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# To drink or not to drink: A study of consumer choice of safe drinking water

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**ABSTRACT:** The objective of the study was to analyze the factors contributing to the consumer's choice of safe drinking water in Faisalabad. Ground water of Faisalabad is not safe for drinking. Safe drinking water is supplied by WASA, some local suppliers and branded water. Binary logit model was used to analyze the factors contributing to choice of WASA supplied water. The results revealed that education of family head, number of children under 10 years of age, residential status and level of awareness were positively related while age of family head, occupation of family head, per capita income of family, occurrence of water borne disease to any family member, smell and appearance of ground water were negatively related to the consumption of WASA supplied water.

**KEYWORDS:** Safe drinking water, WASA supplied water, education, per capita income, waterborne disease.

## 1 INTRODUCTION

Ground water level has lowered alarmingly due to increase in population of the world, especially in highly populated area like china, Indonesia and south Asia. All over the world, clean water had become a short commodity. The problem of unavailability of clean water is prevailing speedily. In 1951 Water was available round about 5000 cubic meter per capita which decline during 2005 to 1,100. It is very near to scarcity level recognize internationally. If this situation continues and necessary measures to preserve water are not effectively adopted then it is anticipated that availability of water will fall to 700 cubic meter per capita in 2025 (WWF Pakistan, 2007). During 2004-2005, in Pakistan approximately 38.5 million people did not have contact to secure drinking water while round about 50.7 million populace lacked improved sanitation (Khan and Yasir, 2007). According to an estimate by Pakistan Council of Research and Water Resources (PCRWR), almost 50 percent of urban water supply is inadequate for drinking and personal use. This research concludes that an average of 25.61 percent of Pakistan's 159 million inhabitants have access to safe and adequate drinking water. There is nothing to doubt that the greater part of the Pakistan's population is exposed to the risks of drinking unsafe and polluted water (Mahmood and Maqbool, 2006). It is an indispensable human right to have approach to secure drinking water and it is an effective health interference to provide sufficient drinking water. If drinking water is inadequate it will result an increase in illness and death. Illness will need higher cost to be cure, work productivity will lower, school enrolment will be lower and hence it will be a cause of poverty. Secure drinking water is a fundamental need of health and has a significant impact on reducing poverty. Polluted drinking water is a major threat to health in developing countries most of the diseases are due to polluted water. The cholera and diarrhea become a cause of the death of 1.8 million people every year. And 88% cases of diarrhea are credited to poor sanitation and insecure water supply (WHO, 2004). Just 23.5 % rural and about 30 % urban inhabitants had contact with safe drinking water in Pakistan and diarrheal diseases approximately causes 200,000 deaths of children in one year (Rosemann, 2005). If proper interventions are designed to supply secure water to household then this practice can reduce health risk associated with contaminated water.6-25 % diarrheal diseases can be reduced if secure water supply is available to whole world (WHO, 2004). Untreated waste water is also being used for growing vegetables and crops due to shortage of canal water, reliability in its supply and high nutritional value. Due to seepage from drains and settling basins, ground water quality is being contaminated (Kahlown *et al.,* 2006). The analysis of the ground water samples from Faisalabad illustrated very high concentration of chloride, sulphate, DO and TDS in ground water were much greater than the average concentrations in sewage effluents (Hussain and Hanjra, 1996). The ground water of Faisalabad was not suitable to use

directly for domestic, industrial and irrigation purposes (Hassan *et al.,* 1997). There are two treatment plants for canal water. Water is being supplied for only 8 hours in a day, because of having less storage capacity and high expenses of energy. The laboratory at WASA Faisalabad has the capacity of determining bacteria and chemicals present in the water. Chemical and bacteriological testing is also routinely conducted at the source. Residual chlorine levels are monitored. The water supplied at source is of good quality. There is a daily check on bacteria and all the water is chlorinated. Arsenic levels have been tested and found to be safe (World Bank, Status Quo Report December 2006).

