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ASSESSMENT OF DRINKING WATER QUALITY IN AFGHAN REFUGEE CAMP, DISTRICT HARIPUR, PAKISTAN

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Abstract: The present study was conducted at Panian-1 Afghan refugee camps of District Haripur for the Purpose to evaluate the quality of drinking water. Total of twenty one water samples were randomly collected from hand pumps, containers and tube wells which are the main sources of water used by the local community. Eleven samples were collected at storage point i.e. (containers in which community stored water) and twelve were collected from hand pumps while two of the samples were collected from the main tube wells. The collected samples were then analysed for selected physical (Turbidity, pH, EC, TDS, taste, colour and odour) chemical (Fluoride, Nitrate) and biological (Total coliform, E. coli) properties. According to this study, water sources were found more contaminated and did not meet the safe limits for drinking water as described in the WHO guidelines. The ratio of bacteriological contamination i.e. in 53% of the samples T. Coliform while in 47% of the samples E.coli was detected. In 53% of samples T. Coliform while in 47% of samples E. coli were found. Major causes of water contamination were found poor water quality (41%), improper sanitation system (37%), open defecation (12%) and unhygienic conditions (8%). All these factors contributing major threats to the local community in form of water borne diseases such as diarrhoea, typhoid, hepatitis, skin diseases, and cholera.

Keywords: Physio-chemical parameters, biological parameters, water contamination, Afghan refugee camps.

Introduction

Safe drinking water is a fundamental requirement for good wellbeing and an essential right of the people. Fresh water is now a constraining asset in numerous parts of the world and especially in Pakistan. There are approximately more than 160 million individuals in which 32% are living underneath poverty line. Out of the total population, 65% has access to safe water, 85% of them are living in urban and 55% in rural areas. Sanitation facilities, which incorporate sewerage framework in urban territories and drainage in rustic zones, are accessible to 42% of population—65% urban and 30% rural areas (Nawab et al., 2006).

Around 70% of the general population in Pakistan depends on ground water for their household uses (Malik et al., 2010). Because of pollution and microbiological contamination and impurities of the Pakistani nationals have deficient access to safe

drinking water with poor water supply lines and shattered drainage system (Tanwir et al., 2003). Especially, biological diseases brought on high child death rate of 128/1000 every year (Mohsin et al., 2013). It is assessed that, in Pakistan, 30% of all sicknesses and 40% of all deaths are brought about by poor quality of water (Asia, 2000). Presently, 30-40% hospitalized patients are due to water borne diseases, and about 80% of the infant death is only because of the polluted water that causes diarrhoea, cholera, dysentery, gastro-intestinal problems etc (Adhikari et al., 2007). Besides these facts, Pakistan is also the world's largest refugee hosting nation with around 1.65 million registered Afghan refugees and approximately one million unregistered individuals. In Hazara division there are about more than 1,20,000 population of refugee while in Haripur district the population of registered afghan refugees is more than 88,000, this figure may increase after counting in the registered and unregistered individuals (DTR, 2013) .

Due to emergency situation no proper planning was ensured for the adjustment of such a huge population contributing to degradation of environment and health status of the local community. Factors like improper water sanitation systems, open defecation and improper water supply systems contaminating the water quality directly which affects the health status of the target community and causing different types of waterborne diseases like typhoid, Diarrhoea, hepatitis, Cholera, Skin diseases etc. Thus all these problems are contributing to the poor public health (DTR, 2013).

There are three camps of refugees in district Haripur named as Panian-1, Panian-2 and Padhana. The total population of refugees in district Haripur is more than one lack. The present study was carried out in Panian-1, having population approximately thirty thousand. The objective was to analyse the current status of the drinking water quality, how it is deteriorated and affecting our health status.

Materials and Methods

Panian-1 refugee camp has three tubes well out of which two were functional and one is non-functional while more than 13 hand pumps were also non-functional. Each Tube well has five valves connected to distribution line and provide intermittent water supply. Each house hold received water twice a day from tube wells and stored it in different utensils for their usage. Random sampling technique was followed and accumulatively twenty one samples were collected and analysed. Nine samples were collected from water tanks (44%) and ten were collected from hand pumps (48%) while two of the samples were collected from the main tube wells (8%) (Figure1). Collected water samples were coded for identification and analysed for selected physical (Turbidity, PH, EC, TDS, Taste, colour and Odour,) chemical (Fluoride, Nitrate) and biological (Total Coliform, E. coli) properties (Figure 2).

