

Studies on drinking water quality at public transport stations from Kolhapur and Sangli city

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ABSTRACT

Aim of the present work was to study the quality of drinking water from Kolhapur and Sangli city public transport station. Water samples are collected from four sites of Kolhapur and two sites from Sangli city for about six month hence total 36 samples were collected during study. It includes Physico-chemical and bacteriological characteristics of water sample from selected six sites. The analysis was done for six months i.e. from Sept 2010 to Feb 2011. A water samples were analyzed for different parameter like pH, E.C., TDS, TSS, Hardness, Chlorides, alkalinity, Acidity and MPN. The sampling frequency was once in a month. From study it was observed that all parameters were within limit expects alkalinity, chlorides. In bacteriological analysis it was observed that the entire sample was fully contaminated. By the sample analysis, visual observation and questionnaire survey it was concluded that, the quality of drinking water not much good in rainy season and health problem created in people. It is very important to maintain good water quality at public transport.

Key words: Drinking Water quality, public transport etc.

INTRODUCTION

Water is one of the abundantly available natural resource. Life on the earth began in water. Water is essential for the survival of any form of life including all kinds of human, insects, birds, animals, plants, etc. The regular monitoring of water quality has become a crucial factor in the conservation of aquatic resources. According to world health organization 80% of the disease in human is due to lack of safe drinking water.

Kolhapur and Sangli city are growing city by population and development. Growing urbanization and industrialization show adverse effect on quality of water which is supplied at public transport station may cause many health problems. Therefore the continuous monitoring of water quality is necessary. Therefore there is need to check drinking water quality at public transport stations of Kolhapur and Sangli city.

Water quality assessment helps in identification of any contamination and check the quality of water. As one of the essential amenities local government authorities provide drinking water to passengers at all the stations. But many times apathy has been observed towards the quality maintenance of water, storage tanks and particular area. This work seeks to check the quality of water made available at the public transport stations in Kolhapur and Sangli city. Hydrogen ion concentration (pH) is an important factor in water analysis since it enters into the calculation of acidity, alkalinity [1]. pH is important to regulate enzyme system. Electrical conductivity is a parameter for dissolved ionic substance. Water with hardness above 200mg/lit may cause scale deposition in distribution system. Water with a total 500mg/lit is considered harmful to human health. Chloride are one of the major constitute found all natural water in different concentration. High concentration of chloride gives an undesirable taste to water beverages. Higher concentration of salt especially chloride in water higher will be electrical conductivity. If chloride level exceeds 300mg/lit there is risk of change in taste of water. if chloride excess will be impart salty taste to water [2]. The presence of MPN gives a direct proof of a dangerous impurity of water [3] . The MPN count more than 10 Coli form from 100 ml and the presence of E. Coli, the typical coli form indicate that the sample from all the sites

were bacteriological not safe for drinking purpose due to fecal pollution [3].

Total dissolved solid values are useful to determine whether water is suitable for drinking agriculture and industrial purpose. TDS are obtained are mainly due to salt water contamination and industrial pollution. The higher values of alkalinity indicate presence of bicarbonate, carbonate and hydroxide in water body. It increases the concentration of carbonate increasing the level of alkalinity in water. Drinking water should be rich in D.O. for good taste high temperature, biological impurities, substance such as hydrogen sulphide reduced DO values the higher values of TDS can be related to solid waste deposited near bore well [5]. As all these parameters can affect the human health and responsible for many diseases. It becomes very important to analyze the water quality during the transportation system.

MATERIALS AND METHODS

Study area:

Kolhapur and Sangli cities were selected as study area. Kolhapur is situated at 16° 42' N latitude and 74° 14' E longitudes. Sangli is situated at 16° 51' N latitude and 74° 35' E longitudes. Kolhapur and Sangli are growing cities in Maharashtra. The Jurisdiction of Kolhapur municipal corporation(KMC) covers an area of 66.82 sq km with population of 4,85,183 with literate population of 3,86,256(Census, 2001.) Kolhapur temperature in May, 2011 at 42°C. In the Kolhapur city except from March to May when it is hot the climate is temperate and healthy from march to may not wind prevail but the sea breeze which begin in afternoon makes the evening cool and pleasant.

Sangli city covers an area about 8572sq.Km. and population 2583524 Krishna and its tributaries flows through Sangli district the climate ranges from rainiest in Chandoli and Shirola region. Sangli district comes under the Deccan plateau geographical region.

Both the cities are adjoined with rural agricultural areas. Kolhapur is an important pilgrim place and a tourist attraction on an account of famous Goddess Mahalaxmi. Number of people travel from Kolhapur and Sangli to nearby places for jobs and other reasons as well as vice versa. Both the cities have road and rail as transport facilities. Kolhapur city is situated on the banks of Panchaganga River and Sangli district is situated at river basin of Varna and Krishna River. Both the river act as a source of water to respective cities. Hence two these adjoining cities were selected for this particular project. There are three bus stands and one railway terminus in the Kolhapur city. There is one bus stand and one railway station in Sangli city.

