

Factors Affecting Drinking Water Quality and Human Health at Household Level in Punjab, Pakistan

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Abstract

Access of pure drinking water is the basic human right but contrary to the fact, in Pakistan water and sanitation is the ignored sector. A huge number of people in Pakistan do not have access to safe drinking water facilities causing households to be suffered from diarrheal illness. Keeping in view these facts, A cross-sectional study was designed to look into the drinking water quality influencing factors and their health outcome in three districts; Toba-Tek Singh, Multan, and Rawalpindi of Punjab province in Pakistan. Six hundred married females of 20-60 age groups were interviewed through well structured interviewing schedule under multi stage sampling technique. The findings of the study revealed that socio economic characteristics were one of the risk factors for diarrheal illness as it was concluded from bi- variate analysis that there was a significant relationship between the socio economic characteristics i.e. family type, mothers' education, household income and health outcome. Over and above, it was further revealed that the families who adopted measures to improve the drinking water quality at home were at lower risk of diarrheal illness. The present study suggested that the policy makers formulate the policies towards the efficient handling of limited water resources and its quality.

Key words: Drinking water quality, use of measures, socio economic characteristics

Introduction

Access of pure drinking water is the basic human right, which is supported by international law and the declarations (Gleick 1999). The available data reflects that only 2.5 percent is the available fresh water out of the total volume present on the earth. However, most of it is locked up in glaciers or in the

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depths of groundwater aquifers. The experts opine that, by 2025, 52 nations comprising of half of the world's population will have to suffer with severe shortage of potable water, whereas, around 3 billion people will face water shortage (Pani Pakistan, 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).

Water and Sanitation is the ignored sector in Pakistan. A huge number of people in Pakistan do not have access to safe drinking water and lack toilets and satisfactory sanitation systems. As of 2005, approximately 38.5 million people did not have safe drinking water source and approximately 50.7 million people lacked access to improved sanitation facilities in Pakistan. By year 2015, if this trend keep on going, 52.8 million people will be deprived of safe drinking water and 43.2 million people will be lacking adequate sanitation facilities in Pakistan, reported by Khan and Javed (2007). The present study has designed to investigate the drinking water quality influencing factors and their health outcome at household level.

Materials and Methods

A cross- sectional study was carried out in urban as well as rural areas of three districts of Punjab Province; Rawalpindi, Toba-Tek Singh, and Multan under the Multistage sampling technique. At the first stage, three districts, Toba-Tek Singh, Rawalpindi, and Multan were selected through purposive sampling technique keeping in view the current water condition in these districts (PCRWR, 2005). At the second stage, one tehsil was selected from each district by using simple random technique. At the third stage, two urban and two rural union councils were selected randomly. At the fourth stage, rural and urban localities were selected and finally, nth household was selected from those localities by using systematic sampling technique.

Data were collected from 600 married females (20-60 yrs) to look into the drinking water quality influencing factors and their health outcome at household level in three districts; Toba-Tek Singh, Multan, and Rawalpindi of Punjab province in Pakistan. The study was conducted in urban as well as rural areas of above mentioned districts. A well structured interviewing schedule was constructed to gather data keeping in view the research objective. SPSS/PC+ 15.0 Statistical Package for Social Sciences were used for analyzing data (Asghar et al., 2010).

Results and Discussion

Use of Measures

Use of measures to improve water quality at the household level can avoid water related health illness. Different studies have reported that the persons whose families boil drinking water at home were at lower risk of diarrheal illness (Blake et al., 1993; Rice and Johnson, 1991).

Table 1 depicts that 26.2% respondents adopted measures to improve the quality of drinking water because they were much concerned about their health. While 73.8% respondents were not using any of the measures to improve drinking water quality because of, mainly less awareness of such measures. Over and above, low household income was also one of the factors of not spending money to adopt different measures, for instance, filtration etc.

Table 2 demonstrates that 44.6% respondents took measure of improving the quality of drinking water by boiling it, because boiling is the cheapest measure to improve water quality at household level and almost everyone can adopt it. Besides, 24.8% respondents adopted both filtration and boiling measures for improving their drinking water quality, these were the respondents having more concern to the quality of drinking water used by them or in other words, they were more health conscious.

