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A STUDY FOR THE REMOVAL OF BACTERIOLOGICAL CONTMEMINANTION FROM GROUNDWATER OF KASUR

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Abstract: The present study was undertaken to determine the suitability of ground water of the Kasur city for drinking purpose. In Kasur there are 23 colonies and 23 samples were collected in total, one sample from each colony. The pH of the samples was in the range of 6.6-7.2 while the electrical conductivity from 1.0-3.2 $dsm^{-1.}$ The microbial contamination showed very high values in samples. The treatment of activated carbon, hydrogen zeolite and chlorination was applied to remove bacteria from water samples, to improve the quality of water. Therefore, the results showed that there was a great contamination in ground water of the area under study.

KEYWORDS: Removal, Drinking water, Ground Water, Kasur, Environment

Introduction

In order to use a healthy fluid for human consumption, water should be aesthetically acceptable and free from apparent turbidity, color, order, objectionable taste and microbial contamination. The demand for such potable water in Kasur and rapid increase in population every year. The water pollution is a specific impairment of water quality by agriculture, domestic or industrial wastes to a degree that has an adverse effect upon any beneficial use of water. Due to the urbanization and industrialization, waste water that is being discharge into natural water bodies' results in serious ground water contamination (1). This situation is further complicated by total absence of effluent treatment facilities at the industrial site (2). The most serious pollutant in terms of human health worldwide is a pathogenic organism. Altogether, at least 25 million deaths each year are blamed on these water-related diseases, including nearly two-third of the moralities of children fewer than 5 years old. The main source of these pathogens is from untreated or improperly treated human waste (3). Gastrointestinal infections resulting in the diarrhea show high frequency among children as well as adults, accounting for 25 % of patients treated at hospitals and clinics (4).

In Pakistan, there are several potential sources to contaminate water. Bacteriological contamination of drinking water has been reported to be one of most serious problems throughout the country in rural as well as urban areas; such contamination is attributed to leakage of pipes, pollution from sewage pipes due to problem within the distribution system, intermitted water supply and shallow water tables due to the human activities. A second strong source for ground water contamination in irrigated and industrial areas in chemical pollution from toxic substances from the industrial areas in chemical pollution from toxic substances from the industrial effluents, textile dyes, pesticides, insecticides, nitrogenous fertilizers and other chemicals. In addition, excessive monsoons, rains, floods, fungicides, herbicides, untreated municipal wastes, sewage breakdown and are extremely hazardous to drinking water. The use of shallow groundwater sources for drinking and other domestic purposes in

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a common feature of many low-income communities in developing countries (5).

The shallow groundwater quality is threatened with not only metals contamination but also by bacteriological contamination e.g *Escheria coli*, *coliform* and *Pseudomonas putida* (5). The world Health organization estimated that up to 80% of all the sickness and diseases in the world is caused by inadequate sanitation, polluted water and only about one in four has any kind of sanitary facilities (6, 7). Regular contamination of water quality for the presence of organisms, chemicals, and other physical contents provides information on the level of safety of water. The overall concept adopted for biological quality is that no water intended for human consumption shall contain E. coli in 100 ml sample. Treated water entering the drinking system should be Zero total and faecal coliform per 100 ml of water.

The study was undertaken to investigate the quality of groundwater in Kasur. The study was focused on the microbiological contamination using total coliform as an indicator of faecal contamination.

Materials And Methods

The samples were collected in plastic bottles and these bottles were sterilized before sampling from the wells for the microbiological analysis and then rinsed with the sample water (1).The samples were analyzed within 8 hours after collection. The samples were collected in one-liter quantity from wells of different locations of Kasur and then stored in ice box until shifted to the Laboratory for analysis. The sampling strategy was based on capturing each type of water sources. Water samples were collected at randomly selected residential and industrial areas of Kasur.

The apparatus was sterilized properly using standard methods for the examination of water and wastewater (8-10). Samples were analyzed using bacteriological methods for water quality analysis, to check the degree of contamination The culture tubes containing water samples were labeled and the remaining seven culture flasks containing 9 ml water blanks (with out test sample) numerically (8).Transferred aseptically with a sterilized glass pipette, 1 ml sample from tube to tube I containing water blank. Discard the glass pipette in the beaker containing sodium hypochlorite solution. The sample has been diluted 10 times. The dilution factor is 10.

Mix the contents of tube I thoroughly with a fresh sterilized pipette transfer I ml from flask 1 to flask 2 containing water blank. Discard the glass pipette in the beaker containing sodium hypochlorite solution. The sample has been diluted 100 times. The dilution factor is 10^2.The dilution factor is 100.The required dilution can be obtained by following the dilution procedure described above. The dilution samples were then poured on NA and EMB media for the detection of E. coli and total viable count. All samples were then incubated at 37 $^{\circ}$C. For coli form bacteria measurement, the most possible number method (MPN), expressed in standard methods for examination of water and wastewater used for identification, enumeration of indicator bacteria and the total coli forms. Samples were analyzed using standard bacteriological methods for water quality analysis to determine the degree of contamination (8). All samples were analyzed for total viable count, *faecal coli forms* and *E. coli*. The results interpreted using WHO guidelines for drinking water quality.