Drinking water supply in public transport station of Kolhapur and Sangli city:

In Kolhapur and Sangli city the river water is a source of drinking water. The main source of drinking water in Kolhapur city is river Panchaganga and in sangli city the river Krishna provides drinking water. In Kolhapur city presently water supplied to city through -

Balinga filter house – This filter house has capacity of 49.2 MLD Here water is provided with PAC or chlorine dosing.

Puikhadi filter house- it is located at Puikhadi. Water treatment plant is with capacity of 60 MLD. Here the chemical dosing and PAC dosing is given to water.

Bawada filter house – It's with the capacity of 43 MLD. Water is provided with PAC dosing.

Kalamba filter house- it has 8 MLD capacity. It is situated in sambhajinagar, Water comes from Kalamba tank. Here only turbidity is checked.

In Sangli city provided drinking water to Bus stand and Railways station by municipality through – Sangli, Miraj, and Kupwad Municipality.

Hirabag Water Purification Center –From here drinking water of the river Krishna is supplied to the Sangli city.

In both the cities leakage are frequently observed because of many reasons like road construction, old pipelines, lack of maintenance, cleanliness of machinery and bad valves, etc.

Selection of sampling site:

During the study the drinking water was collected in six sites in Kolhapur and sangli city. At public transport station water provided by municipal corporation. Total 36 samples were collected at every month from sept to Jan and analyze various parameter.

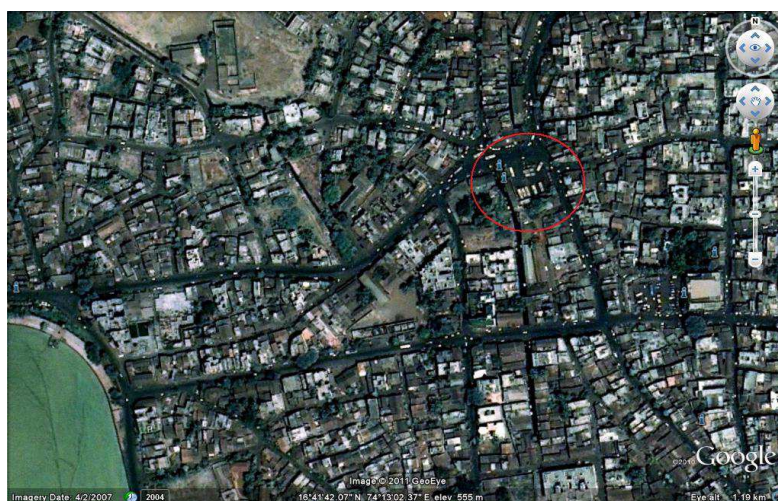
- **Sampling sites are as follow**

Sr. no.	code	Site	area	Source of water
1	K1	Central bus stand	Kolhapur	Panchaganga River
2	K2	Rankala bus stand	Kolhapur	Panchaganga River
3	K3	Sambhaji nagar bus stand	Kolhapur	Kalamba tank
4	K4	Kolhapur railway stand	Kolhapur	Panchaganga River
5	S1	Sangli bas stand	Sangli	Krishna River
6	S2	Sangli railway station	Sangli	Krishna River

Google Images of sampling site



Images of Central Bus stand and Kolhapur railways station

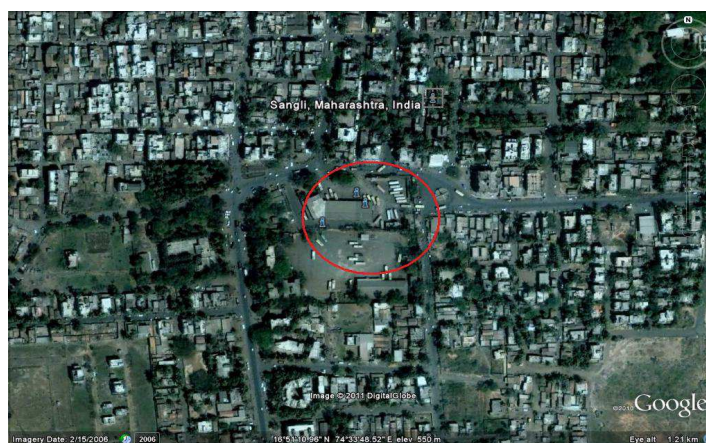


Google Images of Rankala bus stand

Plate No. 2 Images of sampling sites

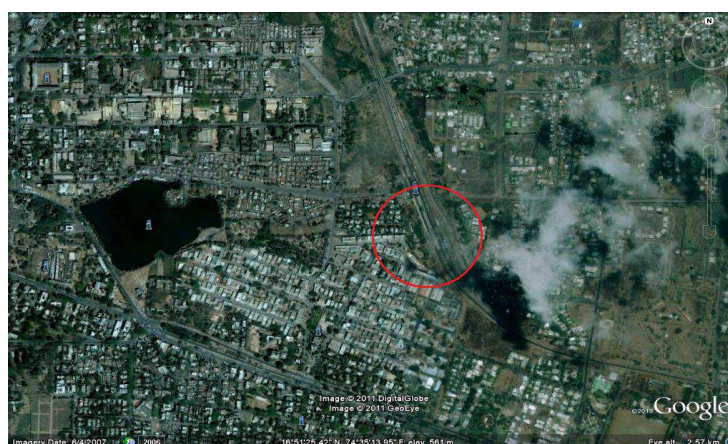


Google Images of Sambhajinager Bus Stand



Google Images of Sangli Bus Stand

Plate No. 3 Images of sampling sites



Google Images of Sangli Railways Station

Methodology:

Samples were collected from four sites of Kolhapur and two sites from Sangli city. Various physico-chemical and bacteriological parameters were analyzed and compared with drinking water standard.