### 1.1 OBJECTIVES OF STUDY

The study is planned to identify the socio-economic factors affecting maternal health. So the objectives of study as under:

- To study the socioeconomic characteristics of respondents in Faisalabad
- To analyze the factors contributing towards consumer's choice of WASA water supply
- To suggest suitable policy

## 2 REVIEW OF LITERATURE

Mi-Jung Um *et al.,* (2001) argues that a resistance against the use of supplied water was created by previously contaminated water supply in Korea. Because it was being perceived by people that the quality of tap water was low. The study introduced perception averting technique and revealed that the level of contamination was lower than the tolerable risk.

Raje *et al.,* (2002) studied the willingness to pay of people for better water supply and also highlight the factors which affect willingness to pay. The study set up logistic model and revealed that consumer's satisfaction regarding water supply, water management and price charged for water mostly effects consumer's readiness to pay for clean water.

Jalan (2003) discussed the awareness and willingness to pay for environmental quality. He argues that if household is aware of the harms of poor environment quality, he will be agree to par for improvement in environmental quality like water. The study used bivariate probit and multinomial logit models to check the effects of wealth and awareness on household decisions to disinfect drinking water and observed significant effects in Delhi. This study also reveals that awareness has equal effect at willingness to pay for clean water as that of wealth.

Khan and Javed (2007) argues in his study about providing way into the clean drinking water and better sanitation in Pakistan that this factor is often neglected in Pakistan. If clean drinking water is made accessible and proper sanitation in provided it will decreases the chances of occurrence of certain diseases. Poor people living in slum areas of city and rural areas are neglected which affect their wellbeing, effects their health and decrease income and hence increase cost of living. If the monitoring department and filtration plants do not get proper attention they will become a cause of contamination.

Haq *et al.,* (2007) in his study analyzed house hold's readiness to pay for improved supply of secure drinking water in Abbotabad district by using method of contingent valuation. The study revealed that House Holds readiness to pay for better secure water supply service is meaningfully effected by education of members of family, demographic position and water source.

Sattar and Ahmad (2007) did the same job in Hyderabad district. Multinomial logit model and averting behavior technique was used for disinfecting the contaminated water. The study exposed that House Hold's readiness to pay for different techniques for purification of infected water is being effected significantly by the exposure of head of family to mass media and his formal education. The study also illustrates that the house hold head's education has more influence on willingness to give than the level of income.

Khan and Yasir (2007) while discussing the present water and sanitation condition in Pakistan argues that large number of people in Pakistan have no approach to clean water and good sanitation. Almost 38.5 and 50.7 million people did not have access to clean water and good sanitation respectively. If same pattern continues to 2015 near about 52.8 and 43.2 million people will lack clean water and good sanitation respectively. Study states that large number of people would lack these necessities even if we achieve regional and national targets.

Mehrara *et al.,* (2009) used contingent valuation technique to estimate the willingness to pay for the connections of drinking water in LARESTAN (IRAN). Study exposed that literacy level, per capita income, the distance consumer had to walk to get water, number of tours and time required to arrive at water tank positively affect the willingness to pay whereas age

affects it negatively. Results show that consumer are agree to pay 2399.7 Rials to get water connection besides its monthly charges. Family units are agree to pay 0.24us$ more for each cubic meter of clean water consumed.

Noor and Siddiqi (2010) Used Tobit model to study people's willingness to pay for improved drinking water provided by WASA. Six areas of Lahore were selected for the study and contingent valuation technique was used for survey about perception of household. The study show that the costs borne for copping the harms of contaminated water, educational status of family head is also a major factor which effect the willingness to pay for better water service. It was estimated that if WASA improves quality and service it can earn 4.22 million additional revenue annually.

## 3 RESEARCH METHODOLOGY

The current research work attempt to analyze the factors which contributes to the consumption of WASA supplied water in Faisalabad. Cross sectional Primary data for present study was accumulated from city Faisalabad. Stratified random sampling method was used to collect the data. 225 questionnaires were got filled. Questions were included about the consumer characteristics, consumer perception and behavior regarding drinking water. In descriptive statistics frequency distribution and percentage are used for discovering the relationship between Socio-economic, demographic variables with consumption of safe drinking water. Study used consumption of safe drinking water as a dependent variable and Education, age of household head, occupation of household head, per capita income of family, children under 10 years of age, occurance of water borne disease, different levels of awareness, smell and appearance of ground water was used as independent variables. The logit model was estimated for the current study. There are many previous studies which used logit model for this type of binary choice analysis of consumer behavior, as Sattar and Ahmad (2007), Haq et al(2008), Abrahms, et al. (2000), Jalan et al (2003). Percentage was calculated by the following formula, P=F/N *100, F= frequency, N= Total number of observations.

