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Microbiological Assessment of Water Samples Collected from Different Areas of Karachi, Pakistan

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Abstract: Water is essential for living beings. The strength of humans and different life forms is identified with safe water other than anything. The most well-known and far-reaching threat related to drinking water is pollution from direct and indirect resources straight forwardly or by implication, by sewage, different squanders or human excrement. Around 25 years back, legitimate evaluations showed that every year about 500 million individuals are influenced by water associated sickness and more than 10 million of these expire. In a current analysis in light of WHO information, it is shown that 3/4 of every single human sickness is caused by natural contamination. A total of 100 water samples were collected from different areas of Karachi for the microbiological assessment of contaminants in potable water. The samples were analyzed according to the standard microbiological testing protocol. Seventy-eight (78%) untreated and twenty-two (22%) treated water testers were found positive for coliforms. Fecal coliform and fecal *Streptococci* were present in 57 and 27 testers respectively. *Escherichia coli* were found in 73% of the samples which is an indicator of fecal contamination. Hence, we can use this study for microbiological assessment of the drinking water available in different areas of Karachi.

Keywords: Potable water, microbiological analysis, fecal pollution, *Escherichia coli.*

Introduction

Karachi is the largest city of Pakistan and capital of Sindh province. Due to the city being a business hub, its population is rapidly increasing and facing shortage of water supply in Karachi. Determining quality of water is a key segment for declaring its utilization fit and is a part of the Millennium Development Goals (MDG) in 2015 (Payment, 1997 and van Leeuwen, 2000).

Drinking water supply via circulation pipe is normally exposed to the microbial quality changes (Feacham, l980). Drinking water must be free from a zone, which may antagonistically influence human health. The illnesses caused by microorganisms in developing nations are far reaching in some sections of the population. This issue has become more serious by rapidly growing population (Rand, et al., 1976).

The most outstanding and endless danger related with intake of water is contaminated water in pipes which explicitly takes a path through sewage (FAO, 1979). The aim of this study was to evaluate the sensitivity of potable water in Karachi and give a model to reduce the incidence of water borne diseases.

Materials and Methods

A total of 100 drinking water samples were collected from 33 different locations of Karachi, in March 2016. Water samples were collected in 1.5 liter sterilized bottle of narrow mouth. All samples were collected from municipal and cantonment water supply lines and immediately transported to the laboratory for microbiological analysis. Physical parameter tests for pH and turbidity are very important in the microbiological analysis of potable water.

Water tests were handled as portrayed by Rand et al. (1976) quickly, five tubes of two fold quality lactose broth (containing Durham tube) were inoculated with 10 ml tested water (in every tube) and two tubes of single strength with 0.1 ml and 1.0 ml. Afterwards, incubation at 35^{o}C aimed at 48 hours acid production with the presence of gas in some of the Durham tubes was considered as a positive result. Quantity of the positive tubes was documented and Most Probable Number (MPN) was calculated according to MPN table.

Sand filtered treated water sample, 50 ml of double strength MacConkey's broth was inoculated with 25ml of water sample and incubated at 35^{o}C for 48 hours (Baker and Breach, 1980).

01 ml of every positive container of possible coliforms was inoculated in Brilliant Green Lactose Bile Broth (BGLB) tube. Once brooding at 44.5°C, of every water sample shower for 24 hours; tubes with gas and turbidity were viewed as positive. The positive tubes were additionally refined on Eosine Methylene Blue agar (EMB) for the confinement of fecal coliforms (Baker and Breach, 1980).

Positive tubes of the presumptive coliform test were sub-cultured in glucose broth and incubated for 2 hours

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at 37°C. Sodium Azide (0.25 gm/500 ml) was then added and incubation carried out at 44.5°C for further 48 hours. Positive tubes showing acid were sub-cultured on MacConkey agar plates and incubated at 37°C for 24 hours. The occurrence of small red point was indicative of *Streptococcus faecals*. Gram staining and the production of acid in mannitol and lactose only, but not in raffinose, confirmed their presence.

Positive tubes of presumptive coliform test were sub-cultured in glucose broth and incubated for 2 hours at 37°C. Sodium Azide (0.25 gm/500 ml) was formerly included and incubated at 44.5°C for an additional 48 hours. Positive tubes showing acid were sub-cultured on MacConkey agar plates and incubated at 37°C for 24 hours.

Results and Discussion

Drinking water samples were investigated with the main focus of analyzing microbiological contamination. The pH of the water samples range between 4.9-8.2. against WHO (1984) limit of 6.5-8.0 pH (Table 2). The turbidity of all water samples (absorbance reading is taken at 540 nm wave length) ranges between 0.48-0.58, which is within WHO (1984) guideline of 0.5NTU (Table 2). It is observed that the turbidity increases with the change of color of water from white to yellowish, reddish or greenish respectively.