1. Physical parameter:

1. pH
2. Electrical Conductivity(E.C.)
3. Total dissolved solids (TDS)
4. Total suspended solids (TSS).

2. Chemical parameter:

5. Alkalinity
6. Dissolved oxygen
7. Hardness
8. Chloride
9. Free co₂
10. Acidity
11. MPN

Bacteriological parameter:**Collection of sample:**

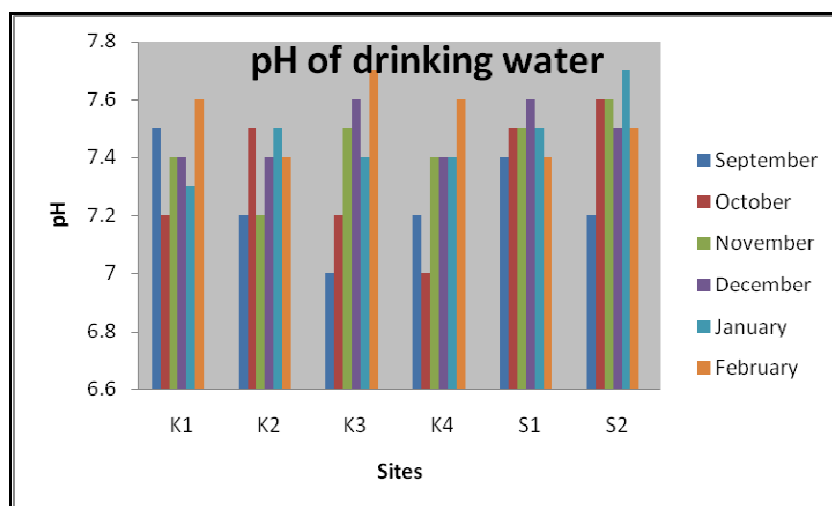
Samples from each site were collected twice in a month that is first and third week of a month. Sampling was carried out for six months which means total 36 samples were collected by grab sample technique. Grab samples are collected from the Kolhapur and Sangli public transport station at various sites at every month from September to February. The sample was collected directly into 1 lit polythene bottle that was previously rinsed for two times with distilled water before use. To check the dissolved oxygen sample was collected in DO bottles and DO was fixed immediately with Maganous sulphate and Alkali iodide azide solution. For MPN sample was collected in pre-sterilized glass bottle.

Sampling preservation and analysis:-

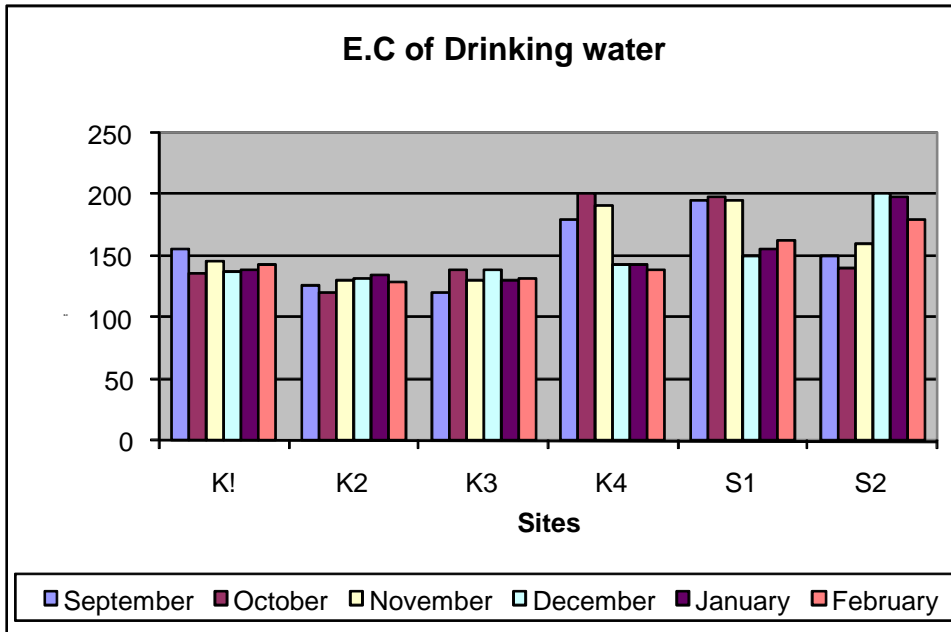
36 samples are collected from 6 sampling sites over period of 6 month at six sites. Sample was collected in polythene bottle and glass BOD bottles. Collected samples were refrigerated and stored at temperature 6 °C to 8 °C and sample was used within 24 hrs for analysis. MPN was carried out within 2-3 hrs after sample collection. The water sample were analyzed for the physicochemical and bacteriological parameter such as pH, E.C.,TDS, TSS, Alkalinity, Dissolved oxygen, total hardness, chloride ,free CO₂, acidity, MPN.