Colorimeter technique using DR/890 colorimeter for nitrate and fluoride was used. Nitro vile for nitrate and SPAND reagents for fluoride was used. Hanna pH, TDS, EC meter was used testing of respective parameters. Biological parameters was analysed by using Delgua kit and membrane filter technique was used (Ahmed et al., 2012).

Sampling duration was from March to May. For water analysis WHO standard procedures were followed and transported to the laboratory within 2 hours of collection time

and serially analysed on the same day. A questionnaire was filled from 550 respondents randomly and information on their socio economic background, water quality and waterborne diseases, sanitation system; suggestions for improvement were also documented.

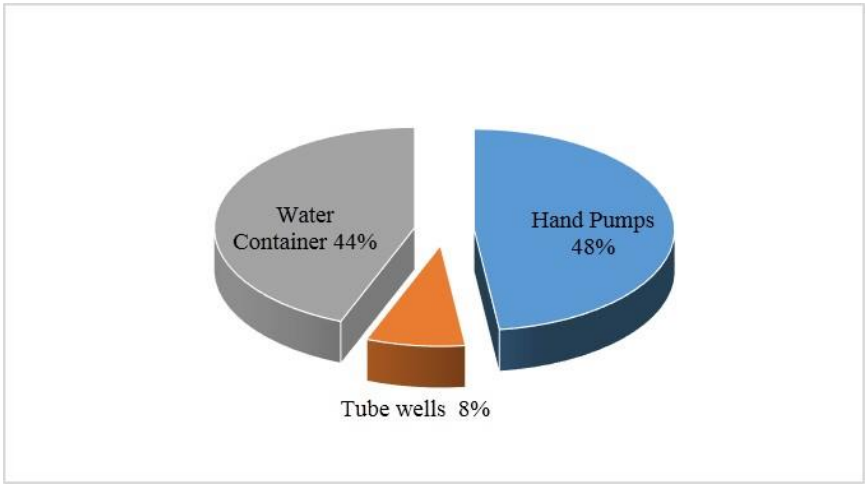

Fig.1: Distribution of water samples collected from different sources

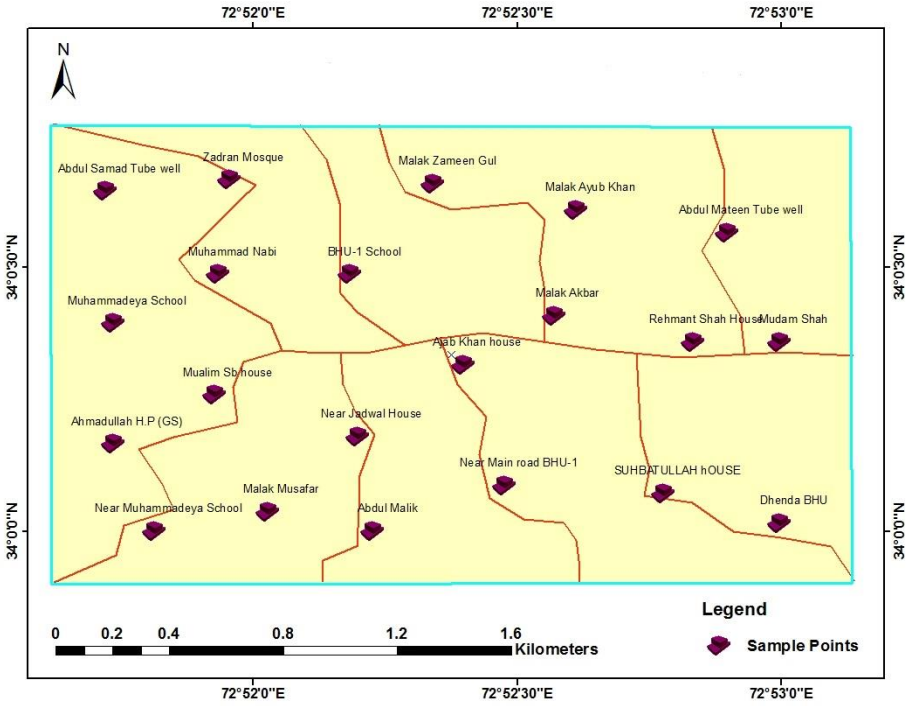

Fig. 2: Study area Panian-1 Afghan refugee camp and sampling points

Results and Discussion

Physio–Chemical and Microbiological Analysis

Water analysis showed that all the samples have transparent colour, no odour and non-objectionable/acceptable taste. The pH of the water was examined at the sampling site. The mean values for pH (7.5) and turbidity (3.2 NTU) were found within the permissible limits set by WHO and Pak-EPA respectively except EC (4.9µS/cm).Average temperature values of samples from water containers, hand pumps, and tube wells were 18.6-21^{o}C,which did not show much variation. The mean of Nitrates (11.6mg/l) and fluorides (0.51ppm) were also noted within the permissible limits. But the mean value of E.coli (9.8CFU/100 ml) and total coliform (5.04CFU/100 ml) with ranged from 40 and 50 respectively were found exceeding the limit which should be zero (Table 1).

