

BACTERIOLOGICAL AND PROTOZOAL STUDY ON DOMESTIC WATER SUPPLY IN KARACHI

Pages with reference to book, From 33 To 35

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ABSTRACT

Four hundred and fifty eight water samples collected from domestic tanks and taps and community taps were analysed for bacterial contamination. Faecal pollution was more in domestic tanks and taps in Mehmoodabad, Korangi and least in water collected from community taps of Liaquatabad, Korangi and Mehmoodabad. Bacteria isolated were mostly e.coli, Enterobacter sp, Klebsiella sp. and A. faecalis, while other organisms (except Pseudomonas) were found in lower numbers. Salmonella para typhi and para typhi B, Shigella dysenteriae and Aeromonas sp. were found in Clifton area. Parasite (Fluke) was isolated from one water sample only (JPMA 41: 33, 1991).

INTRODUCTION

Hepatitis (A,E)^{1,2} and diarrhoeal disease³⁻⁵ widely prevalent in Karachi, may be due to consumption of polluted water. Pollution can occur at source, in pipes carrying water from the source to domestic water supply and in domestic tanks. The degree of contamination may vary in different areas depending upon the hygienic and living standards of the population⁴. This study was done on domestic water supply to determine whether water consumed by Karachi population is potable.

MATERIAL AND METHOD

Four hundred and fifty eight water samples (211 each from domestic tanks and taps, and 36 from community taps) were collected from different areas of Karachi (Table 1).

Table I. Area of collection and number of samples.

Group A	Group B	Group C	Group D	Group E	Group F
D.H.S. Clifton	P.E.C.H.S. II,VI KDA I Gulshan	Nazimabad I,III,IV,V N.Nazimabad F.B. Area Liaquatabad	Malir	Mehmoodabad Korangi	Liaquatabad Korangi Mehmoodabad
80	112	156	40	34	36
Group A to E Tanks and taps.			DHS - Defence House Society		
Group F Community taps		PECHS -Pakistan employees cooperative. Housing Society.			

Chlorinated water samples were collected once from each source, and specimens were analysed for faecal contamination by membrane filter technique⁶. A measured volume (100 ml) of water was passed through the membrane, the test carried out in duplicate. Each membrane was transferred to MacConkey's agar. The plates were incubated at 37°C and 44°C for 24 to 48 hours. Colony counts

between 10-80 were considered significant. Bacterial growth was identified by colony morphology, gram's staining and biochemical reactions on API 20-E kit. Out of 458 water samples, parasites were looked for in 248 specimens. A similar volume of water was passed through another membrane filter. The membrane was washed with 2 ml sterile saline in a petri dish. The saline solution was centrifuged and the sediment was examined under low and high power objective.

RESULTS

Water samples collected from different areas of Karachi were divided into 6 groups. Contamination in tanks was similar in groups A to D. Higher contamination was found in group E, both in tanks and taps while least contamination was found in community taps (Table II).

TABLE II. Faecal contamination of domestic water supply.

Groups	Tank		Tap	
	No. tested/No. +ve(%)		No. tested/No. +ve(%)	
Group A	40/20	(50)	40/14	(35)
Group B	56/27	(48)	56/21	(37)
Group C	78/39	(50)	78/36	(46)
Group D	20/6	(30)	20/4	(20)
Group E	17/13	(76)	17/12	(71)
Group F (Community taps)	-		36/3	(8)

Faecal contamination was found in all areas (Table III).

TABLE III. Bacteria isolated from domestic water supply

Bacteria isolated	Group A	Group B	Group C	Group D	Group E	Group F
	No. tested/ No. +ve (%)	No. tested/ No. +ve(%)	No. tested/ No. +ve(%)	No. tested/ No. +ve(%)	No. tested/ No. +ve(%)	No. tested/ No. +ve(%)
<i>E. coli</i>	34/22 (65)	48/28 (58)	75/46 (61)	10/7 (70)	25/7 (28)	3/3 (100)
<i>Klebsiella sp.</i>	34/11 (32)	48/6 (13)	75/16 (21)	-	-	-
<i>Enterobacter sp.</i>	34/2 (6)	48/20 (42)	75/22 (29)	10/5 (50)	25/17 (68)	-
<i>Salmonella sp.</i>	34/2 (6)	-	-	-	-	-
<i>Shigella sp.</i>	34/2 (6)	-	-	-	-	-
<i>Aeromonas sp.</i>	34/4 (12)	-	-	-	-	-
<i>A. faecalis</i>	80/12 (15)	112/15 (13)	156/34 (22)	40/5 (13)	34/1 (3)	36/5 (14)
<i>P.aeruginosa</i>	80/25 (31)	112/22 (20)	156/43 (28)	40/16 (40)	34/2 (6)	36/4 (11)
<i>Acetivobacter sp.</i>	-	112/6 (5)	156/2 (1)	40/3 (8)	34/2 (6)	-
<i>A.cloacae</i>	-	-	156/5 (3)	-	-	-
<i>Proteus sp.</i>	-	-	156/2 (1)	40/3 (8)	-	-
<i>B.subtilis</i>	-	-	156/2 (1)	-	-	-
<i>Citro bacter</i>	-	-	75/4 (5)	-	-	-

Among the bacterial isolates *E.coli* (both at 37°C & 44°C) were mainly isolated followed by

Enterobacter sp and Kiebsiella sp. Other pathogenic bacteria were found in lower numbers, while Shigella dysenteriae, Salmonella para A and B and Aeromonas sp. were found in few water samples from underground tanks in Clifton. Pseudomonas was isolated in moderate numbers in all the groups. Direct microscopy for parasites indicated only one positive sample (Fluke) from an underground tank.

DISCUSSION

Faecal pollution of domestic water supply may introduce a variety of intestinal pathogens and result in microbial disease in the community. These organisms may cause diseases that vary from mild gastroenteritis to severe and sometimes fatal dysentery, cholera or typhoid. The source of water and the type of supply has a bearing on contamination and diarrhoeal disease. This study indicates that unhygienic polluted water is being consumed by a large proportion of Karachi population. In other cities of Pakistan faecal contamination was found in domestic water in congested areas and also in water obtained from natural sources⁸⁻¹², as water supplies might be contaminated from faeces being passed or washed into rivers, streams or being allowed to seep into wells. Parasitic infestation is probably not through water in Karachi city as only one parasite (Fluke) was detected. A coliform limit is not adequate to ensure the absence of pathogenic intestinal protozoa in treated water supplies due to extreme chlorine resistance of the pathogens¹³. In order to ascertain potable water supply extra care must be taken right from the source of supply to the consumers' tanks and taps. Quality of construction of underground tanks should be improved to avoid cracks and seepage from outside. Water and sewage pipe lines should be laid far apart so that mixing does not occur when cracks develop or seepage occurs. Regular cleaning of tanks and.. checking contamination by a simple test tfran occasionally by a more complicated test or series of tests is necessary as contamination is often intermittent. Addition of alum or sulphur in tanks, and above all, simply boiling of water which is used for drinking purposes is necessary to make water safe for human consumption.

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