OBSERVATIONS:

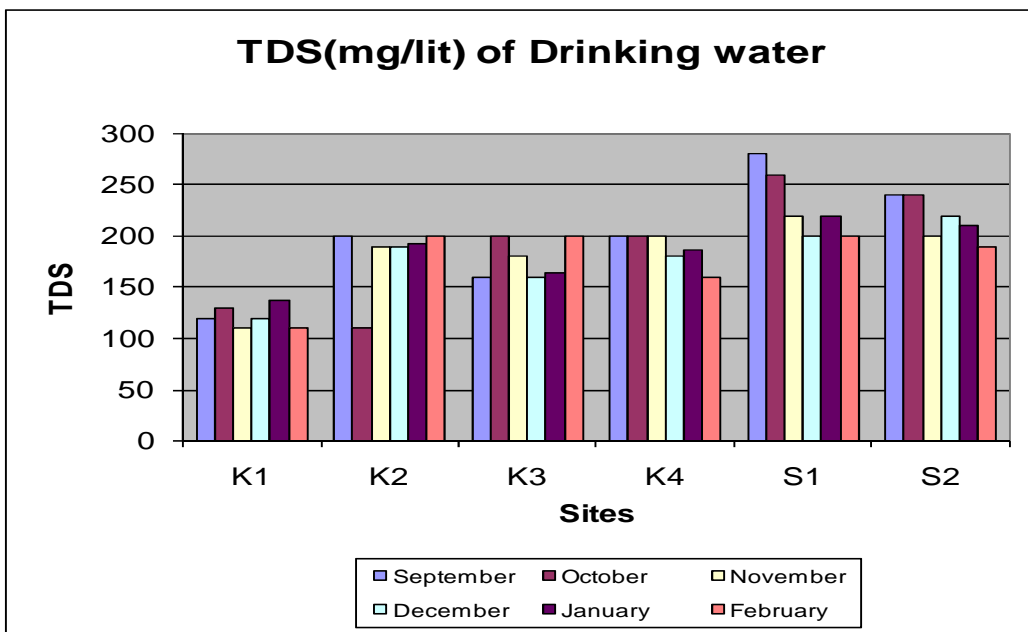
Graph no 1- Study on pH of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



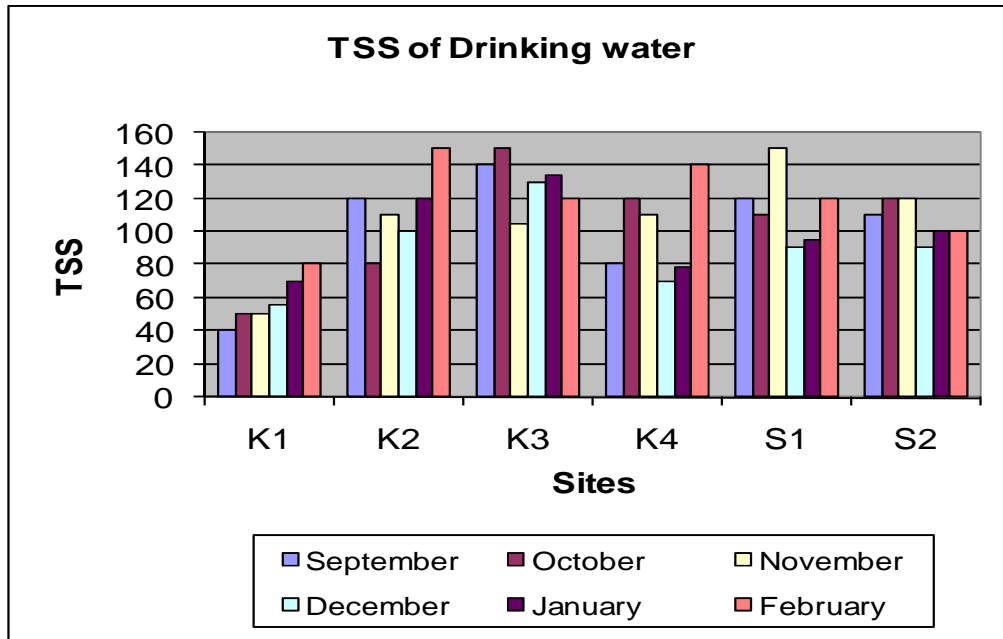
Graph no 2- Study on Electrical Conductivity (Us/cm) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