## 4 RESULTS AND DISCUSSION

***Table 4.1: Distribution of respondents according to the use of WASA supplied water***

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Do not drink water supplied by WASA | 168 | 74.7 | 74.7 | 74.7 |
| Drink water supplied by WASA | 57 | 25.3 | 25.3 | 100.0 |
| Total | 225 | 100.0 | 100.0 | |

Table 4.1 shows that in the total sample of 225, there are 168 (74.7%) respondents who do not consume water supplied by WASA and only 25.3% (57 out of 225) use this water.

***Table 4.2: Distribution of respondents according to the use of WASA supplied water and level of their education.***

| | Do not Drink WASA Water | Drink WASA Water | Total |
|---|---|---|---|
| Illiterate | 27 | 0 | 27 |
| Primary | 11 | 0 | 11 |
| Middle | 16 | 0 | 16 |
| Matric | 21 | 2 | 23 |
| Inter | 21 | 17 | 38 |
| Graduate | 19 | 20 | 39 |
| Masters | 39 | 18 | 57 |
| Post Graduate | 14 | 0 | 14 |
| Total | 168 | 57 | 225 |

Table 4.2 shows that the use of WASA supplied water is showing differential results with level of education. Its use is nil in illiterate and highly educated class and highest in the people who are intermediate, graduate and masters.

***Table 4.3: Distribution of respondents having children under the age of 10 years and using WASA supplied water for drinking purpose***

| | Children under 10 years of age | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Total |
| Do not drink WASA water | 25 | 49 | 48 | 32 | 9 | 4 | 1 | 168 |
| Drink WASA water | 8 | 8 | 10 | 17 | 12 | 2 | 0 | 57 |
| Total | 33 | 57 | 58 | 49 | 21 | 6 | 1 | 225 |

Table 4.3 shows that 57 respondents use WASA supplied water. Out of these 57 respondents, 8 respondents, 10 respondents, 17 respondents, 12 and 2 respondents have one, two, three, four and five children under the age of 10 years respectively. There is only one family who has 6 children under the age of 10 years and they told that they are not drinking WASA supplied water. There are 33 families who have no children and out of these 8 are using WASA supplied water.

***Table 4.4: Distribution of respondents according to the use of WASA supplied water for drinking purpose and its relation with having some water born disease.***

| | Occurrence of disease | | |
|---|---|---|---|
| | No | Yes | Total |
| Do not drink WASA water | 71 | 97 | 168 |
| Drink WASA water | 37 | 20 | 57 |
| Total | 108 | 117 | 225 |

Table 4.4 shows that one hundred and eight (108) respondents never suffered from some water born disease, from these respondents thirty seven use WASA supplied water for drinking purpose and seventy one do not use WASA supplied water. On the other hand out of two hundred and twenty five, one hundred and seventeen respondents suffered from some water born disease. From these respondents ninety seven do not use WASA supplied water for drinking and twenty uses WASA supplied water.

***Table 4.5: Distribution of respondents according to the earning hands in a family and use of WASA supplied water.***

| | Number of earners in family | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Total |
| Do not drink WASA water | 25 | 80 | 48 | 13 | 2 | 168 |
| Drink WASA water | 14 | 24 | 17 | 2 | 0 | 57 |
| Total | 39 | 104 | 65 | 15 | 2 | 225 |

Table 4.5 shows that majority of respondents are not using WASA supplied water regardless of the fact how many earning members they have in the family, only fifty seven families are consuming WASA supplied water and one hundred and sixty eight are not using WASA supplied water for drinking purposes.

***Table 4.6: Distribution of respondents exhibiting the relation of their use of WASA supplied water with watching TV.***

| | Drink WASA water | | |
|---|---|---|---|
| | No | Yes | Total |
| Do not watch TV | 39 | 10 | 49 |
| Watch TV | 129 | 47 | 176 |
| Total | 168 | 57 | 225 |

Table 4.6 shows that out of 176 respondents, who watch TV, 129 do not use WASA supplied water for drinking purpose and 47 use this water. There are 49 respondents who do not watch TV.

