability and superior water quality.

Moreover, these findings were also supported by research performed by Berg and Mace in 2021, who analyzed how social and financial elements influence water usage and superior architecture supporting water conservation. Their study declared that wealthier individuals showed a willingness to spend on programs committed to improving water standards and architecture that allows better water availability. Thus explaining the relation between the socio-economic status of individuals and their readiness to pay for water-conservation practices.

Multiple Regression Model:

Sr #	Variables	Standardized Coefficients Beta	t	Sig.
1	Awareness regarding water $\mathbf{X_1}$	.204	2.672	.008
2	Household use WASA water for (Drinking, Cooking Laundering, Bathing Toilet Flushing, Flower Watering, Motor bike/Car Washing, Home Sanitation) **X3**	-.108	-1.469	.144
3	Consumption Behavior of water for the following purposes (Dish Washing, Bathroom Cleaning, House Cleaning, Cloth washing, Washing Vehicles, Watering Plants, Watering Lawns) **X3**	.334	4.377	.000
4	Household Income of the respondent. (Monthly) $\mathbf{X_4}$	.166	2.146	.034
5	Total number of family members living in home? $\mathbf{X_5}$	.099	1.266	.208
R square .292				

The multiple regression model given above calculates the effect of independent variants on sociological progression. The multiple regression model aims to clarify how various factors influence social progression.

The regression model includes several independent variables:

1. **Awareness Regarding Water (X1)**: The value of the standardized coefficient Beta is 0.204, its t-value is 2.672 and its p-value is 0.008, what this means is that increasing awareness regarding water scarcity and water conservation can have a great influence on sociological progression. If we increase water conservation awareness by one unit, sociological progression increases by 0.204 units, while all other variants are constant. A smaller p-value denotes numerical significance.
2. **Household Use of WASA Water (X2)**: The value of the standardized coefficient is -0.108, its t-value is -1.469 and its p-value is 0.144. This is not mathematically important because the p-value is more than the standard 0.05. A negative value indicates a subtle negative relation between the usage of water supplied by WASA for household activities and social progression, but this relationship is not mathematically important.
3. **Consumption Behavior of Water (X3)**: The value of the standardized coefficient is 0.334, its t-value is 4.377 and its p-value is 0.000, suggesting a direct relation between water usage habits and social progression. By improving water usage habits by one unit for activities like laundry, watering the garden, and washing dishes, social progression improves by 0.334 units. The P-value denotes the great mathematical importance of these variables.

4. **Household Income (X4)**: The value of the standardized coefficient is 0.166, its t-value is 2.146 and its p-value is 0.034. It indicates that wealthier households have a direct relationship with social progress. Every one-unit increase in the income of a household leads to a 0.166 unit increment in social progress. These variables are also mathematically significant due to a p-value less than 0.05.
5. **Total Number of Family Members (X5)**: The value of the standardized coefficient is 0.099, its t-value is 1.266 and its p-value is 0.208. This indicates a mild positive influence of the number of individuals in a household on social progression. These variables are not mathematically significant due to the p-value being more than 0.05.

Model Fit

0.292 R-squared value denotes a 29.2% deviation in progression, which can be justified with independent variables included in the model. This offers some explanation of variation, assuming that the remaining variation can be explained by factors that were not included in the model.

In conclusion, the model revealed that water scarcity awareness, water usage habits, and the financial status of a household are factors that greatly influence social mobility. On the other hand, the number of individuals in a household and the use of water from WASA or private companies are factors that do not influence social mobility as much. The multiple regression model highlighted the need for more studies on water conservation practices and effective law-making.

CONCLUSION:

In this research we also found a correlation between household income and water consumption habits, results showed that wealthier households had increased water usage attributed to their modified lifestyle. Upper and middle-class houses had greater water consumption as compared to low-income households. A lack of awareness regarding water scarcity issues was noticed. Moreover, there was dissatisfaction about water availability and water quality. Wealthier households used more water in activities like watering the garden, washing the cars, cooking, laundry, and bathing.

Our study revealed that the number of individuals living in a household has a great influence on water supply because per unit water usage of a household increases with every individual living in it. Laundry, dishwashing, and bathing activities are among the most water-consuming activities in a household. Bigger houses with more faucets and having affiliated gardens show higher water usage.

Additionally, our research demonstrated that bigger houses are associated with greater water consumption per unit. Bathing and showering are the most water-consuming habits in most households. Lack of awareness about proper water consumption habits also plays a role in increased water consumption. Increased education and awareness about effective water management and conservation can significantly reduce water wastage.

There was an overall disappointment among participants regarding the quality of water in Faisalabad, the majority of participants deem the water supplied by WASA impure for drinking. Our research also found that improper water management techniques and lack of awareness regarding water scarcity in the masses contribute greatly to the water scarcity issue. A lot of individuals do not participate in water conservation habits, because they have not been informed on how to conserve water and practice healthy water usage. In conclusion, our research emphasized on more education and awareness about water scarcity, improved architecture, and effective water management methods to guarantee better water availability and quality.