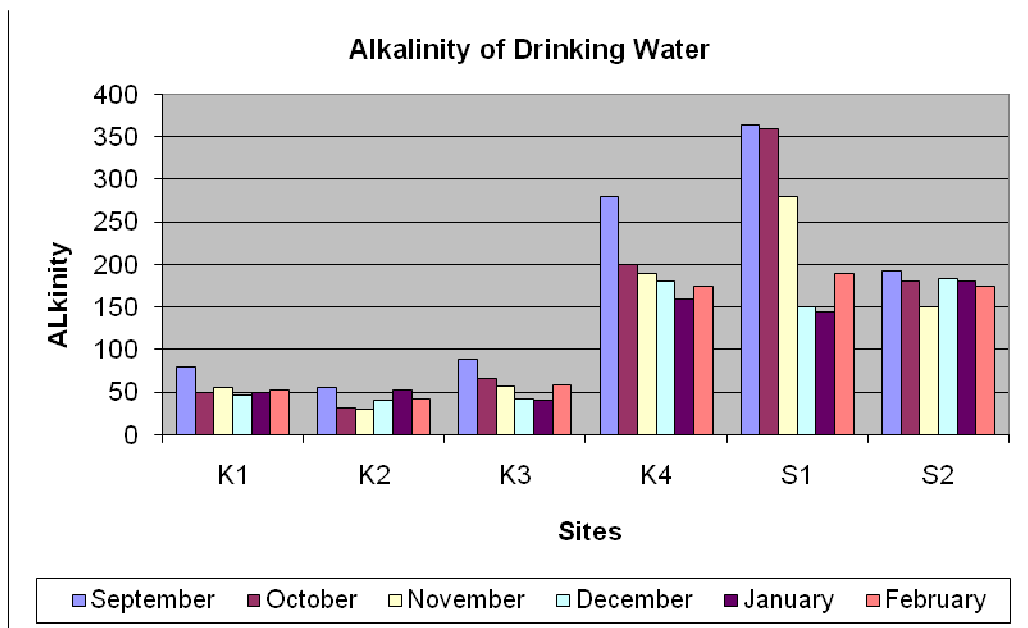
Graph no. 3: Study on TDS (mg/lit) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



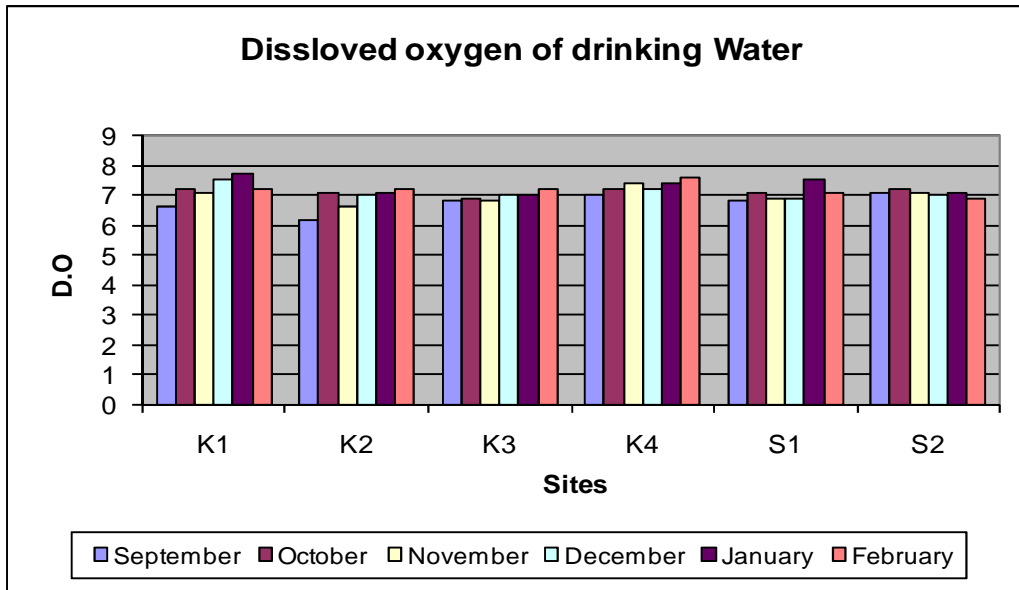
Graph no. 4: Study on Total Suspended Solid (TSS) (mg/lit) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



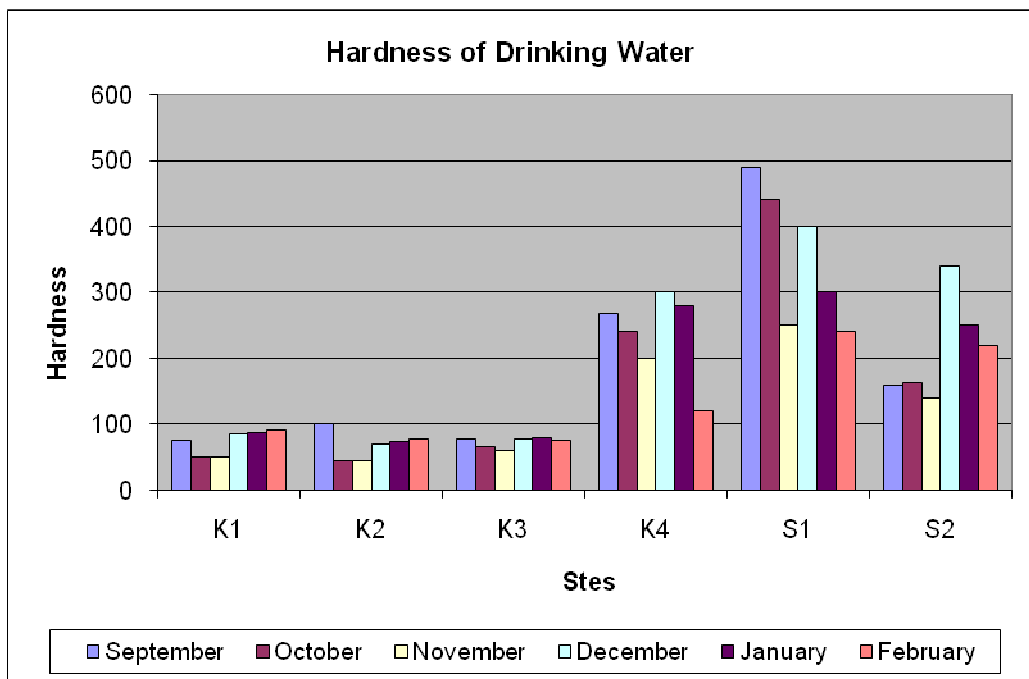
Graph no. 5: Study on Alkalinity (mg/lit) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