Treatment

A glass column of 241-inch was used. In the lower most portions, activated carbon (5-6 inches) than ion-exchange resin e.g. hydrogen-zeolite in a second and a small bolted filled with liquid chlorine (50 ml) was taken in upper most part of the column. Polluted water samples (50 ml each) were introduced one by one; outlet of the column opened and effluent was collected. To seek the effect of the treatment, eluted samples were reanalyzed for the bacterial count (9, 10).

Results and Discussion

Indicator microorganisms for faecal contamination were observed in the most of ground water samples collected from various colonies of Kasur. The ground water of area 1, 2, 4, 6, 7 and 10 (Table 1) high counts of faecal coliform but in the areas 12, 13,15,17,18 and 23, (Table 1) there is no contamination of coliform and *E.Coli*, as well as the total viable count is in lower limits. This shows that the ground water of later areas has no facal contamination and fit for drinking purpose. The presence of *E.Coli* in ground water of area 1, 4, 8, 19, 20, and 21 (Table 1) indicates that it's not fit for drinking as *E.Coli* is an indicator organism of contamination feacal contamination may be by human or animals. The presence of coliforms and *E.coli* shows that there may be presence of pathogenic bacteria in the ground water, which may cause dysentery, diarrhea, vomiting, and other waterborne diseases after drinking of this contaminated water. As *E.Coli* it causes various gastrointestinal diseases in human. There is high number of the total viable count in area 1, 4, 7, 15, 16, and 18 (Table 1) that indicates that there may be other pathogenic bacteria beside coliforms and *E.Col (11-14).*

Table 1: Bacterial quality of ground water from different areas of kasur

Area No.	Sampling Location	Total coliform/ 100ml	Total viable count/ml	*E. Coli* /ml
1	Niaz Nagar Mangal Mandi Road	95	6.8×10^4	1.3×10^2
2	Officers colony	70	3.2×10^3	Nil
3	Civil Hospital	45	4.5×10^3	Nil
4	Din Garh	95	6.2×10^4	1.7×10^2
5	Purani sabzi mandi	21	5.2×10^2	Nil
6	Chouk baldia	76	4.8×10^3	Nil
7	Steel park	58	5.4×10^3	Nil
8	Steel park	43	2.8×10^3	2.2×10^3
9	Gulberg colony	45	4.6×10^3	Nil
10	Rehmat nagar	95	2.2×10^4	Nil
11	Lari Adda	78	1.3×10^2	Nil
12	Basti Eiday shah	Nil	1.2×10^2	Nil
13	Nafees colony	Nil	1.8×10^2	Nil
14	Chock tehsildar	43	5.4×10^3	Nil
15	Kot nusad klaw	Nil	6.4×10^3	Nil
16	Muneershaheed colony	17	4.8×10^3	Nil
17	Basti chiradh Din	Nil	1.4×10^3	Nil
18	Bahadar Pura	Nil	2.5×10^3	Nil
19	Tolowala	31	1.8×10^4	1.2×10^2
20	Kot molvi abdul qadir	95	1.36×10^5	2.6×10^2
21	Near rohi nullah	95	8.4×10^3	1.4×10^3
22	Nizam pura	64	8.8×10^3	Nil
23	Kot Ghulam muhammad	Nil	5.4×10^3	Nil

The Self designed column was applied to the collected groundwater and again counted for faecal coliform which showed significant reduction as shown in Table 2.

Table 2: Comparison of Coliform counts before and after self designed column treatment

Area No.	Sampling Location	Total coliform/ 100ml	Total coliform/ 100ml
		Before treatment	**After treatment**
1	Niaz Nagar Mangal Mandi Road	95	18
2	Officers colony	70	09
3	Civil Hospital	45	04
4	Din Garh	95	16
5	Purani sabzi mandi	21	02
6	Chouk baldia	76	07
7	Steel park	58	04
8	Steel park	43	05
9	Gulberg colony	45	07
10	Rehmat nagar	95	12
11	Lari Adda	78	06
12	Basti Eiday shah	Nil	Nil
13	Nafees colony	Nil	Nil
14	Chock tehsildar	43	
15	Kot nusad klaw	Nil	Nil
16	Muneershaheed colony	17	Nil
17	Basti chiradh Din	Nil	Nil
18	Bahadar Pura	Nil	Nil
19	Tolowala	31	08
20	Kot molvi abdul qadir	95	15
21	Near rohi nullah	95	13
22	Nizam pura	64	12
23	Kot Ghulam Muhammad	Nil	Nil

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