Table 1 Descriptive statistics and values comparison with standards

Parameters	Range	Min	Max	Mean	Std. Deviation	WHO Standards
EC (µS/cm)	56.9	0.12	57	4.9	11.7	0.28-0.91
pH	2.5	6.5	8.9	7.5	0.7	6.9-8.2
TDS (mg/l)	213.9	0.12	214	49.4	64.9	500-1500
Turbidity (NTU)	3	1	4	3.2	0.94	<5
Nitrate (mg/l)	45	0	45	11.6	12.74	50
Fluoride (ppm)	1.4	0.13	1.5	0.51	0.4	1-1.5
E. coli (CFU/100 ml)	50	0	50	9.8	16.8	0
T. Coliform (CFU/100 ml)	45	0	45	5.04	9.6	0

Comparison of water quality parameters at different water sources of sampling points showed the highest mean value of TDS as compared to the other parameters (Figure 3). Nitrate also showed higher mean value while fluoride and turbidity has lower value i.e. less than 5 that's why they are not tabulated and not shown in the standard bar.

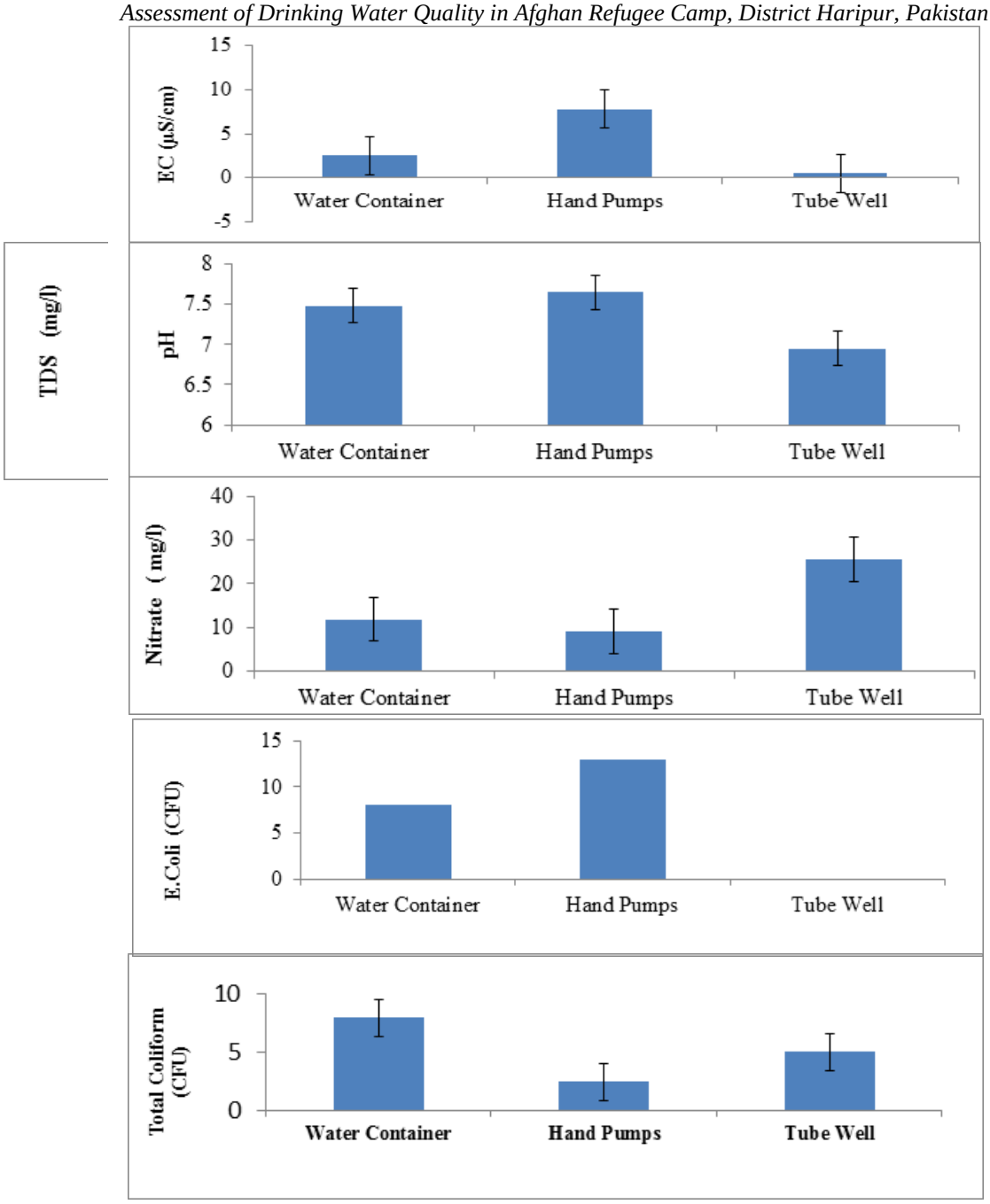

Fig 3: Water quality parameters at different water sources

Overall microbiological contamination in total number of water samples were statistically analyzed using SPSS and descriptive statistics. T. coliform were found greater in percentage in total number of water samples (53%) and tube wells and container i.e. water tank. (67%) while E. coli was in hand pumps (58%) (Figure 4).The main reason of contamination of water collected at storage may likely be due to the decades of old rusty and leaked water supply networks. Further, it was also observed in the study area that attitudes and practices of the people such as non-cleaning of the surroundings of water tanks, storing of water in open containers are also contributing to water contamination.