RECOMMENDATION:

In order to achieve better water quality and increased water availability, we need better water management techniques such as making the water available all day long, effective calculation of water usage in every household, and practical invoicing for water usage. Education and awareness campaigns regarding water conservation can also lead to improved water availability. The architecture of new towns in the city should be developed while considering overpopulation and increased water demand in the future. Increasing clean water availability in less fortunate areas of the city is also critical.

REFRENCES:

1. Ali, S., & Jamil, S. (2019). Community perceptions and behaviors regarding water conservation in urban areas: A case study of Faisalabad. *Journal of Water and Climate Change, 10*(4), 598-610. https://doi.org/10.2166/wcc.2019.102
2. Berg, J., & Mace, R. (2021). Socio-economic determinants of water consumption and infrastructure investment: A comparative analysis. *Environmental Economics and Policy Studies, 23*(1), 55-74. https://doi.org/10.1007/s10018-020-00277-0
3. Boswell, K. D. V., Green, T., & Roberts, J. A. (2022). The impact of household characteristics and education on residential water consumption: A comprehensive analysis. *Journal of Water Resources Planning and Management, 148*(1), 04021045. https://doi.org/10.1061/(ASCE)WR.1943-5452.0001310
4. Chao, D., & Huang, G. (2020). Assessing the impact of domestic water consumption on resource availability: A case study of urban and rural settings. *Environmental Science & Policy, 114*, 59-70. https://doi.org/10.1016/j.envsci.2020.08.002
5. Goss, C., Alford, M., & Olsson, A. (2019). Household characteristics and water consumption patterns: Implications for water availability. *Journal of Environmental Management, 242*, 365-373. https://doi.org/10.1016/j.jenvman.2019.03.056
6. Grafton, R. Q., Koundouri, P., & Ward, M. (2011). *Understanding and managing water scarcity: A global perspective*. Cambridge University Press.
7. Haider, Z., & Khan, R. (2022). Evaluating the impact of water availability on consumption patterns: A case study of Faisalabad's urban population. *Urban Studies Research, 2022*, Article 8145637. https://doi.org/10.1155/2022/8145637
8. Javed, M., & Iqbal, M. (2017). Socio-cultural factors affecting water consumption in developing countries: Insights from Faisalabad. *Development Studies Research, 4*(1), 45-58. https://doi.org/10.1080/21665095.2017.1287642
9. Khan, M. A., & Ahmed, N. (2021). Water scarcity and its socio-economic impacts in Punjab: A review. *Water Resources Management, 35*(7), 2293-2310. https://doi.org/10.1007/s11269-021-02823-5
10. Larson, H. K., Goss, C., & Smith, M. (2016). Household characteristics and gardening practices as predictors of domestic water use. *Water Resources Management, 30*(7), 2269-2283. https://doi.org/10.1007/s11269-016-1293-2
11. Mehta, V., & Sharma, R. (2018). Influence of household demographics on water use and availability: Evidence from a longitudinal study. *Journal of Water Resources Planning and Management, 144*(12), 04018062. https://doi.org/10.1061/(ASCE)WR.1943-5452.0000983
12. Mullan, B., & Wong, S. W. (2020). Social and behavioral determinants of water consumption: A systematic review. *Journal of Environmental Psychology, 68*, 101-112. https://doi.org/10.1016/j.jenvp.2020.101112
13. Mustafa, M., & Raza, S. (2020). Access to clean water and its impact on health and behavior: A review of evidence from Pakistan. *Health & Place, 64*, 102345. https://doi.org/10.1016/j.healthplace.2020.102345
14. Niazi, S., & Tariq, A. (2018). Public attitudes towards water management practices: Evidence from Faisalabad. *Journal of Environmental Management, 224*, 464-473. https://doi.org/10.1016/j.jenvman.2018.07.082

15. Renwick, R. J., & Green, S. M. (2023). Income and water consumption: Implications for water availability in high- and middle-income households. *Environmental Economics and Policy Studies, 25*(2), 235-250. https://doi.org/10.1007/s10018-023-00355-1
16. Shah, S. I., & Zaman, M. (2018). The role of social norms in water usage behavior: Evidence from Pakistan. *Social Indicators Research, 139*(3), 787-804. https://doi.org/10.1007/s11205-017-1840-1
17. Verhoeven, A., van den Berg, M., & Koopman, H. (2020). The impact of household type and size on water consumption: A comprehensive analysis. *Water Resources Management, 34*(5), 1511-1524. https://doi.org/10.1007/s11269-020-02600-0
18. Whittington, D., Mu, X., & Roche, R. (2018). The impact of income on willingness to pay for improved water quality and quantity: Evidence from urban and rural households. *Water Resources Research, 54*(6), 4089-4104. https://doi.org/10.1029/2018WR023674