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BACTERIOLOGICAL STATUS OF DRINKING WATER IN RURAL AREAS OF PESHAWAR

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A study was carried out on the occurance and distribution of different types of bacteria present in the drinking water of 12 villages near Peshawar from different sources i.e. well, tube-well, canal and river. 120 samples were analysed and the different types of pathogenic bacteria detected were of the type *E.coli, Salmonella, Shigella* and *Streptococcus*. The most prevalent was the coliform bacteria. A lot of variation was observed in the total bacterial count present in the various sources. Except a few samples almost all the samples had a total bacterial count as well as total faecal coli-form MPN beyond the standard values.

Key words: Bacteriology, Drinking water, Rural areas.

Introduction

Water is often a main source of infection because it carries a number of micro-organisms. Microbiological status is commonly employed for determining the quality of water. Previously, methods were evolved for the detection of organic matter in water by chemical means and further methods were elaborated depending on the estimation of free and albuminoid ammonia, chlorine, nitrate and nitrites for distinguishing between organic matter of animal and plant origin. Though considerable progress was made it was found that these tests were not sufficiently accurate or specific for the detection of minor degrees of sewage contamination. With the development of bacteriology, efforts were made to supplement the chemical analysis [1].

Amongst the different techniques, total bacterial count is easier to detect the bacterial population in water than coliform index. It is not an important parameter considered for potability test of water, but it is total coliform count.

Gestroenteritis, diarrhoea, typhoid are common problems of public health in rural areas of Peshawar region. Thousands of people suffer from dysentry, cholera [2] due to water borne bacteria. The use of water from canal, well, tube-well , hand pump, spring water and shallow wells is the main cause of such diseases. The water from these sources is collected in Matkas, pit, tank, etc. and after 12-14 hr. decantation, it is used for drinking purposes. The present work deals with the bacteriological examination of drinking water and to confirm the presence of pathogens such as *Salmonella, Shigella*, etc., in drinking water.

Materials and Methods

Sampling. Glass stoppered, sterilized bottles of 500 ml capacity were used to collect the samples.

Water samples. Sixteen locations were selected near Peshawar region for collecting water from well, tube-well, canals and river.

Media. Different types of media used for estimation of *Coliform, Faecal coliform, Streptococci, Salmonella* and *Shigella* are as folows:

For total count nutrient agar was used as a culture media. . For total *coli* MPN and *Faecal coliform* MPN. Lactose broth was used for presumptive test and brilliant green lactore bib broth and endoagar were used for confirmatory.

For *Shigella* and *Salmonella*, only those organisms are reported which grow on Bismuth sulphit agar and desoxycholate agar and for *Streptococcus faecalis* nutrient agar was used [4].

Results and Discussion

Results of the bacteriological examination of drinking water from various localities of the rural areas of Peshawar region are shown in Tables 1-3. Total bacterial count per ml as well as most probable number of total *Coliform* and *Faecal coliform* per 100 ml is very high ranging from a few organisms per 100 ml to thousands of organisms. Total count of sixteen samples out of one twenty samples is within the required standard and total *coli* MPN as well as *Faecal coliform* MPN is also within the standard range. Moreover, pathogenic organisms are absent and water of these sixteen samples is potable. Total bacterial count of sixteen samples is within the normal range whereas total *Coli* MPN and total *Faecal coliform* MPN is much higher than the required standard value, hence the samples are unfit for human consumption. Rest of the samples show both a high total count and *Coliform* MPN and are not suitable for drinking. As *Coliform* are indicative of faecal contamination their presence in drinking water in such high number is alarming. The presence of pathogens i.e. *Salmonella, Shigella* and *Streptococcus faecalis* was also confirmed. *Salmonella*, is present in thirty-five samples, *Streptococcus faecalis* in twenty-eight samples and *Shigella* in twenty samples. From sixteen sources five samples were from tube-well, seven from well, three