***Table 4.7: Distribution of respondents according to their awareness about the harms of using contaminated water and use of WASA supplied water***

| | Level of Awareness | | | | |
|---|---|---|---|---|---|
| | Good | Average | Minimum | No awareness | Total |
| DO not drink WASA water | 48 | 57 | 31 | 32 | 168 |
| Drink WASA water | 19 | 30 | 6 | 2 | 57 |
| Total | 67 | 87 | 37 | 34 | 225 |

Table 4.7 indicates that sixty seven respondents are aware about harms on contaminated water, out of these nineteen use water supplied by WASA and forty eight do not use this water. There are eight seven respondents having average level of awareness and from these respondents thirty use WASA supplied water and fifty seven do not use this water. In case of minimum and no awareness, respondents who are not using WASA supplied water are thirty one and thirty two respectively.

***Table 4.8: Distribution of respondents who are satisfied with the quality of WASA supplied water***

| | Satisfied with quality of WASA water | | |
|---|---|---|---|
| Drink WASA water | No | Yes | Total |
| No | 143 | 0 | 143 |
| Yes | 14 | 43 | 57 |
| Total | 157 | 43 | 200 |

Table 4.8 shows that 157 respondents are not satisfied with the quality of WASA supplied water and 57 respondents are satisfied with its quality. Out of these 157 respondents 14 still use this water for drinking purpose and 143 do not use it. On the other hand 43 respondents are satisfied with its quality and using it for drinking purpose.

***Table 4.9: Distribution of respondents using WASA supplied water and satisfied with its price***

| | Satisfied with price of WASA water | | |
|---|---|---|---|
| Drink WASA water | No | Yes | Total |
| No | 25 | 0 | 25 |
| Yes | 15 | 42 | 57 |
| Total | 40 | 42 | 82 |

Table 4.9 indicate that from the total sample 57 respondents are consuming WASA supplied water from which 42 respondents are satisfied with the price charged by WASA and 15 respondents are not satisfied with the price that they are paying for using WASA supplied water.

### 4.1.1 ESTIMATION FOR FACTORS DETERMINING HOUSEHOLD DEMAND OF WASA SUPPLIED WATER FOR DRINKING (LOGIT MODEL)

In this section, the findings of the study were explained and discussed by applying the Logistic model on the complete set of data. Here use of WASA supplied water was our dependent variable and some socio-economical and demographical factors, which were affecting this demand for WASA supplied water.

***Table 4.10: Logistic Regression analysis of sample data for WASA supplied water. Dependent variable: Consumer choice. 1 if consumer drink WASA supplied water, 0 otherwise***

| Explanatory Variables | Coefficient | Std. Error | z-Statistic | Probability |
|---|---|---|---|---|
| Constant | 0.572 | 2.947 | 0.194 | 0.846 |
| Age | -0.121* | 0.046 | -2.645 | 0.008 |
| Occupation | -0.203 | 0.568 | -0.357 | 0.721 |
| Education | 0.865* | 0.310 | 2.789 | 0.005 |
| Per capita income | -0.001* | 0.000 | -4.519 | 0.000 |
| Children under 10 years | 0.384*** | 0.213 | 1.808 | 0.071 |
| Disease | -1.080** | 0.532 | -2.031 | 0.042 |
| Good awareness | 1.583 | 1.154 | 1.372 | 0.170 |
| Average awareness | 1.610 | 1.140 | 1.412 | 0.158 |
| Minimum awareness | 0.395 | 1.263 | 0.313 | 0.754 |
| Smell of ground water | -0.104 | 0.323 | -0.320 | 0.749 |
| Appearance of ground water | -0.957 | 0.585 | -1.636 | 0.102 |

*Note: significant at 1% *, 5 % **, 10% ****

The co-efficient of age was negative and had a significant effect on consumption of WASA supplied water. According to the results of the Logit model family head having more age are less likely to use WASA supplied water for drinking purpose. The family head having more age may have less education and awareness about harms of drinking contaminated water. Age is the most important determinants in the selection of bottled water (Abrahms *et al.,* 2000).

