

Bacterial Flora of Sindh- An Investigation

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Abstract—An essential means of sustenance is water. Availability of insufficient amount of drinking water is a threat to living population. A wide range of pathogenic microorganisms can be transmitted to humans via water due to faecal material present.

In this paper the presence of microbial life emphasizing bacterial flora, coliform in river Sindh located in district Ganderbal (J&K) has been investigated, to determine potability of Sindh water. The water body is chosen as it is being considered as one of the fresh waters available in J&K. The study is carried out to get an approximate idea about the availability of safe and drinking water in J&K. The results indicate that Sindh river is polluted to a large extend due to varied factors.

1. INTRODUCTION

Water one of the greatest gifts of nature, is a vital factor for life survival and development of living beings. The importance of water can be ascertained by the fact that our body possesses 70% of water. However, only a tiny fraction of planet's abundant water is available to us as fresh water. About 97% of water is found in the oceans and is too salty for drinking, irrigation or industry. The remaining 3% is fresh water. About 2.997% of it is locked up in the ice caps. Only about 0.003% of earth's total volume of water is easily available to us as soil moisture, exploitable ground water, water vapors, lakes and streams. Fresh water is the vital resource for agriculture, manufacturing, transportation and countless other human activities [1]. Given the importance of fresh water for sustenance of life, a lot of research is carried out to analyze the potability of fresh water. Microorganisms are widely distributed in nature, and their abundance and diversity may be used as an indicator of the suitability of water [2]. Microorganisms include bacteria, viruses, yeasts, fungi, algae, protozoa and helminthes. Analyzing presence of microorganisms especially bacteria as water quality indicator can be viewed in two ways, first, the presence of such bacteria can be taken as an indication of faecal contamination of the water and thus as a signal to determine why such contamination is present, how serious it is and what steps can be taken to eliminate it; second, their presence can be taken as an indication of the potential danger of health risks that faecal contamination poses. The higher the level of indicator bacteria, the higher the level of faecal contamination and the greater is the risk of water-borne diseases [3].

The valley of Kashmir is very well known for its snow capped peaks, forests, lakes and springs. This part of world is called the "Paradise on Earth". Kashmir is the land of rivers and lakes but the studies conducted on Kashmir lakes and rivers mostly pertain to physico-chemical parameters and amongst these [4, 5] are relatively well known. But at the same time very little attention has been paid to investigation of microbial flora of fresh water of rivers in the valley. One of the prominent fresh water rivers is Sindh river. While some preliminary investigation of microbial flora in relation to its water quality has been carried out to study the microbial flora of Sindh river to relate the microbial composition with the water quality of the river [6] but no work has been carried out on the Sindh river flowing in the Ganderbal district which is more polluted and provides drinking water to 297,446 people that is total population of district Ganderbal (census 2011). In this backdrop, the present investigation has been carried out to study the water quality of the river Sindh in Ganderbal district.

2. LITERATURE REVIEW

Assessment of water quality is necessary for understanding and documenting the occurrence and distribution of pollution indicator and human pathogenic bacteria. Microbiological indicators can therefore serve as early warnings. Bacterial community composition varies as a function of water quality. It mainly depends on temperature, pH organic concentration and contamination sources. Plenty of literature is available on the aquatic microbiology, some of which has been reviewed as follows.

Microorganisms and chemicals have been explored and re-evaluated in [7-9] as potential tools for the identification of human faecal sources. Another study was conducted in [10] to evaluate the status of tap water of Kashmir valley and to monitor coliforms through multiple tube method by. The study showed that majority of the towns exceeded the recommended permissible level of WHO. However, district Srinagar shows lowest level of MPN 2/100ml of tap water as compared to other districts. Latief et al. [11] while analyzing water samples from fifteen springs of Kashmir valley for coli form count recorded very high values of coli form from these grossly contaminated springs.

Radhika *et al.* [12] reported that various abiotic as well as biotic activities of an aquatic system are regulated by water temperature. In the same year Tanveer and Kamili [13] reported the presence of total coli form from tap water in Gogji Bagh area (Kashmir) which was supplied from Doodganga. Shafiet *al.* [6] carried out a preliminary microbiological study of river Sind, a glacier fed river of Sonamarg, Kashmir and revealed that bacterial and fungal flora showed variations in relation to the conditions prevailing at different sites. Another study was carried on isolation, identification and seasonal distribution of bacterial flora in Dal lake, Kashmir by Saleem *et al.* [14]. They reported a total of eleven species of bacteria from surface water and also found that seasonal fluctuation of bacteria was highest in spring season followed by summer, autumn and winter season.

3. METHODOLOGY

3.1 Study site

A total of five sites were selected on Sindh river to assess its bacterial flora.

SITE 1: It is located in Ganiwan area of Kangan block in Ganderbal district of J&K state. it lies within the geographical coordinates of 75° ,00.775'E and 34°13.203'N.

SITE 2: It is located in Kichpora area of kangan block in Ganderbal district, and lies within the geographical coordinates of 74° ,00.712'E and 34°16.352'N.

