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Ground drinking water and its consequences on health of residents; A case study of selected areas in Bahawalpur City

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Abstract: Arsenic in ground drinking water exposure serious skin diseases, including skin cancer, lung, bladder and kidney cancers, and perhaps other internal tumors, peripheral vascular disease, hypertension, and diabetes. This research is focused on poor ground drinking water quality of four selected areas (Tibba Badar Shar, Modal Town "C", Nashat Colony and Ghani ghot) in Bahawalpur. The residents of the study areas have no awareness about drinking water quality. Main objectives of the study is to exam the drinking water quality and compare with W.H.O standard and identify the different types of diseases caused by the Arsenic drinking water. A cross-sectional study was designed to look into the drinking water quality influencing factors and their health outcome of study areas. Water sample was collected through random sampling from the selected study areas and tested in Pakistan Council of Research in Water Resources (PCRWR) Bahawalpur laboratory. After the water tested, water testing report was compare with W.H.O standard and checked the arsenic level in drinking water. In study area for check public health and awareness we conducted the structured questionnaire survey. A random sampling technique was applied for data collection. Data was collected through questionnaire (social survey technique) and 136 inhabitants were selected for sampling. After the data collection data was analyzed by using statistical techniques such as chi-square, correlation on quantitative data. The findings of the study related that People are using contaminated drinking water by arsenic. Due to the used of arsenic drinking water the rate of diseases is rapidly high. There was a significant relationship between the socio economic characteristics i.e. family type, education level, household income, public awareness and health outcome. The present study suggested that the policy makers formulate the policies towards the efficient handling of limited water resources and its quality.

Keywords: Ground drinking water, Health consequences, Tibba Badar Shar, Modal Town "C", Nashat Colony, Ghani ghot

1. INTRODUCTION

Arsenic contamination of water wells in Argentina, Chile, India, Taiwan and Thailand caused skin lesions such as skin keratosis, hyperpigmentation or hypopigmentation. Skin lesions characteristic of arsenic toxicity can be used as an indicator of high exposure and are distinguished by the difference in other clinical manifestations of arsenic poisoning weakness including, conjunctiva congestion, edema, the portal hypertension, bronchitis and hepatomegaly. Bangladesh seems to be one of the greatest examples of mass arsenic poisoning 30-70 million people in 41 of the 64 districts are water contaminated by arsenic consumption containing> 50 pg/L arsenic (standard running drinking water in many countries of the world) for a long time (Tondel *et al.*, 1999).

Arsenic exposure is associated with many human diseases, including skin lesions and cancers of the liver, lung, bladder and skin as well as other health effects of non-cancer, as adverse reproductive outcomes, neurological and cognitive development in children. As it is a natural element in the earth's crust. Arsenic contamination has a profound impact at both the individual and the community. Reports attributed the illness and death caused by the toxicity of a lack of knowledge about the source of this metal. Awareness is also important for strategies to reduce exposure.

Without proper knowledge of the effects of exposure and adverse mitigation options on health, people will not be motivated to participate initiated by governmental and non-governmental agencies (Parvez *et al.*, 2005).

It also seems to have a negative impact on the birth process (infant mortality and weight of newborns). The toxicology of arsenic involves mechanisms that are not fully understood, but it is clear that a number of factors can affect both individual and population-level sensitivity to the toxic effects of arsenic contaminated drinking water (Hopenhayn 2006).

Disease suspected to be caused or aggravated by arsenic in drinking water by the Environmental Protection Agency (EPA) rule Benefit Analysis of arsenic, August 9, 2001. Lung cancer, bladder cancer, skin cancer, prostate cancer, kidney cancer, nasal cancer, liver cancer, stillbirth, post-neonatal mortality, ischemic heart disease (heart attack), diabetes mellitus, nephritis (Chronic inflammation of the kidneys) Nephrosis (degenerative kidney disease), hypertension, hypertensive, emphysema, bronchitis, chronic airway

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obstruction, lymphoma (tumors in lymph nodes), Black-foot disease, developmental deficits.