Seventy-eight (78%) untreated and twenty-two (22%) treated water tasters found positive for coliform tests. Fecal coliform and fecal *Streptococci* were found in 57 and 27 tasters, correspondingly, representing polluted bases, insufficient treatment or post-treatment pollution of potable water tasters. *Escherichia coli* were identified in 73% of the tasters which is an indicator of fecal contamination (Tables 3, 4).

Table 1. Details of samples collection locations.

SAMPLE NO.	Sample area	Detail
WS. 1	Azambasti	HC / UT
WS. 2	Buffer zone	HC / T
WS. 3	Clifton	HC / UT
WS. 4	Drigh road	HC / UT
WS. 5	F.B.Area Block 08	HC / UT
WS. 6	F.B.Area Block 09	HC / UT
WS.7	F.B.Area Block 10	HC / UT
WS. 8	F.B.Area Block 11	HC / UT
WS.9	F.B.Area Block 12	HC / UT
WS.10	F.B.Area Block 13	HC/ T
WS.11	F.B.Area Block 14	HC / UT
WS. 12	F.B.Area Block 15	HC / T
WS. 13	F.B.Area Block 16	HC / T
WS. 14	F.C.Area	HC / UT
WS. 15	Gulshan-e-Iqbal	HC / UT
WS. 16	Malir	HC / UT
WS. 17	Nazimabad Block 01	HC / UT
WS.18	Nazimabad Block 02	HC / UT
WS.19	Nazimabad Block 03	HC / UT
WS.20	Nazimabad Block 04	HC / UT
WS.21	Nazimabad Block 05	HC/ T
WS.22	New Karachi	HC / UT
WS. 23	North Nazimabad A	HC / T
WS. 24	North Nazimabad B	HC / T
WS. 25	North Nazimabad C	HC / UT
WS. 26	North Nazimabad D	HC / UT
WS. 27	North Nazimabad E	HC / UT
WS. 28	North Nazimabad M	HC / UT
WS.29	Orangi Town	HC / UT
WS. 30	Ranchor line	HC / UT
WS.31	Sadder	HC / UT
WS.32	Shadman Town	HC/ T
WS.33	Sultanabad	HC / UT

Note: WS = Water Sample, HC= House connection, T= treated, UT= untreated
samples were collected from each area

Table 2. Mean values of pH and turbidity.

S.No.	SAMPLE NO.	pH (6.5 – 8.0)	Turbidity 0.5 NTU
1	WS. 1	8.2	0.58
2	WS. 2	7.0	0.5
3	WS. 3	6.8	0.48
4	WS. 4	6.6	0.5
5	WS. 5	7.0	0.48
6	WS. 6	7.1	0.5
7	WS.7	8.0	0.5
8	WS. 8	7.8	0.5
9	WS.9	6.9	0.5
10	WS.10	7.0	0.5
11	WS.11	7.2	0.5
12	WS. 12	6.6	0.5
13	WS. 13	6.9	0.5
14	WS. 14	7.2	0.5
15	WS. 15	4.9	0.48
16	WS. 16	6.9	0.5
17	WS. 17	7.4	0.5
18	WS.18	7.0	0.53
19	WS.19	7.5	0.54
20	WS.20	6.9	0.53
21	WS.21	7.1	0.52
22	WS.22	7.2	0.54
23	WS. 23	7.3	0.52
24	WS. 24	7.2	0.49
25	WS. 25	7.3	0.51
26	WS. 26	7.2	0.49
27	WS. 27	7.0	0.5
28	WS. 28	7.3	0.53
29	WS.29	7.0	0.49
30	WS. 30	6.7	0.51
31	WS.31	7.3	0.49
32	WS.32	7.8	0.51
33	WS.33	6.4	0.53

The WHO bases guide line of pH (6.5 – 8.0) and Turbidity 0.5NTU.

Table 3. Presumptive tests for coliforms N=100.

Type of water sample	Positive	Negative
Untreated	78%	22%
Treated	22%	78%
Total	100%	100%

Table 4. Bacterial isolates were found in test report of D.W.S.

Bacterial species	No of water samples
Fecal coliform	57
Fecal streptococci	43
Escherichia coli	73%

Water is essential for living beings. The strength of humans and different life forms are clearly identified with safe water other than anything. In a current gauge in light of WHO information proposes that three-fourth of every single human illness whereas, triggered by natural contamination fecal contamination of drinking water may present an assortment of intestinal pathogens.

Karachi is facing large scale theft by water mafia, causing severe shortage of potable water in the city. The old water supply lines being mixed with sewerage lines are causing serious ailments among people.

Seventy-eight (78%) untreated and twenty-two (22%) treated water tasters showed positive for coliforms tests. Fecal coliform and *Streptococcus faecalis* were present in 57 and 27 tasters of potable water.

Hence, we can use this study for microbiological assessment of the drinking water being supplied to different areas of Karachi for ensuring safe water supply to people of the city.

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