SITE 3: It is located in Manigam ganderbal above wayil bridge and lies within the geographical coordinates of 74° ,00.712'E and 34°16.558'N.

SITE 4: It is located in Duderhama ganderbal within the geographical coordinate of 74°46.165'E and 34°12.717'N.

SITE 5: It is located in Shadipora Ganderbal which lies within the geographical coordinates of 74° ,44.642'E and 34° ,11.057'.

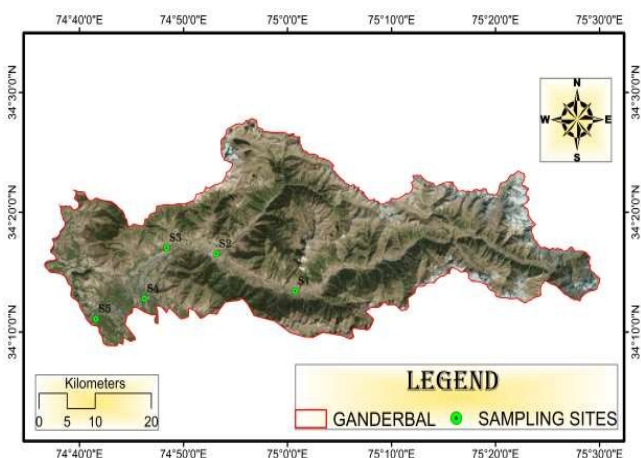


Figure 1. Geographical representation of Study sites.

3.2 Sample Collection

Water samples from river Sindh under study were collected on monthly basis from May 2017 to November 2017.

3.3 Microscopic Examination

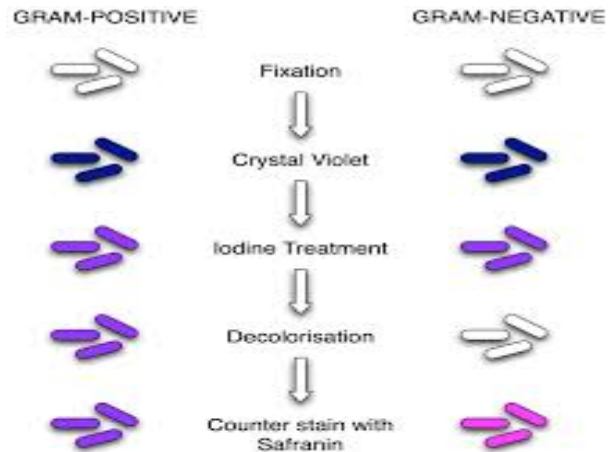


Figure 2. Procedure of Gram staining.

4. RESULTS AND DISCUSSION

Different types of colonies were obtained during the study period. Some colonies were circular some irregular and a few colonies were rhizoid and filamentous. A total of 49 strains of bacteria were isolated from the five different sites of river Sindh during the study.

TABLE 1. Colony count and cfu/ml at 5 different sites

SITES	MAY		AUGUST		NOVEMBE R		GT
	CC	CFU/m l	CC	CFU/m l	CC	CFU/ ml	
GANIWA N	172	1.72×1 04	196	1.96×1 04	184	1.84× 104	552
KICHPO RA	179	1.79×1 04	204	2.04×1 04	185	1.85× 104	568
MANIG AM	192	1.92×1 04	224	2.24×1 04	190	1.90× 104	606
DUDER HAMA	212	2.20×1 04	287	2.87×1 04	193	1.93× 104	692
SHADIP ORA	217	2.17×1 04	247	2.47×1 04	211	2.11× 104	675

TABLE 2. MPN/100ml at different sites

Sites	May	August	November
Site 1 GANIWAN	15	28	14
Site 2 KICHPORA	20	39	15
Site 3 MANIGAM	93	210	75

Site 4 DUDERHAMA	460	1100	210
Site 5 SHADIPORA	210	460	240

Out of 49 isolates the gram negative bacteria was dominant throughout the study period and across all study sites. This may be attributed to the addition of the excretory substances to the water. As Feachem *et al.* [15] reported that the gram negative bacteria have a reservoir in the intestines of man and other warm blooded animals and after excretion along with faeces are introduced in to the environment These revelations were also confirmed by a study carried out by Gandotra [16] on river Tawi in Jammu city who reported the dominance of gram negative bacilli in the river. The MPN index was observed for the samples and it was found that all the study sites crossed the permissible limit of WHO(1998) standard (0/100ml). The perusal of the data indicates that none of the samples was fit for drinking purpose. Some of the water samples obtained from the river were fit for bathing and swimming with a good or fair quality and two samples (site 4 and 5) were having the poor quality and hence unfit for any type of use.

5. CONCLUSION

- The bacterial flora obtained was highest in the month of August across all the sites.
- Among the bacterial strains isolated and identified most of them were Gram's negative bacilli followed by Gram's negative cocci. These are of much concern because of their pathogenicity resulting in diseases in human.
- The presence of coliform indicates the presence of faecal matter of human and animal origin.
- Sindh water though being the fresh water is polluted to a greater extent due to negligence of government and people.
- Since the present study is of preliminary nature more investigation in this direction confirms the results.

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