Original Article

A

Drinking Water Quality Assessment and Related Diseases Burden at Tando Muhammad Khan

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ABSTRACT

Objectives: Objective of the study was analyse the drinking water quality of TMK and found related disease load
Study Design: A prospective, descriptive study
Place and Duration of Study: This study was conducted at District Tando Muhammad Khan from 1st January to 31st January, 2017.
Materials and Methods: Water samples were collected from different water sources of the subject area and properly labelled in plastic bottles wrapped in aluminium foil and brought to water testing and surveillance laboratory packed in ice boxes for a physico- chemical and bacteriological analysis. The following methods shown in table 1 was used for water quality assessment.
Results: Results indicates that the water collected from different areas of TMK was not attained the quality parameters suggested by WHO standards for drinking water as the water showed high level of TDS and arsenic level consecutively was found positive inbacteriological examination.
Conclusions: It was sum up from study that contaminated water is the foundation of many human health linked issues.
Key Words: Diseases, Water Borne Illness, Physico-Chemical Analysis, Bacteriological Examination

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INTRODUCTION

Tando Muhammad Khan is the district in southern part of Sindh province and this district consists of three talukas with total population approximated is 619,900 as per 2011 figures. The water quality is highly affected by the shortage and multiple water usage and increase of water pollution which made frightening the situation globally as well as in Pakistan. The contaminated water creating many health related issues either directly by drinking or indirectly through using in agriculture yield. Pakistan being most water stressed country facing many water borne illness problems which consecutively let condition towards absolute water scarcity[1]. The ground water is used for drinking and irrigation purpose because the drought stress of surface water in some areas due to increasing population, climatic change, improper operational maintenance and water supply make the system impotent to run at required capacity therefore monitoring program is obligatory to save the resources of fresh water [2,3,4,5].

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Metal pipes and hand pumps has been used 66% in domestic drinking through which the quality of water is unable to maintain due to rusts passage and number of pathogen availability that can cause the 30% of illnesses and 40% of demises. Estimated of 5 millions of children lost their lives by drinking contaminated water followed by diarrhea[6,7,8]. Surprisingly water supplying agencies mainly focusing on the quantity supply of water whereas the water quality is being neglected. The lack of monitoring, surveillance, proper government's arrangements, legal framework for quality drinking water have aggravated the situation and contended to avenue this research study for public awareness.

MATERIALS AND METHODS

This study was conducted at District Tando Muhammad Khan from 1st January to 31st January, 2017. Water samples were collected from different water sources of the subject area and properly labelled in plastic bottles wrapped in aluminium foil and brought to water testing and surveillance laboratory packed in ice boxes for a physico- chemical and bacteriological analysis. The following methods shown in table 1 was used for water quality assessment.

RESULTS

The results reveled in table 2 that physical analysis of water samples shows the water aesthetically acceptable from consumer viewpoint. Color and Turbidity of water

samples (Coded: TMK-2, TMK-6, TMK-8,TMK-9) is within the range 13-27 NTU, odor, color and turbidity of samples coded TMK-1,TMK-3,TMK-4,TMK-5, and TMK-7 are counted in the permissible limits of WHO, moreover the < 5 NTU due to the ground nature and depth of boring. Furthermore pH value was also recorded in standards range. The Electric conductance (EC), Salinity, TDS (Total Dissolved Salts) and Chlorides was above the recommended level for the ground water samples with coding TMK-1,TMK-3,TMK-4,TMK-5, and TMK-7 however the arsenic level of samples coded TMK-1,TMK-3,TMK-4,TMK-5, and TMK-7 was also noted high than WHO suggested limitations, moreover Presumptive coliform countper 100ml water method was used for bacteriological analysis, and water samples (TMK-2, TMK-6, TMK-8,TMK-9) contained unacceptable number of coliform bacteria, whereas no coliform growth was observed in ground water samples due to its saline nature consecutively the TDS values was above WHO seted level.The table 3 and figure shows the percentage value of some common water borne diseases like Typhoid Fever, Shigellosis (Basillary Dysentary), Amoebiasis, Acute Poliomyelitis Viral Hepatitis (A & E), and Ascariasis, thesediseases were diagnosed and recorded at District hospital administration, district Tando Muhammad Khan (TMK).

Table No. 1: Water Quality Parameters and Methods used for Analysis

S. No:	Parameters	Test Method
1.	Odor	Smell Sensing organ
2.	Colour	Visual
3.	Turbidity	Turbidity Meter (PCCHECKIT, Germany),
4.	Electrical Conductivity (EC)	Multiparameter Water Quality meter (Model no: sanso-direct con 200) Germany
5.	Salinity,	
6.	Total Dissolved Salts (TDS)	
7.	pH	
8.	Chlorides	Titration method
9.	Arsenic	kit method MERCK the detection range 0.005mg/L to 0.5mg/L
10.	Bacteriological Examination	Presumptive coliform count per 100ml water