This research is focus on poor drinking water quality of the selected areas (Tibba Badar Shar, Modal Town "C", Nashat Colony and Ghani Ghot) of Bahawalpur City. In Nashat Colony and Ghani Ghot people use the ground water for drinking it's not fit for human health. In Tibba Badar Shar and Modal Town "C" where ground water is not fit for drinking. People are using municipal ground water supply for drinking purpose but it is also unsafe for human health. This ground water and municipal ground supply water spread perilous diseases in study area likewise cancer, hypertension, kidney disease, and developmental deficits. The residents of the study areas have no awareness about drinking water quality. Similar researches were conducted focused on sewage system in slum areas of Bahawalpur that impact on drinking water quality and human health of the slum residents (Anwar and Rani, 2012).

2. MATERISLS AND METHODS

Study Area

Pakistani cities are diverse in nature with urban and suburban population in close vicinity to each other. Population of the cities is increase due to the rural-urban migration, that's why slum areas also grow. The first step is to calculate the area of Bahawalpur City and divided into equal parts with the help of grids. The area of each grid is 1.8 sq m. The central point of each grid is the sample point for water sampling. 42 water samples were collected. Four selected study areas for this paper, One is the largest slum area of Tibba Badar Shar, Second is the Modal Town "C" of the City area, third one is the Nashat Colony also a City area, forth one is the Ghani Ghot of the fringe area of Bahawalpur City. Population of selected study areas is consisting of approximately 40,200 inhabitants (Censes 1998). In Tibba Badar Shar and Modal Town "C" ground water quality is substandard that is not fit for drinking. Inhabitants of selected research study areas are used to use the municipal supply water for daily use which comes through water pipelines. This municipal supply water is also not fit for human health because in this supply water the quantity of arsenic is more than the (W.H.O, 2011) standard. The mean daily intake of arsenic from drinking-water will generally be less than 10mcg: however, in those areas in which drinking-water contains elevated concentrations of arsenic, this source will make an increasingly significant contribution to the total intake of inorganic arsenic as the concentration of arsenic in drinking-water increases (W.H.O., 2011) The municipal ground supply water increases the rate of diseases in the study areas. In Nashat Colony and Ghani Ghot people use the ground water for drinking it also unsafe for human health. This ground water creates many health risks because this ground water have extensive amount of arsenic. Residents of these selected areas are belonging to lower labor class or middle class.

This research focuses on the contaminated ground drinking water quality by arsenic and its health impact, public awareness and implementations in (Tibba, **Fig.1)**. Badar Shar, Modal Town "C", Nashat

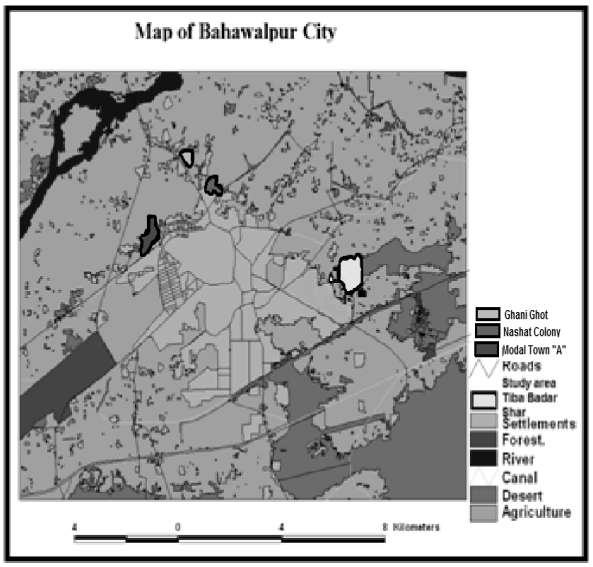


Fig 1: Location Map of Study areas in Bahawalpur City. Source: Anwar, 2013

Colony and Ghani ghot) of Bahawalpur City. Water sample was collected through random sampling. Water sample was tested in laboratory of Pakistan Council of Research in Water Resources (PCRWR) Bahawalpur. After the water tested, water testing report was compare with W.H.O standard and checked the arsenic level in drinking water. In study areas for check public health and awareness we conducted the survey. A random sampling technique was applied for data collection. Data was collected through questionnaire (social survey technique) and 136 inhabitants were selected for sampling. After the data collection, data was analyzed by using statistical techniques of chi-square and correlation