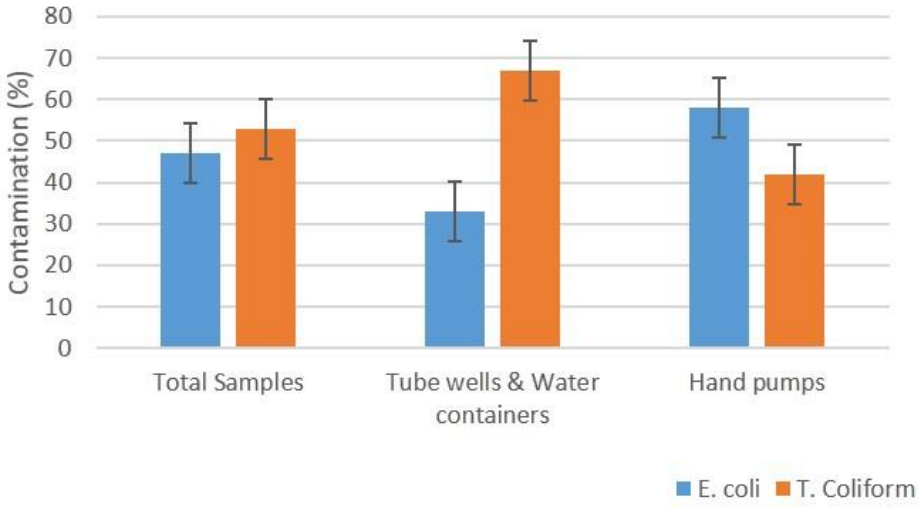

Fig. 4: Microbiological contamination in water sources

Occurrence of Water Borne Disease and its causes

According to the questionnaire analysis, Diarrhoea (53%) was found the major waterborne disease during the study period. Hepatitis (20%) Cholera (12%) typhoid (11%) and other skin diseases were also noted common in the existing community as depicted in the figure (5). Majority of the people in the study area responded that poor water quality is the main cause of waterborne disease. 41% of the total population viewed that water borne diseases are mainly caused due to lack of safe drinking water. However 39% in considered lack of improved water and sanitation system due to which waterborne diseases are causing. 12% of the total population thought open defecation to be the major cause of water borne disease while 22% viewed as unhygienic practices are mainly responsible for causing water borne diseases (Figure 6). A similar study was carried out by Khan et al. (2013). He reported that poor sanitation, open defecation and improper disposal of solid waste are the main factors contributing towards health issues of the inhabitants.