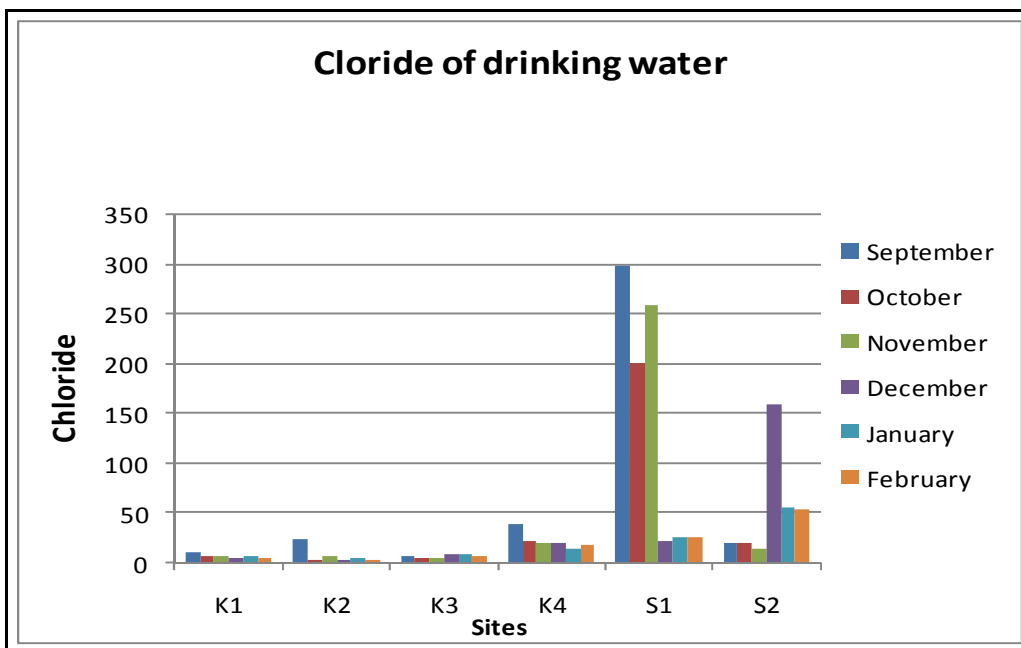
Graph no. 6 Study on Dissolved oxygen (mg/lit) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



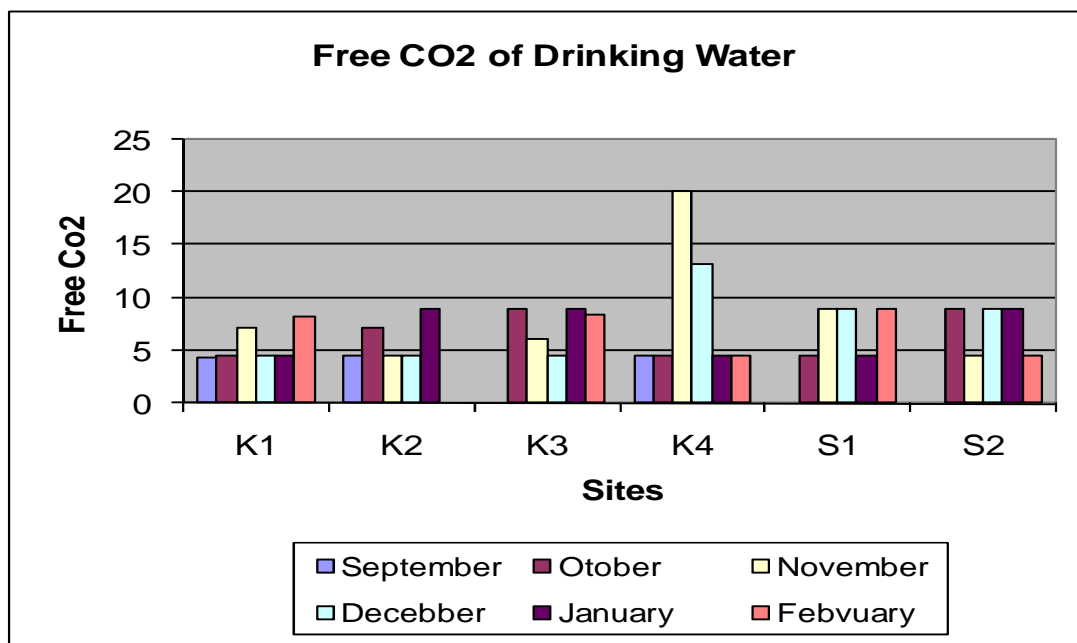
Graph no. 7 Study on Hardness (mg/lit) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