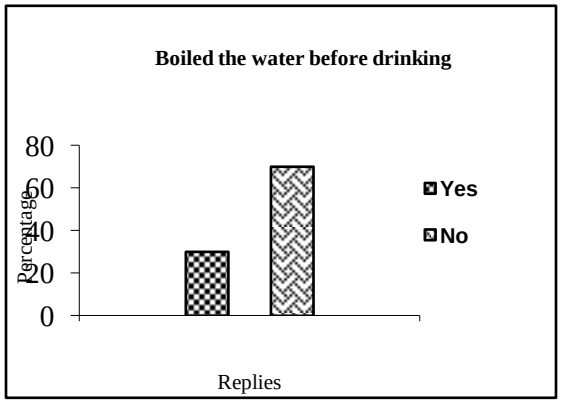
3. RESULTS AND DISCUSSION

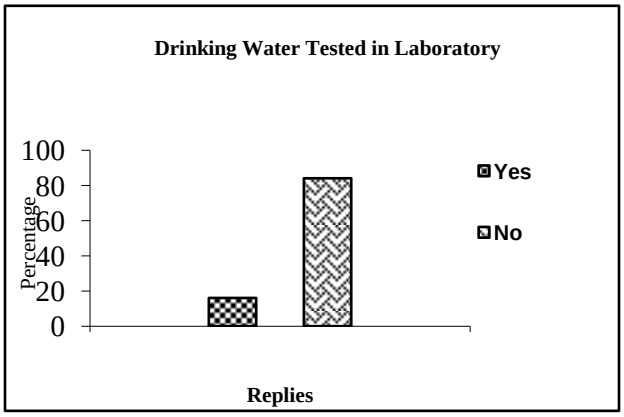
The drinking water tested report show the drinking water quality of study areas in **(table 1).** This drinking water tested report proved that the drinking water quality is very harmful for human health because Arsenic level is very high in drinking water. Atomic absorption method was used for determined the arsenic level in water. The water tested report compare with W.H.O standard as followed:

Table-1 Drinking water tested report compare with W.H.O standard

Locations: Tibba Badar Shar (T.B.S) Source: Main Water Supply Tap Location: Modal Town "C" (M.T.C) Source:Main Water Supply Tap Location: Nashat colony (N.C) Source: Ground water Location: Ghani Ghot (G.G) Source: Ground Water	Laboratory No: C/3152 Place: Bahawalpur District. Tehsil: Bahawalpur Date of Analysis: 20-07-2013 Date of receipt in lab:19-07-2013 Collected by: Mehwish Rani

S#	Parameters	W.H.O Max Permissible Level	T.B.S	M.T.C	N.C	G.G
1	Temperature	25 C	25 C	25 C	25 C	25 C
2	Ph	6.5-9.2	7.11	9.01	9.06	6.07
3	Total Dissolved Solids mg/1	1500	308	662	570	644
4	Calcium mg/1	200	28	30	23	46
5	Magnesium mg/1	150	10	18	21	11
6	Sulfate mg/1	400	40	76	23	76
7	Chloride mg/1	600	35	54	87	45
8	Iron Total mg/1	1.0	0.00	0.00	0.3	0.06
9	**Arsenic ppb**	**50**	**70**	**80**	**55**	**70**
10	Fluoride mg/1	1.5	0.00	0.78	0.00	0.55





Source: PCRWR and Rani, 2013

Fig. 1: Health risks create by the arsenic drinking water in selected areas of Bahawalpur Source: Rani, 2013 N=136

Fig. 1: Drinking water tested in laboratory of selected areas in Bahawalpur, Source: Rani, 2013 N=136

The result shows that the drinking water quality is very poor and badly effect on human health. In the study areas people have no awareness about drinking water quality. Governmental facility such as purifying filter plants of drinking water supply in study area is not installed as well as municipal authority is also not giving any attention to the area regarding safe drinking water.

The **(Fig.2**) shows the different types of diseases occurred due to the use of arsenic contaminated drinking water in study areas (Tibba Badar Shar, Modal Town "C", Nashat Colony and Ghani Ghot). Diseases due to use of arsenic contaminated drinking water is Cancer 7%, Bronchitis 8%, Heart disease (heart attack) 13%, Hypertension 8%, mellitus 5%, Nephrosis (degenerative kidney diseases) 9%,Emphysema 4%,Black-foot disease 6%, Developmental deficits 9%, Allergies 14%. Diabetes, Allergies, Heart disease (heart attack) is the major disease in study area. Even if people will continuously use municipal water supply with highly contaminated arsenic then occurring of diseases rate is going high within few years. According to the **(Fig.3)** people did not tested their ground drinking water because they have no awareness.