TABLE 1. BACTERIOLOGICAL EXAMINATION OF DRINKING WATER COLLECTED FROM TUBE WELL

Site	Nature of sample	Total count /ml	*Coliform* MPN/100ml	*Faecal coliform* MPN/100ml	*Salmonella* /1000ml	*Streptococcus* /1000ml	*Shigella* /1000ml
Bashir Abad	Tube-well	95	40	2	1	1	1
		80	20	1	Nil	Nil	Nil
		40	2	Nil	Nil	Nil	Nil
		20	Nil	Nil	Nil	Nil	Nil
		10	Nil	Nil	Nil	Nil	Nil
		230	1	1	1	Nil	Nil
Palosi Atozai	Tube-well	917	2	3	Nil	Nil	1
		200	35	2	Nil	Nil	1
		400	50	5	1	1	Nil
		350	100	3	Nil	Nil	Nil
		170	10	4	1	Nil	Nil
		200	15	3	Nil	Nil	1
		160	40	20	1	1	Nil
		830	30	10	Nil	1	Nil
		700	15	15	Nil	1	1
Kachi Garhi	Tube-well	3000	40	20	1	1	Nil
		1150	10	2	Nil	Nil	Nil
		2500	7	Nil	Nil	Nil	Nil
		1100	0	Nil	Nil	Nil	Nil
		1005	6	3	Nil	Nil	Nil
		930	1	1	Nil	Nil	Nil
		250	Nil	Nil	Nil	Nil	Nil
		2000	20	10	1	1	Nil
Bashir Abab	Hand Pump	90	50	3	Nil	Nil	Nil
Saeed Abad	Tube-well	Nil	Nil	Nil	Nil	Nil	Nil
		100	5400	Nil	Nil	Nil	Nil
		80	Nil	Nil	Nil	Nil	Nil
		200	150	Nil	1	1	1
		100	60	2	Nil	Nil	Nil
		150	40	1	Nil	Nil	Nil
		80	2	Nil	Nil	Nil	1
		90	Nil	Nil	Nil	Nil	Nil
		80	Nil	Nil	Nil	Nil	Nil

TABLE 2. BACTERIOLOGICAL EXAMINATION OF DRINKING WATER COLLECTED FROM WELL.

Site	Nature of sample	Total count /ml	*Coliform* MPN/100ml	*Faecal coliform* MPN/100ml	*Salmonella* /1000ml	*Stretococcus* /1000ml	*Shigella* /1000ml
Garhi Bad Shah Gul	Well-I	4700	3500	1100	1	Nil	Nil
Garhi Bad Shah Gul	Well-II	2900	2800	460	1	1	Nil
		2013	3500	0	Nil	Nil	1
		8000	435	35	1	1	Nil
		2000	1000	40	Nil	Nil	Nil
		3500	230	10	Nil	Nil	2
		2500	115	4	1	Nil	Nil
		4000	2400	3	Nil	Nil	Nil
		4000	200	1	Nil	Nil	Nil
Bud Bair	Well	985	497	3	1	Nil	1
		800	200	Nil	1	Nil	Nil
		1001	10	Nil	Nil	1	Nil
		835	70	10	Nil	1	Nil
		728	40	5	Nil	Nil	Nil
		500	20	1	0	Nil	Nil
		478	1	Nil	Nil	Nil	0
Regi	Well	150	Nil	Nil	Nil	Nil	Nil
		90	Nil	Nil	Nil	Nil	Nil
		71	1	Nil	Nil	Nil	Nil
		15	1	Nil	Nil	Nil	Nil
		200	5	3	1	Nil	Nil
		90	40	2	Nil	Nil	Nil
		75	1	Nil	Nil	Nil	Nil

(Contd..)

(Table 2 , Contd.)