Table 3 represents that more than half (59%) of the respondents told that none of their family members suffered due to bad quality drinking water as most of them were using good quality water sources like tube well, water filter plants. Additionally, it is further noticed that some of them were using water quality improvement measures regularly.

Table 1 Distribution of respondents according to adoption of measures to improve drinking water quality

Measures	Frequency	Percentage
Yes	157	26.2
No	443	73.8
Total	600	100.0

Table 2 Distribution of the respondents according to different measures to improve drinking water quality

Measures	Frequency	Percentage
Filtration	20	12.7
Boiling	70	44.6
F&B	39	24.8
Others	28	17.8
Total	157	100.0
Missing N.A	443	

Table 3 Distribution of the respondents whether they suffered or not due to water

Health outcome	Frequency	Percentage
Suffered	246	41.0
Not suffered	354	59.0
Total	600	100.0

From the above table 4 it is concluded that almost 50 percent of those households who were not using measures [200(45.1%)] to improve the drinking water quality, suffering from diarrheal illness while majority of households [111(70.7%)] those adopted measures were not suffering from diarrheal illness. Different studies have reported that the families who boil drinking water at home were at lower risk of diarrheal illness (Blake et al., 1993; Rice and Johnson, 1991).

Table 4 Relationship between the use of measures to improve drinking water quality and health outcome

Health out come	Yes	No	Total
Suffered	46	200	246
	29.3%	45.1%	41.0%
Not Suffered	111	243	354
	70.7%	54.9%	59.0%
Total	157	443	600
	100%	100%	100.0%

Statistics; Chi- Sq= 12.035, P ≤ 0.0001; Phi= -0.142, P ≤ 0.001

Table 5 Distribution of the respondents according to their family type

Family type	Frequency	Percentage
Nuclear	253	42.2
Joint	347	57.8
Total	600	100.0

Socio-economic characteristics

The demographic features regarding socio economic characteristics of households have multifarious effects on their health. These Characteristics include education, family type, and household income. As Van der Hoek et al (2001) also explored that low

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socio economic status is one of the risk factors for diarrheal illness. Following tables show the socio economic characteristics of the respondents.

The information presented in table 5 show that more than a half (57.8%) of the respondents lived in joint family system and 42.2% were living in nuclear family.

The data given in table 6 show that 42.2% respondents were illiterate as fifty percent of our data is from rural background and this data also emphasized to have a look on study area's where literacy rate is very low especially among females {Literacy Ratio (10+) Multan: 32.28%, Rawalpindi: 59.18%} (PCO, 2005) and more than one fourth of the respondents (28.9%) were graduated and above. This figure shows the ongoing trend of higher education among females.

Table 6 Distribution of the respondents according to their education

Female education	Frequency	Percentage
Illiterate	253	42.2
Primary	29	4.8
Middle + Matric	103	17.2
Intermediate	42	7.0
Graduate>	173	28.8
Total	600	100.0

Household Income

Household's income plays an important role in order to avoid health incidence as reported by World Bank (1999) poor people had worse health outcomes than well-off people. Likewise, Pritchett and Summers (1996) reported that low income also caused ill-health. Families with higher the household income have more chances to improve drinking water quality for instance, water treatment and hygiene practices etc which had great impact on health status.

Above table 7 indicates that 30.4% households belonged to low income group while 62.5%

households belong to medium income group. And only 7.2% households fall into high income group.

An educated mother, who is aware of various issues of drinking water quality like, hygiene and sanitation practices which ultimately affects human health, plays an elementary role to educate their family. Likewise, in most of the societies women play a key role for the management of water resources, sanitation, hygiene and health at household level also supported by IANGWE (2004).

Above table 8 illustrates that 253 out of 600 respondents were illiterate. Amongst those, almost fifty percent respondents reported that households were suffering from diarrheal illness and similar trend was followed where mothers were educated up to primary level. Similar results were shown by a nationwide survey of NIPS (1992) where it was reported that prevalence of diarrhea was lowest when the mother had followed secondary or higher level of education. However a primary education did not lead to a significant decrease in diarrhea.