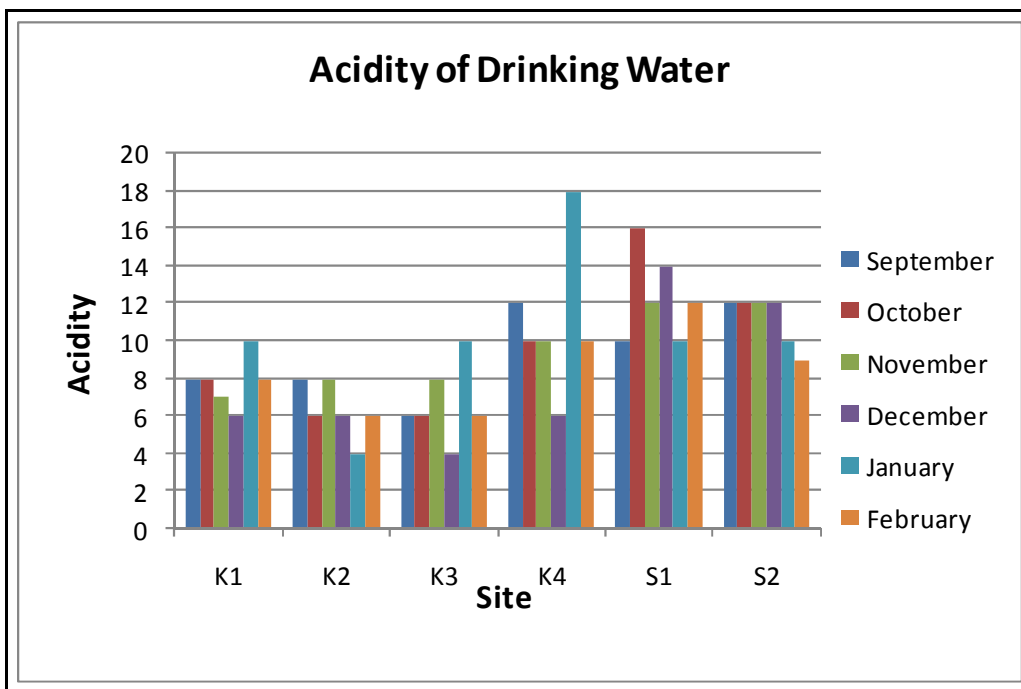
Graph no. 8 Study on Chloride (mg/lit) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



Graph no 9- Study on Free CO₂ (mg/lit) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



Graph no.10- Study on Acidity (mg/lit) of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)



Graph no.11- Study on MPN /100ml of drinking water at public transport stations from Kolhapur and Sangli city. (Sept. 2010 to Feb. 2011)

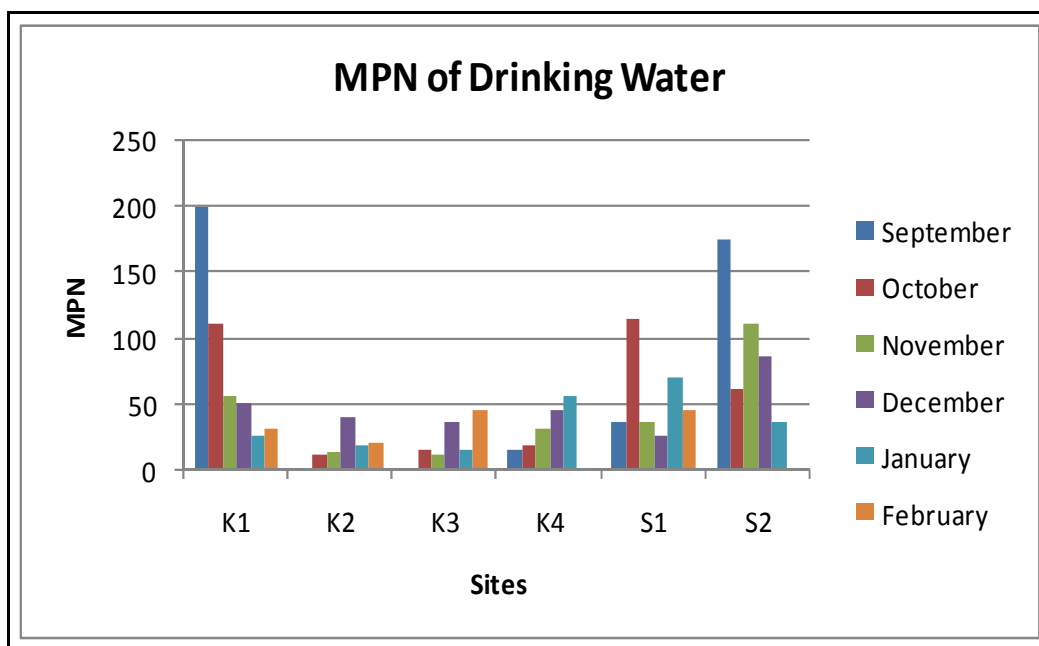


Table no 12.- Average result of physico-chemical and bacteriological analysis of drinking water samples collected from public transport stations in Kolhapur and Sangli city from September 2010 to February, 2011