		80	2	Nil	Nil	Nil	Nil
		60	1	Nil	Nil	Nil	Nil
		200	2	Nil	1	Nil	Nil
		70	Nil	Nil	Nil	Nil	Nil
Mulazai	Well	90	50	0	Nil	1Nil	
		70	40	35	Nil	Nil	Nil
		4	1	Nil	Nil	Nil	Nil
		90	20	15	Nil	Nil	Nil
		80	60	0	1	1	Nil
		60	30	10	1	Nil	Nil
Kohat Road	Well-I	28	50	40	Nil	1	1
		40	20	1	Nil	Nil	Nil
		20	Nil	Nil	Nil	Nil	Nil
		10	Nil	Nil	Nil	Nil	Nil
Kohat Road	Well-II	836	40	20	1	Nil	Nil
		530	20	Nil	Nil	Nil	Nil
		400	1	Nil	Nil	Nil	Nil
		500	Nil	Nil	Nil	Nil	Nil
		150	Nil	Nil	Nil	Nil	Nil
		135	2	2	Nil	Nil	Nil

TABLE 3. BACTERIOLOGICAL EXAMINATION OF DRINKING WATER COLLECTED FROM CANAL/SPRING.

Site	Nature of sample	Total count /ml	*Coliform* MPN/100ml	*Faecal coliform* MPN/100ml	*Salmonella* /1000ml	*Stretococcus* /1000ml	*Shigella* /1000ml
Achini Bala	Canal	28700	24000	2400	1	Nil	Nil
		4105	Nil	Nil	Nil	Nil	Nil
		53166	24000	1500	1	1	1
		2829	3500	Nil	Nil	Nil	Nil
		15805	1600	1500	1	Nil	Nil
		520	Nil	Nil	Nil	Nil	Nil
		11200	2300	40	Nil	Nil	Nil
		10500	130	20	Nil	Nil	Nil
		412	Nil	Nil	Nil	Nil	Nil
		630	200	50	1	1	Nil
		535	40	20	1	Nil	Nil
		5200	20	10	Nil	Nil	Nil
		1230	10	5	Nil	Nil	Nil
		1150	7	4	Nil	Nil	Nil
		9700	200	40	Nil	Nil	Nil
Haji Banda	Canal	5410	Nil	Nil	Nil	Nil	Nil
		18000	24000	Nil	3	3	1
		1930	2400	Nil	Nil	1	Nil
		1900	Nil	Nil	1	1	Nil
		3115	200	10	1	1	Nil
		2500	50	40	1	Nil	Nil
		1103	40	30	Nil	Nil	1
		2900	20	10	1	Nil	1
		1000	480	5	2	Nil	Nil
		500	200	1	Nil	1	Nil
		930	Nil	Nil	Nil	2	Nil
		835	50	40	Nil	Nil	Nil
Sarband	Bara River	400000	3500	2400	Nil	3	1
		11200	130	90	Nil	Nil	1
		45	450	430	Nil	Nil	Nil
		2900	350	230	Nil	Nil	Nil
		7693	9200	930	Nil	Nil	Nil
		27000	24000	Nil	Nil	Nil	Nil
		3200	2400	Nil	Nil	Nil	Nil
		6530	200	40	Nil	Nil	Nil
		3450	100	10	1	1	Nil
		2530	26	2	1	2	Nil
		1535	20	4	Nil	1	Nil
		1030	10	3	1	Nil	Nil
		1520	7	4	Nil	Nil	Nil
		1105	60	7	Nil	Nil	Nil
Bashir Abad	Spring	60	1700	0	Nil	Nil	Nil

from canal and one from spring. Among the thirty three samples (Table 1) collected from various tube wells, six samples are potable whereas twenty-seven samples are unfit for human consumption. Forty-five samples (Table 2) procured froms seven wells, ten samples are potable whereas thirty-five samples are not potable. Forty-two samples (Table 3) obtained from five sources of canal and spring are not fit for human consumption. Water from most of the sources is unfit for drinking, majority of the organisms belong to the coliform group. This investigation leads to the conclusion that the water used for drinking purposes is highly contaminated by faecal organisms in the rural areas of Peshawar. This means that apart from canal, spring and shallow wells, even the water from most of the tube-well is also contaminated.

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