Table 7 Distribution of the respondents according to the household income

Household income (Rs. in thousands)	Frequency	Percentage
<5000	82	13.7
6-10	100	16.7
11-15	166	27.7
16-20	209	34.8
21-25	40	6.7
>26000	3	.5
Total	600	100.0

Table 8 Relationship between the respondent's education and health outcome

Health outcome	Illiterate	Primary	Middle and Matric	Intermediate	Graduation and above	Total
Suffered	124 49.0%	14 48.3%	36 35.0%	23 54.8%	49 28.3%	246 41.0%
Not suffered	129 51.0%	15 51.7%	67 65.0%	19 45.2%	124 71.7%	354 59.0%
Total	253 100.0%	29 100.0%	103 100.0%	42 100.0%	173 100.0%	600 100.0%

Statistics Chi Sq= 23.686, P ≤ 0.0001 Phi= 0.199, P ≤ 0.0001

Table 9 Relationship between the types of family and health outcome

Health outcome	Nuclear	Joint	Total
Suffered	81 33.8%	165 45.8%	246 41.0%
Not suffered	159 66.3%	195 54.2%	354 59.0%
Total	240 100.0%	360 100.0%	600 100.0%

Statistics; Chi-Sq= 8.692, $P \leq 0.002$; Phi= -0.120, $P \leq 0.003$

While 173 respondents were having graduation or above level, out of them, a majority of respondents i.e. 71.7% reported that their households were not suffering from diarrheal illness. This depicted the impact of female education on family's health and with the increase in education, health status become improved. These results also supported the idea of Esrey & Habicht (1998) that the family health was dependent on mother's education. According to Esrey, literate mother protected their infants especially in unsanitary environments lacking toilets & that when piped water was introduced, they used it more effectively to practice better hygiene for their infants. Similarly, mother years of education were often found to be positively correlated with improved child health in developing countries (Glewwe 1999; boadi and kuitunen, 2005).

Number of people is an important factor for a healthy life because more number of people can be a factor of poor hygiene. Above table- 9 indicates that approx. fifty percent (165 out of 360) of the households, living in joint family, were getting suffered. Results are also supported by Mahmood and Maqbool (2006) who reported that number of family members in the household were positively associated with contamination of drinking water.

Statistical results [Chi sq (0.002) and Phi (0.003)] also showed significant relationship between family type and health outcome.

Table 10 draws attention to, majority of households having less than <Rs.5000 income level (60 out of 82(73.2%) and Rs.6000-10,000 [82 out of 100(82.0%)] were getting suffered as compared to medium income level [96 out of 375(25.6%)] and high income level [7 out of 43 (16.3%)]. As the level of income increased, the cases of diarrheal illness decreased and vice versa. Pritchett & Summers (1996) also supported the above results, that low income caused ill-health. As Families with high income have more chances to improve the drinking water quality for instance, water treatment & hygiene practices etc which had great impact on household's health status. Both Chi-Sq and Phi statistics showed the significant relationship between the household income and health outcome.

FWR (2000) also mentioned a factor of Poor health which was lack of toilet and the reason given for not having a toilet was that the household did not have the money to build one. Furthermore, World Bank (1999) also illustrated that poverty and ill-health were intertwined. Poor people had worse health outcomes than better-off people.

Conclusion

Study findings reveal that socio-economic characteristics have pivotal role in reduced diarrheal illness seeing that mother's education, family number, and household income are correlated to the drinking water quality and ultimately to health outcome. Additionally, it is further mentioned that by adopting different measures, people can avoid diarrheal illness. The same as households who were using any of the measures, had low chances to be suffered from diarrheal illness, revealed by the findings of the present study. Thus, it was suggested that policy makers should formulate the people centered policies rather target oriented. Therefore, it is the need of the hour, that govt. should take steps on emergent basis for the efficient handling of limited water resources. Over and above, it is further recommended that provision of safe drinking water to common people must be ensured.

Table 10 Relationship between the household income (Rs. in thousands) and health outcome

Health outcome	Low income group		Medium income group		High income group		Total
	<5000	6-10	11-15	16-20	21-25	>26000	
Suffered	60 73.2%	82 82.0%	52 31.3%	45 21.5%	7 17.5%	0 0.0%	246 41.0%
Not suffered	22 26.8%	18 18.0%	114 68.7%	164 78.5%	33 82.5%	3 100.0%	354 59.0%
Total	82 100.0%	100 100.0%	166 100.0%	209 100.0%	40 100.0%	3 100.0%	600 100.0%

Statistics Chi-Sq= 154.963, $P \leq 0.0001$ Phi= 0.508, $P \leq 0.0001$

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