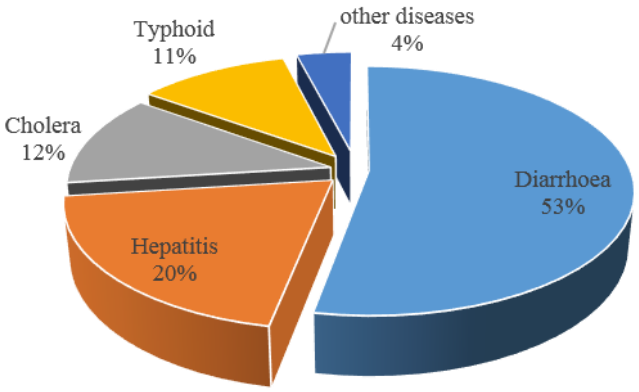

Fig.5. Occurrence of waterborne diseases in the study area

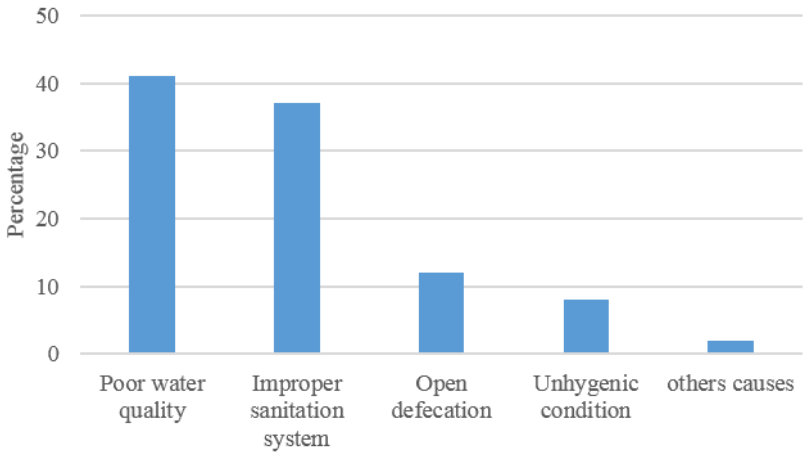

Fig. 6: Major causes of water bone diseases in the study area

Conclusion

The present study was conducted at Panian-1 refugee camps of District Haripur for the Purpose to assess water quality and major water diseases caused due to poor water sanitation. Study revealed that people of the study are mostly using tube wells water for their drinking and daily routine activities while less people are depended on hand pumps. Water sources are generally not clear from the surroundings and even sewerage and drainage lines are closely passed through it which is likely to contaminate the water source. Moreover, unsafe drinking water and poor sanitation in refugee village are the main contributing factors to the high number common diseases reported. Present study revealed that majority of local community do not boil their daily drinking water, many collect water from unprotected sources, and people often resort to open defecation. In the rainy season, the excreta pollutes in water and

flow into rivers or other unprotected drinking water sources. It was found that hand pump was comparatively safer to tube wells water but as majority of the people is using tube well water and the situation is alarming for their health. The contaminated water quality of the study area is causing major threats to the local community in form of water borne diseases such as diarrhoea, typhoid, hepatitis, skin diseases, and cholera.

References

Adhikari, H., Barnes, D. L., Schiewer, S. & White, D. M. 2007. Total coliform survival characteristics in frozen soils. Journal of Environmental Engineering, 133, 1098-1105.

Ahmed, K., Ahmed, M., Ahmed, J. & Khan, A. 2012. Risk assessment by bacteriological evaluation of drinking water of Gilgit-Baltistan. Pakistan Journal of Zoology, 44, 427-432.

Asia, D. S. 2000. water vision 2025, Country Report, Pakistan. Maharashtra, India, Global Water Partnership, South Asia Technical Advisory Committee Regional Office.

DRC. 2013. Annual Report.

Khan, S., Shahnaz, M., Jehan, N., Rehman, S., Shah, M. T. & Din, I. 2013. Drinking water quality and human health risk in Charsadda district, Pakistan. Journal of cleaner production, 60, 93-101.

Malik, M. A., Azam, E. M. & Saboor, A. 2010. Water Quality Status of Upper KPK and Northern Areas of Pakistan. Water Resources Research Center, Peshawar, Ministry of Science and Technology, Publication≠, Peshawar, Report No.: 142.

Mohsin, M., Safdar, S., Asghar, F. & Jamal, F. 2013. Assessment of drinking water quality and its impact on residents health in Bahawalpur city. International Journal of Humanities and Social Science, 3, 114-128.

Nawab, B., Nyborg, I. L., Esser, K. B. & Jenssen, P. D. 2006. Cultural preferences in designing ecological sanitation systems in North West Frontier Province, Pakistan. Journal of Environmental Psychology, 26, 236-246.

Tanwir, F., Saboor, A. & Shan, M. 2003. Water contamination, health hazards and public awareness—a care of the urban Punjab, Pakistan. International Journal of Agriculture and Biology, 5, 560-562.