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EVALUATION OF PLATFORM DRINKING WATER QUALITY AT DIFFERENT RAILWAY STATION IN AND AROUND BANGALORE

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ABSTRACT

Water of good drinking quality is of basic importance to human physiology, and man's continued existence depends very much on its availability. Drinking water is most essential for livelihoods and for other consumptions. Due to Increase population, advanced agricultural practices, industrialization, man –made activity, water is being highly polluted with different contaminants. The availability of good water is an indispensible feature for preventing diseases and improving quality of life. Here, water quality at different railway stations in Bangalore including Bangalore City Railway station Majestic, Malleshwaram railway station, and Yeshwanthpur railway station was chosen for the study. Collected samples were analyzed for physicochemical and, Biological parameters. The quality of drinking water has been checked and analyzed. The data were analyzed. Suitable suggestions and recommendations were made to decrease the problem of drinking water supply in a proper manner. This attempt will be helpful for the drinking water and its attribute problems in the study area and it leads to a sustainable example for future generations and also be a good fore step for the research field.

KEYWORDS: Water quality, Chemical, Physical and Biological parameters, Platforms of railway station.

INTRODUCTION

Drinking water disease outbreaks (DWDOs) occur when bacterial, protozoan or viral pathogens or toxic chemicals contaminate drinking water ingested by humans. This type of disease transmission differs from water-washed, water-based and water-related diseases, whose transmission pathways involve inadequate personal hygiene, parasites living within intermediate aquatic organisms, or water-related insect vectors, respectively.

Awareness of the public health impact of compromised water supplies has evolved since John Snow's analysis of and response to a cholera outbreak in London in 1854, which played a major role in establishing the science of epidemiology and discipline of public health. Nevertheless, at the start of the 21st century, few countries conducted national waterborne disease outbreak surveillance (NWDOS) to identify and describe waterborne disease outbreaks (typically including DWDOs and outbreaks linked with recreational water exposure). Such surveillance could facilitate understanding of contributing factors and thus inform outbreak prevention.

Railway stations are the main source of drinking water for railway travelers and analysis of water is very important in the evaluating of these supplies. A large number of railway passengers consume this drinking water on railway platform and this contaminated water may be the vehicle of transmission of water born diseases.[1]

Drinking water at railway stations is mainly supplied from bore wells. Most of the railway stations in India rarely have the much needed purifying technology.[2] Water quality assessment helps in identification of any contaminants and checks the quality of water. As one of the essential amenities local government authorities provide drinking water to passengers at all the stations. The present investigation highlights on evaluation of drinking water quality of different railway station platforms, Bangalore.

2. MATERILS AND METHODS

2.1. Sample Collection

The Water samples were collected from different Railway station platforms in Bangalore city. The platforms are Bangalore city, Malleshawaram, Kengeri and Yeshwanthpur railway station. Drinking Tap water collected in sterile polyethylene bottles. These water samples were brought to the laboratory and stored in a refrigerator (4°C) before analysis.

2.2. Study Area

Bangalore District is located in the heart of South-Deccan Plateau in Peninsular India to the South-East

corner of Karnataka State between the Latitudinal Parallel of 12° 39' N and 13° 18' N and Longitudinal Meridians of 77° 22' E and 77° 52' E at an altitude of 900m average mean sea level covering an area of about 2,191 sq.km. For convenience, Bangalore City, it was divided into 5 phases as North, South, East, West, and Central phases.The details of sampling locations were represented in Table -1.

Table 1: Details of sampling location.

Sl. No	Details of sampling locations	Longitude	Latitude
1	Bangalore City Railway station	77.5697° E	12.9781° N
3	Yeshwanthpur Railway station	77.5517° E	13.0238° N
2	Malleshwaram Railway station	77.5632° E	13.0008° N
4	Kengeri Railway station	77.4838° E	12.9177° N

2.3. Analysis of Physical, Chemical and Biological Parameters

The parameters analyzed to assess the water quality are broadly divided into:

Physical parameters: Color, Temperature, Transparency, Turbidity and Odor.

Chemical parameters: pH, Electrical Conductivity (EC), Total suspended Solids (TS), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Total Hardness, Total Hardness, Calcium, Magnesium, Nitrates, Phosphates, Sulphates, Chlorides, Fluorides, Potassium and Sodium and Alkalinity.

Heavy metals: Lead, Copper, Nickel, Iron, Chromium, and Zinc.

Biological parameters: The biological parameters involved are of Total coliforms, Faecal coliforms and *E.Coli.*

2.4. Methods used for Analysis

The American Public Health Association (APHA) for Standard Methods For the Examination of Water and Waste Water, 23rd Edition, 2017.