Sr. no	Parameter	K1	K2	K3	K4	S1	S2	WHO std
1	pH	7.4	7.3	7.4	7.3	7.6	7.5	6.5-8.5
2	E.C.(Us/cm)	142	128.1	131.3	165	175.8	171.3	300
3	TDS(mg/lit)	121.3	180.3	177.3	187.8	230	216.6	1000
4	TSS(mg/lit)	57.6	113.3	129.8	99.6	114.1	106.6	500
5	Alkalinity(mg/lit)	55.5	42	58.6	197.5	248	176.8	200
6	D.O. (mg/lit)	7.2	6.8	6.9	7.3	7.0	7.0	6-8
7	Hardness(mg/lit)	73.3	68.3	72.8	234.6	346.6	212.3	500
8	Chlorides(mg/lit)	7.5	8.3	7.2	22.7	138	54.1	250
9	Free Co2(mg/lit)	5.6	4.1	6.0	8.4	5.8	5.86	-
10	Acidity(mg/lit)	7.8	6.3	6.6	11	12.3	11.1	-
11	MPN/100 ml	78	16.6	20	26.8	54.1	77.5	0

DISCUSSION

In present study six different sites were selected for water collection and analyze. From analysis which show fluctuation in all parameters in study duration. The pH values of all sample noted from 7.0 to 7.7 which indicate neutral pH of sample however all sample were within limit that is 6.5 to 8.5 as per WHO std (1989). pH values of water quality which depends on the carbonate, bicarbonate. Electric conductivity is parameter for dissolved organic substance [6]. E.C. is the ability of an aqueous solution to carry out electric current E.C. is useful parameter for indicating salinity hazards. Variation in electrical conductivity was recorded in all samples. All the selected sites showed E.C. Within limit. i.e. 300us/cm. TDS varied from 110 to 280 mg/lit. All the sites show TDS within limit i.e. 1000 mg/lit. According to WHO (1920). And TSS in all sites is within limit i.e. 500mg/lit. TDS is important parameter which depends on the presence of different particulate matter in the water.

Total hardness of selected sites varied from 44 to 490 mg/lit. Hardness have limit 500mg/lit. Hardness bellows 150 mg/lit it shows soft water to drinking in K1, K2, K3 sites and above 150mg/lit it shows hard water to drinking K4, S1 and S2 sites. Hardness is due to multivalent cations in solution associated with anion like chlorides, sulphate and bicarbonate.

All the selected sites having chlorides in drinking water gives a salty taste and some time effect on human being. The alkalinities of all sites are within limits except sangli bus stand (S1 sites) which shows high values of alkalinity. According to A. Langanayogi et al. 2008, most of the alkalinity in neutral water is formed due to dissolution of CO₂ in water. Higher alkalinity indicates presence of carbonate, bicarbonate and hydroxide in water body [7]. Higher alkalinity import undesirable taste to water [8]. Alkalinity gives bitter taste to water. Acceptable range of chlorides is 250 mg/lit by WHO std Chlorides concentration varied from 4.5 to 298.2 mg/lit and higher concentration of chloride observed in S1 sites.

Coli form Bacteria was present in them range 0 to 10 in all sample. As per various WHO standards it should be nil in drinking water. The presence of MPN gives direct proof of dangerous impurities of water. MPN present in all samples. The MPN tests showed that presence of coli form such as *Escherichia coli* in all sample indicate that all sample were bacteriological not safe for drinking purpose due to fecal pollution [9].

CONCLUSION

The present work deals with the water quality analysis of public transport station. The study of physico-chemical and bacteriological analysis of drinking water in Public transport station in Kolhapur and sangli city was performed. It shows that pH, TDS, EC TSS, Hardness are well within limit. The bacteriological it shows MPN is positive. Hence drinking water is faulty Water sample we collected from six sites of Kolhapur and Sangli city for six month i.e. from Sept 2010 to Feb 2011. In Kolhapur city four sites and in Sangli city two sites since total 36 samples we collected during the study of project. These samples were analyzed for different Physico-chemical and bacteriological parameter. Contaminated and not safe drinking purpose. The present study reveals some of the water sample wears above the permissible limit drinking water standard. Chlorides and Alkalinity of all samples are well within limit except from S1 sites. MPN test positive shows fecally contamination of drinking water source Contamination. Poor hygienic conditions were observed which may causes severe effect on human health. The quality of drinking water found to be not much good in rainy season and health problem created in people and other two seasons there is no health hazards. The study conclude that the drinking water quality of public transport station in Kolhapur and Sangali are not proper and having biological contamination.

Acknowledgment

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Photographs of sites



Study area K1 site



Study area K3 site



Study area K4 site



Tap covered with slush and dirty in K4 site