Table No. 2:Physical – Chemical and Bacteriological Analysis

	Sample Station	TMK-1	TMK-2	TMK-3	TMK-4	TMK-5	TMK-6	TMK-7	TMK-8	TMK-9	WHO limits
Physical – Chemical and Bacteriological Analysis	Source	MP	WS	MP	HP	HP	WS	HP	WS	WS	
	Parameter										
	Odor	OL	OL	OL	OL	OL	OL	OL	OL	OL	OL
	Color	CL	ST	CL	CL	CL	ST	CL	ST	ST	CL
	Turbidity NTU	<5	17	<5	<5	<5	13	<5	23	27	5
	EC uS/cm	2914	984	2822	1720	2130	983	2133	981	989	---
	Salinity ppt	1.7	0.7	1.7	1.0	1.4	0.7	1.4	0.7	0.7	----
	TDS mg/L	1864	629	1806	1100	1363	621	1357	625	632	500
	pH	8.1	7.2	7.9	7.8	7.7	7.2	7.5	7.2	7.2	6.5-8.5
	Chlorides mg/L	621	183	588	298	331	177	327	178	185	250
	Arsenic mg/L	0.01	ND	0.01	0.025	0.025	ND	0.01	ND	ND	0.005
	Bacteriological Examination	-ve	+ve	-ve	-ve	-ve	+ve	-ve	+ve	+ve	0

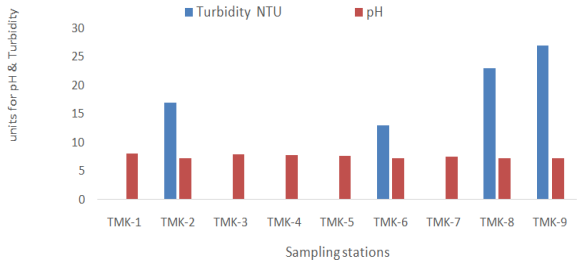

Figure No. 1: pH and Turbidity of water samples of TMK

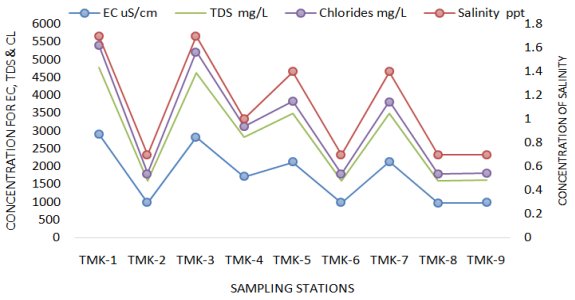

Figure No. 2: EC, TDS, Chloride and Salinity values of water samples of TMK

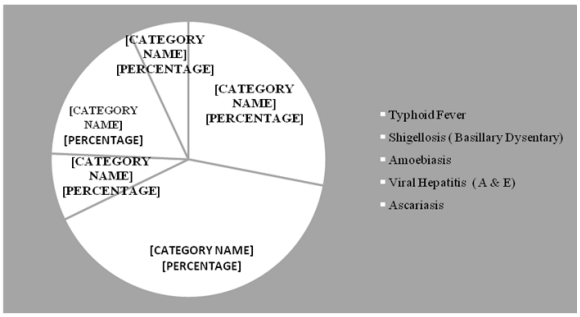

Figure No. 3: Waterborne disease burden at TMK

DISCUSSION

All of the physical parameters of drinking water in current study was with standard limits indorsed by WHO and NSDWQ WHO guidelines and NSDWQ. Although theTurbidity, pH, conductivity, Salinity, TDS,was found responsible for low appealing quality of drinking water[9,10,11]. The acidic and basic nature of water depends on pH of water hence all samples was found in between 6.5 to 8.5 range commended by WHO (2006), the present results showing harmony with Carr and Neary, (2008)[12], Memon et.al.(2016)[13]. The pollution by soluble salts denoted the electrical conductance (EC)[14], and allusion figure by WHO is 1500µS cm^{-2} [15]. The water that has grounds of some natural resources used for treatment like sewage, chemical and industrial wastes increases quantity of inorganic substances known as total dissolved solids (TDS) which make the water unfit for drinking if available above the 1000mg/L a WHO limit, the present results show hitherto published data[8,16, 17]. The concentration of Arsenic (As) ranged between 0.01 to 0.025mgL-1 in samples coded TMK-1,TMK-3,TMK-4,TMK-5, and TMK-7 is higher than the permissible limits of WHO, respectively. Bacteriological quality (coliform bacteria) by the MPN technique was detected as the coliform organism ferment lactose, consecutively gas produced after fermentation and acidic reaction occurs (shades of yellow colour). The positive samples showed presenceand negative the absence of the coliform group of bacteria. The most probable number (MPN)was determined from the positive tests in a set of three replicates made at three different dilutions.

The data collected from district hospitals show no any proofto document that human health was made worsen from drinking of hard water as it is well known certainty that the hard water is unsuitablefor domestic use due to its pHand alkalinity[18]. The people suffered from gallbladder, urinary stones, arthritis, cancer and arthopathies in the areas wheredrinking water is harder than 500 mg/L CaCO3.The higher TDS values also become the cause of persistentdiarrhoea[19,20].

CONCLUSION

It was concluded from study that water a major source for sustaining wellbeing of human consequently if the water become contaminated with different contaminants like toxins, chemicals and wastes than this vital part of life becomes the slow poison for human life and originated roots of many ailments

Conflict of Interest: The study has no conflict of interest to declare by any author.

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