3. RESULTS AND DISCUSSION

3.1 Sample collection

The water samples which are collected from different railway stations Platforms in and around Bangalore city by week wise and were analyzed for physical, chemical and Biological parameters. The collected water sample details were listed in Table 1.

Table 2: Particulars of water sample collection places.

Sl. No	Name of the Location	Platforms of the sample collected
1	Bangalore city Railway station	Platforms1,2,3,4,10
2	Yeshwanthpur Railway station	Platforms 1,3,5,6
3	Malleshwaram Railway station	Platforms 1
4	Kengeri Railway station	Platforms 1

3.2 Analysis of Physicochemical and Biological parameters

The parameters analyzed to assess the water quality are broadly divided into:

Physical parameters: Color, Temperature, Transparency, Turbidity and Odor.

Chemical parameters: pH, Electrical Conductivity (EC), Total suspended Solids (TS), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Total Hardness, Total Hardness, Calcium, Magnesium, Nitrates, Phosphates, Sulphates, Chlorides, Fluorides, Potassium and Sodium and Alkalinity.

Heavy metals: Lead, Copper, Nickel, Iron, Chromium, and Zinc.

Biological parameters: The biological parameters involved the qualitative analyses of Total *coliforms*, *Faecal coliforms* and *E.Coli*.

The water samples which are collected from different railway stations in around Bangalore by week wise and were analyzed for physical, chemical and Biological parameters. The water samples were collected from Bangalore city railway station (four times) and Yeshwantapura railway station (three times), Malleshwaram and Kengeri railway station (once in each).

The results which are tabulated in Table-3 are Bangalore city railway station water samples. The physical parameters were acceptable range and even all chemical tested parameter were also with in the permissible limits except lead (all the platform which are consider for study) and iron(only in platform-1) and nickel is boarder line. In microbiological tested parameters total coliforms were found in all the platforms and Faecal coliforms were present all the platforms except platform 2&3.The major bacterial *E.coli* were found in platform-4 and 10.

Yeshwantapura railway station platform results were represented in Table-4.In physical parameters pH is very close to the permissible limits as per IS 10500 (Drinking water specification). All the chemical parameters and heavy metals found satisfactory and are in acceptable limits. But in case of microbiological parameters total coliforms are present in all the studied platforms. The

Faecal coliforms and *E.coli* are present in platform-1 and in other location are absent.

Malleshwaram and Kengeri railway station plate form-1 of both railway station water were tested and both physical and chemical parameters were good and are within acceptable ranges. The microbiological analysis of water quality were also found satisfactory except total coliforms in Malleshwaram railway station,

Jay G. Patel et al., (2016) were studied drinking water quality supplied at major railway stations in South Gujarat. In the study they found pH is quite higher range and hardness, magnesium and nitrate and fluoride were found more than acceptable range.

Sanjay Singh et al (2015), were discussed the potability of drinking water at Visakhapatnam railway station and they found *E.coli* contamination. Mayur Shah, et al., (2006) were worked on Assessment of Drinking Water Quality of Various Railway Station on Ahmedabad to Khedbrahma Train Route in Gujarat, India.

Table 3: Bangalore City Railway Station.

Sl No	Parameters	Unit	Results-1	Results-2	Results-3	Results-4	Limits As per IS 10500
1	pH	-	7.83	7.85	7.71	7.93	6.5 – 8.5
2	Odor	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Conductivity	Us/cm	337	325	335	325	-
5	Turbidity	NTU	0.2	0.1	0.1	0.1	1-5
6	Alkalinity as CaCo3	mg /l	82	68	48	148	200-600
7	Total dissolved solids	mg /l	327	324	246	224	500-2000
8	Total hardness as CaCo3	mg /l	128.11	144.12	108.09	104.09	200-600
9	Chloride as cl	mg /l	72.24	68.20	68.20	68.20	250-1000
10	Magnesium as CaCo3	mg /l	Absent	Absent	Absent	Absent	30-100
11	Fluoride as F	mg /l	Absent	Absent	Absent	Absent	1-1.5
12	Nitrate as NO3	mg /l	Absent	Absent	Absent	Absent	45
13	Boron as B	mg /l	0.1	0.1	0.02	0.0235	0.5-1.0
14	Sulphate as SO4	mg /l	0.0533	Absent	0.076	Absent	200-400
15	Phosphate as PO4	mg /l	Absent	Absent	Absent	Absent	-
16	Copper as Cu	mg /l	Absent	Absent	Absent	Absent	0.05-1.5
17	Lead as Pb	mg /l	0.39	0.05	0.06	0.05	0.01
18	Zinc as Zn	mg /l	0.08	0.21	0.17	0.05	5-15
19	Iron as Fe	mg /l	0.45	0.25	0.19	0.16	0.3
20	Chromium cr^{+6}	mg /l	Absent	Absent	Absent	Absent	-
21	Color	Hazen unit	05	05	06	05	5-15
22	Total coliforms	Cfu/100ml	present	present	Present	Present	Absent
23	Faecal coliforms	Cfu/100ml	present	Absent	Present	Present	Absent
24	*E.coli*	Cfu/100ml	Absent	Absent	Present	Present	Absent
25	Nickel as Ni	mg/l	0.016	0.028	0.02	0.02	0.02
26	Calcium as CaCO3	mg/l	128.11	144.12	108.09	104.09	75-200

