

# Evaluation Of The Bacterial Quality Of Water Collected From Various Stations In Basrah City

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## Abstract

Water samples were collected from three locations of Shatt Al-Arab and three locations of drinking-water centers from various sites in Basrah city.

Measurement of pH, salinity, and chloride concentrations were carried out in this study. The pH is alkaline in north and south of Shatt Al-Arab (8.6, 8.4) respectively, while neutral in other stations, salinity is highly and chlorine is lowest in surface water in comparison with drinking water that the salinity and Cl<sup>-</sup> concentrations are in optional ranges.

Faecal coliforms ranged between (170 – 240) cell/100 ml in surface water and (< 2 – 12) cell/100 ml in drinking-water, while total aerobic bacteria ranged between (400 - > 1000) cell/100 ml in surface water and (10 – 30) cell/100 ml in drinking-water.

## INTRODUCTION

Water quality guidelines form a basis for judgment of the acceptability of public drinking-water supplies, any judgment associated with the use of bacteriological guidelines must, however, take into account the precision, validity, and appropriateness of the sampling procedures (1,2,3).

Natural and treated waters vary in bacteriological quality. Ideally, drinking water should not contain any microorganisms known to be pathogenic. It should also be free from bacteria indicative of pollution with excreta (4).

The primary bacterial indicator recommended for this purpose is the coliform group of organisms as a whole. Although as a group they are not exclusively of faecal origin, they are universally present in large numbers in the faeces of man and other warm-blood animals, the detection of faecal (thermotolerant) coliform organisms, in particular *Escherichia coli* provides definite evidence of faecal pollution. (5,6).

The most common and wide spread danger associated with drinking water is contamination, either directly or indirectly, by sewage, by other wastes, or by human or animal excrement. If such contamination is recent, and if among the contributors these are carriers of communicable enteric diseases, some of the living causal agents may be present. The certain foods may result in further cases of infection

(7,8).

## MATERIALS & METHODS

### SAMPLING

100 ml of water were taken from three locations varies in Shatt Al-Arab as follow:

North of Basrah after Paper Industry Co. in Al-Hartha district.

Center of Basrah instead of Al-Maqel district.

South of Basrah below Abu-Floos district.

And same volume of drinking water was collected from three locations of water supply in Al-Brada'ea, Al-Hakeemiah and Al-Tahsseniah regions.

### BACTERIOLOGICAL STUDY

A 0.1 ml volume of the sample was placed in the first tube and serial dilutions of sample were made by using MacConkey broth (in the first procedure) to determine coliform bacteria also a serial dilutions of water were made and spread 0.1 ml on the surface of nutrient agar to determine total aerobic bacteria (9).

Results of the present study were compared with the standard tables from (1).

### ENVIRONMENTAL FACTORS

pH, salinity, and turbidity were taken from quality control

laboratory of main water supply station in Al-Bradeiah Region by following instruments :

**Figure 1**

Factor	Instrument
pH	pH-meter
Salinity	Conductivity meter
Cl- cone	Chloridimeter
Temp.	Thermometer

## RESULTS

Table (1) shows correlated factors in the aquatic environment.

The pH of north and south stations are alkaline 8.6 and 8.4 respectively while the Median location and Al-Brada'ea, Al-Tahsseniah and Al-Hakeemiah regions, were neutral pH 7.8, 7.88, 7.95, and 7.72 respectively.

The salinity factor varies among different locations, but it was generally high in Shatt Al-Arab, 6.4, 7.3, 5.6 ppm in North, South, and Central stations respectively, while within the maximum optimal range in the drinking water sample, 2.8, 3.4 and 3.9 in Al-Brada'ea, Al-Tahsseniah and Al-Hakeemiah quarters respectively.

Chloride concentration was optimal in the drinking water ranging 3 - 3.5 ppm and in lowest range in the surface water of Shatt Al-Arab between 0.8 - 1.2 ppm.

(( POD and COD not measured by quality control laboratory of a main water supply station in Al-Brada'ea quarter).

Table (2) shows the numbers of faecal coliform (Fc) and total areobic bacteria (A.B) in all studied locations. In general, these numbers are high in surface water of Shatt Al-Arab rather than in drinking water.

The numbers of fecal coliform and aerobic bacteria in all locations are as follows : 170, 400 cell/100 ml in north location of Shatt Al-Arab; 170,580 cell/100 ml in south location of Shatt Al-Arab; <2, 10 cell/100 ml in drinking water of Al-Brada'ea region; 8, 22 cell/100 ml in Al-Tahseeniah region and 12, 30 cell/100 ml in Al-Hakemeeiah region.