The association between occupation and consumption of WASA supplied water was insignificantly negative. The results show that family heads doing job are less likely to use WASA supplied water. Occupation of decision-maker is not statistically significant in all the cases of purification (Sattar and Ahmad, 2007).

The association between education and consumption of WASA supplied water was significantly positive. The results show that as education level of family head increase, the chances to use WASA supplied water for drinking purpose also increase. An education level of HH heads has positive and significant effect on demand for safe drinking water except first level of education (Ahmad *et al.,* 2010).

Per capita Income of family was negatively related to selection of WASA supplied water for drinking purpose and has strong effect on it. The results revealed that as the per capita income of family increase the probability of drinking WASA supplied water decrease. As income increases people adopt more expensive source of safe drinking water like branded water. Willingness to pay does not depend entirely on income (Noor and Siddiqi, 2010).

The co-efficient of number of children under 10 years of age has positive and significant effect on choice of WASA supplied water for drinking. The results revealed that families having more children less than 10 years of age are more likely to use WASA supplied water. Children are more sensitive to diseases. And parents care more for their children than themselves. So the family head demands safe drinking water to secure children from having diseases. Parents value the health of children more than double of their personal health (Aziz, 2007).

According to the results coefficient of occurrence of water borne disease to any family member is negative and significant. Which implies that people suffered from any waterborne disease are less likely to drink WASA supplied water. Water borne disease is negatively related to perception about quality of water (Noor and Siddiqi, 2010).

The coefficients of different levels of awareness good awareness, average awareness and minimum awareness are positive. This means that awareness has positive relation with the choice of WASA supplied water. Awareness play positive role in adopting averting behavior like filter and is highly significant (Haq *et al.,* 2008).

The coefficient of smell of ground water is negative. This shows that smell of ground water negatively affects the choice of WASA supplied water. Whereas the appearance of the ground water has negative and insignificant effect on the choice of WASA supplied water according to the results. This means that if the appearance of ground water is not clean then people will demand more WASA supplied water and if ground water is clean people will perceive that it is suitable and they will

demand less for WASA supplied water. Quality of water has negative and significant impact on demand for safe drinking water (Ahmad *et al.,* 2010).

## 5 SUMMARY

According to results the socioeconomic factors are important in determining the choice of WASA supplied water for drinking purpose. The results revealed that education level, number of children under 10 years of age and level of awareness were positively related while age of family head, occupation of family head, per capita income of family, occurrence of water borne disease to any family member, smell and appearance of ground water were negatively related to the consumption of WASA supplied water. Young family head have modern ideas, thoughts and understanding and can take better care for his family by adopting goods which are suitable in prevailing situation. It can be concluded from the results of the study that educated and professional family head are more energetic to adopt safe ways in decisions. Mostly educated person are job holders, they remain in touch with current issues and they can understand the problem well and adopt preventive behavior which positively affects the consumption of WASA supplied water. The study also concludes that beside these factors the quality of ground water is also important for choice of WASA supplied water. The quality of ground water is determined by its appearance, smell and suitability. If people think that ground water is suitable for drinking, having no smell in it and do not contain any matter in it, they will have no need to demand any other source of water.

## SUGGESTION

In the light of the above analysis here are some policy implications that the decision makers should keep in mind while formulating the policies for the sake of development of the country.

- Educational policies should be designed by taking into account the needs of the day. The same should be formulated by keeping in mind the scientific and technological needs of the society.
- In addition to the traditional education syllabus, every day science should be a compulsory part of syllabus up to secondary school level. So that in addition to formal education people can get basic scientific knowledge.
- Government should launch public awareness campaigns ranging from urban to country side.
- Media should start programs for providing awareness to the people regarding health; similarly print media can print awareness columns in their papers.
- The supply of WASA water should be expanded in Faisalabad. So that everyone can have access to safe drinking water.
- WASA should use TV commercials to make the people realize that WASA supplied water is safe and should try to increase trust of people in quality of WASA supplied water.
- WASA should arrange some special seminars in educational institutes, offices and industries to make people aware of harms of drinking contaminated ground water, and to build up their confidence in WASA supplied water quality.

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