This **(Fig. 3)** shows that 84% people did not tested their ground drinking water. Only 16% people tested the ground drinking water and they tested ground drinking water 4 to 6 years before. They have no awareness about the drinking water quality.

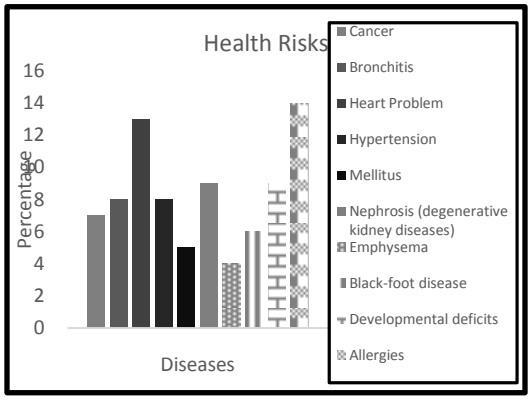


Fig. 4: Figure 2: Replies on Boiled the water before drinking in selected study areas of Bahawalpur, Source: Rani, 2013 N=136

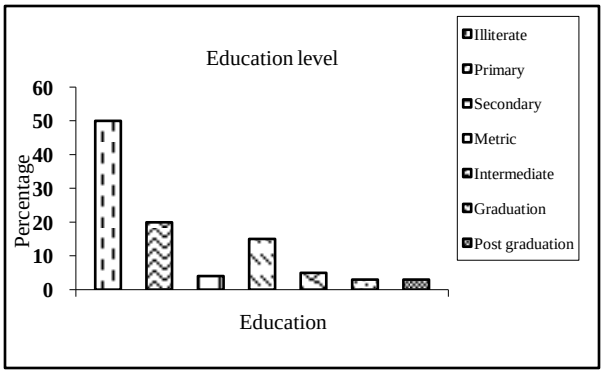


Fig. 3: Education level in selected study areas of Bahawalpur Source: Rani, 2013

(Fig. 4) shows the reply percentage that people are boiling the water before drinking or not? According to results, 70% peoples are not boiling the water before drinking. Only 30% people are boiled the water. But the Residents of the study areas even did not know that simple boiling cannot remove the arsenic from the water. **(Fig. 5)** shows the percentage of education level in selected areas 0f Bahawalpur. Mostly residents belonged to poor, labor class, middle class and low income group. The education level of the residents of the study area is very low. Most of the people are illiterate that is 50%, 20% primary, 4% secondary, 15% metric, intermediate 5%, graduation 3%, post-graduation 3%. The result shows that the residents have low education level which causes lower level jobs that reflect on their income, standard of living and awareness about drinking water quality.

3. CONCLUSION AND RECMMOMDATIONS

This study reveals that the drinking water quality in selected study areas is very poor. In Modal Town "C" amount of arsenic in drinking water is 80 ppb, in Tibba Badar Shar, Ghani Ghot 70 ppb and Nashat Colony 55 ppb amount of arsenic in drinking water, its more than the W.H.O standards. People are used arsenic contaminated drinking water. Due to the used of arsenic contaminated drinking water the rate of diseases is increasing rapidly. Major disease are cancer, Ischemic heart disease (heart attack), mellitus, Nephritis (chronic inflammation of the kidneys), Nephrosis (degenerative kidney diseases), Hypertension, Hypertensive heart disease, Emphysema, Bronchitis, Chronic airway obstruction, Lymphoma (tumors in the lymph), Black-foot disease, and developmental deficits. In this poor drinking water condition, no anyone water filter plant in study areas. The government cannot work properly. In this worst condition government must be installed water filters and water treatment plants not only in study areas but also all over Bahawalpur City. Awareness, education level, family number, and household income are connected to the ground drinking water quality that reflects health consequences.

Thus, it was suggested that policy makers should prepare people-centered policies instead focused on the target. Therefore, it is the need of the hour, which government should take action on emergency basis for the provision of clean drinking water. The government should take action based on emerging to increase the literacy rate among women especially to improve the health of the family. The government should launch a media campaign to raise awareness on improving the water quality and health. More filter plants should be installed as low family income cannot afford water

filters at home. It will help reduce waterborne diseases. NGO should play their role by running a campaign on large scale which must include the awareness by pamphlets; by conducting awareness activity related to enhance the problems by the use of poor water and should also involve electronic media for this purpose.

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