Note: Results-1- Platform no: 1, Results-3- Platform no: 4
Results-2- Platform no: 2 &3 Results-4- Platform no: 10

Table 4: Yeshwantapura Railway Station.

Sl No	Parameters	Unit	Results-1	Results-2	Results-3	Limits As per IS 10500
1	pH	-	8.5	8.5	8.0	6.5 – 8.5
2	Odor	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Conductivity	Us/cm	515	478	472	-
5	Turbidity	NTU	0.0	0.2	0.2	1-5
6	Alkalinity as CaCo3	mg /l	90	84	98	200-600
7	Total dissolved solids	mg /l	278	285	382	500-2000
8	Total hardness as CaCo3	mg /l	160	192	290	200-600
9	Chloride as cl	mg /l	58	69	58	250-1000
10	Magnesium as CaCo3	mg /l	70	80	92	30-100
11	Fluoride as F	mg /l	Absent	Absent	Absent	1-1.5
12	Nitrate as NO3	mg /l	Absent	Absent	Absent	45

13	Boron as B	mg /l	0.534	0.514	0.456	0.5-1.0
14	Sulphate as SO4	mg /l	0.217	0.215	0.209	200-400
15	Phosphate as PO4	mg /l	Absent	Absent	Absent	-
16	Copper as Cu	mg /l	0.03	0.03	0.03	0.05-1.5
17	Lead as Pb	mg /l	Absent	Absent	Absent	0.01
18	Zinc as Zn	mg /l	0.10	0.09	0.20	5-15
19	Iron as Fe	mg /l	0.02	0.06	0.13	0.3
20	Chromium cr^{+6}	mg /l	Absent	Absent	Absent	-
21	Color	Hazen unit	05	05	05	5-15
22	Total coliforms	Cfu/100ml	Present	Absent	Present	Absent
23	Faecal coliforms	Cfu/100ml	Present	Absent	Absent	Absent
24	*E.coli*	Cfu/100ml	Present	Absent	Absent	Absent
25	Nickel as Ni	mg/l	Absent	Absent	Absent	0.02
26	Calcium as CaCO3	mg/l	90	112	198	75-200

Note: Results-1- Platform no: 1 Results-3- Platform no: 5
Results-2- Platform no: 2

Table 5: Malleshwaram And Kengeri Railway Station.

Sl No	Parameters	Unit	Results-1	Results-2	Limits As per IS 10500
1	pH	-	7.24	7.83	6.5 – 8.5
2	Odor	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable
4	Conductivity	Us/cm	833	971	-
5	Turbidity	NTU	0.0	0.1	1-5
6	Alkalinity as CaCo3	mg /l	128	48	200-600
7	Total dissolved solids	mg /l	417	566	500-2000
8	Total hardness as CaCo3	mg /l	256	222	200-600
9	Chloride as cl	mg /l	60.2	51.3	250-1000
10	Magnesium as CaCo3	mg /l	58	76	30-100
11	Fluoride as F	mg /l	Absent	Absent	1-1.5
12	Nitrate as NO3	mg /l	Absent	Absent	45
13	Boron as B	mg /l	0.1	0.2	0.5-1.0
14	Sulphate as SO4	mg /l	0.219	0.319	200-400
15	Phosphate as PO4	mg /l	Absent	Absent	-
16	Copper as Cu	mg /l	Absent	Absent	0.05-1.5
17	Lead as Pb	mg /l	0.04	0.0521	0.01
18	Zinc as Zn	mg /l	0.61	0.0384	5-15
19	Iron as Fe	mg /l	0.34	0.1857	0.3
20	Chromium cr^{+6}	mg /l	Absent	Absent	-
21	Color	Hazen unit	05	05	5-15
22	Total coliforms	Cfu/100ml	Present	Absent	Absent
23	Faecal coliforms	Cfu/100ml	Absent	Absent	Absent
24	*E.coli*	Cfu/100ml	Absent	Absent	Absent
25	Nickel as Ni	mg/l	0.02	Absent	0.02
26	Calcium as CaCO3	mg/l	198	146	75-200

Note: Results-1. Malleshwaram Railway station Platform-1
Results-2. Kengeri Railway station Platform-1

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