Tables (3,4,5) lists standard limits available from WHO (1985) in the standard water supply of surface & drinking water in order to compare between results of present study and standard data to identify the type of surface and

drinking-water quality in the present study.

**Figure 2**

Table 1: Determination of correlated factors in the studies locations.

Stations	pH	Salinity / ppm	Cl- / ppm	POD	COD
Stn. 1	8.6	6.4	1.2	-	
Stn. 2	8.4	7.3	1.0	-	
Stn. 3	7.8	5.6	0.8	-	
Stn. 4	7.88	2.8	3	NM	NM
Stn. 5	7.95	3.4	3	NM	NM
Stn. 6	7.72	3.9	3.5	NM	NM

NM : Not Measured

**Figure 3**

Table 2: Determination of numbers of faecal coliform & aerobic bacteria

Areas	FC cell/100 ml	AB cell/100 ml
North	170	400
South	170	580
Center	240	>1000
Al-Bradeiah	<2	10
Al-Tahsseniah	8	22
Al-Hakeemiah	12	30

**Figure 4**

Table 3: Standard Table.

Surface Water	Accepted No.	FC	AB	For water supply
	Suitable No.	2000	10000	
		100	20	

**Figure 5**

Table 4: Classification of drinking water in European countries based on total bacterial count.

Water class	Total bacteria ( 1 ml )
Very high purified	< 10
High purified	10 – 100
Purified	100 – 1000
Med. Purified	10 <sup>3</sup> – 10 <sup>4</sup>
Polluted	10 <sup>4</sup> – 10 <sup>5</sup>
Very polluted	> 10 <sup>5</sup>

**Figure 6**

Table 5: Classification of drinking water based on faecal Colifom ( British Health Ministry ). \* All information available from ( ).

Class	Faecal Coliform in 100 ml.
Very suitable	< 1
Suitable	1 – 2
Suspected	3 – 10
Not suitable	> 10

## DISCUSSION

The variation of correlated environmental factors, and numbers of faecal coliform and total aerobic bacteria between the six stations may be due to:

1. Present of contaminated industry companies nearest to the sample locations such as Paper Industry Co. northern Basrah city and Fertilizers Industries Co. to the south of Basrah city which manufactures N,P,K for agriculture purposes.
2. Presence of hydrocarbons contamination centers in Shatt Al-Arab such as sanitary repair centers.
3. Contamination of surface water depends on heavy water manholes that excrete the waste materials, heavy compounds, faecal materials and other polluting materials in Shatt Al-Arab without filtration or decomposition and precipitation.
4. Presence of Phycological community in the surface water such as rich growth of green algae, cyano bacteria, and red algae in the surface part of Shatt Al-Arab.

These factors may affects pH, salinity and Cl concentrations depending on the interaction between the pollutants and/or contamination and the aquatic environment; however, it reflects these effects on the Brostatis of the Ecosystem of the aquatic environment (3,8,10). So enrichment of unsuspected organisms and micro-organisms in these environments may happen such as contamination of fecal coliform, fecal Streptococci, aerobic and anaerobic bacteria, protozoa, viruses, and other micro-organisms, which may be considered as important rule in infectious diseases known as water born diseases. (6,11).

Another studies (1,4,12,13), evidenced that the faecal pollution of drinking water may introduce a variety of intestinal pathogens; their presence being related to microbial diseases and carriers, present at that moment in the community world health organization (WHO) from 1984, indicate that the goal water supply programs is to ensure that convenient year round access to adequate quantities of good quality water is available to all. While convenience quantity and year round availability of water will be readily appreciated by most users, water quality may not be so easily identified.

To many people, the quality of water can only be assessed in terms of its characteristics, i.e., clarity, color, turbidity, taste, and odor. Water may meet such aesthetic requirements, yet still be unsafe in terms of its bacteriological and/or chemical quality (2,7,10,12).

## **CONCLUSION & RECOMMENDATION**

1. Highly contamination of Shatt Al-Arab with faecal coliform and total aerobic bacteria, especially in the central part, which yield 240 cell/100ml of faecal coliform and more than 1000 cell/100 ml of aerobic bacteria.
2. Drinking water collected from three locations of Basrah city varied in numbers of faecal coliform and aerobic bacteria ranged between 2-12 and 10-30 cell/100 ml, respectively.
3. Correlated factors, i.e.; pH, salinity, and chloride concentrations varied between six locations. pH is alkaline in north & south of Shatt Al-Arab, natural in others, salinity is high in surface water in comparison with drinking water, while chloride concentration is within the optimal range in drinking water and low in the surface water.

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