



GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH
CHEMISTRY

Volume 13 Issue 4 Version 1.0 Year 2013

Type : Double Blind Peer Reviewed International Research Journal

Publisher: Global Journals Inc. (USA)

Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Assessment of Water Quality in and Around Jamkhandi City, Bagalkot District, Karnataka State, India

By B. M. Kalshetty, R.C. Sheth, R. S. Gani, S.S. Karabasannavar
& M.B. Kalashetti

faculty of sciences Ben msik university of hassan II morocco

Abstract - The assessment of water quality and suitability for drinking and domestic (cooking) purposes was carried out from Jamkhandi city of Bagalkot District. The Bore water (Ground water), Surface water (Open well water) and Municipal water were assessed by examining various physico-chemical parameters such as pH, EC, TDS, TA, TH, DO, COD, BOD, Calcium, Magnesium, Chloride, Sulphate, Sodium and Trace element concentration like Iron, Manganese Cobalt and Copper called dissolved metals have been analyzed. The analyzed results were compared with WHO and ISI drinking water standards. On the basis of pH, EC and Hardness out of 62 Bore wells, 08 Open wells and 09 Municipal water samples, 57 Bore wells, 06 Open wells and all 09 municipal water samples were within the permissible limit and useful (safe) for drinking and cooking purposes.

Keywords : jamkhandi city, ground water, open wells, municipal water, physico-chemical parameters.

GJSFR-B Classification : FOR Code: 250603



Strictly as per the compliance and regulations of :



Assessment of Water Quality in and Around Jamkhandi City, Bagalkot District, Karnataka State, India

B. M. Kalshetty^α, R.C.Sheth^σ, R. S. Gani^ρ, S.S.Karabasannavar^ω & M.B.Kalashetti[¥]

Abstract - The assessment of water quality and suitability for drinking and domestic (cooking) purposes was carried out from Jamkhandi city of Bagalkot District. The Bore water (Ground water), Surface water (Open well water) and Municipal water were assessed by examining various physico-chemical parameters such as pH, EC, TDS, TA, TH, DO, COD, BOD, Calcium, Magnesium, Chloride, Sulphate, Sodium and Trace element concentration like Iron, Manganese Cobalt and Copper called dissolved metals have been analyzed. The analyzed results were compared with WHO and ISI drinking water standards. On the basis of pH, EC and Hardness out of 62 Bore wells, 08 Open wells and 09 Municipal water samples, 57 Bore wells, 06 Open wells and all 09 municipal water samples were within the permissible limit and useful (safe) for drinking and cooking purposes.

Keywords : jamkhandi city, ground water, open wells, municipal water, physico-chemical parameters.

I. INTRODUCTION

Assessment of water quality is an important issue, especially the studies of ground water, open water and municipal water. Assessment is a function of Physico-chemical parameter which is highly influence by geological formations and anthropogenic activities. Among the various sources of water, ground water is said to be safest water for drinking and domestic purpose.

Jamkhandi is one of the important Taluk place of Bagalkot District, located at latitude 16°19'48" N (16.504672° N) and 75°18'24"E (75.291401°E). This Taluk is comprises 48 villages with the population of 4, 08,441. Area of the Jamkhandi city is about 12.6 km² (4.9 miles), population residing in this city is found to be 1, 51,747. And daily public floating is 15,765. The people residing in this city are depended on Bore wells, Municipal water and very few were depended on Open wells for drinking and domestic purpose. River Krishna is the life-line for Bagalkot and Bijapur districts. The Almatti (Dam) reservoir situated in Bagalkot district of Karnataka State. The irrigation potential of 87490 hectares and hydropower generation having an installed

capacity of 290 mw¹. The water spread area is 487.87 sq. kms. with a fetch of 124 kms. The storage capacity at the Dam site has been 3486 m cum (123.08 TMC). The maximum flood discharges of 31.007 cum (10, 95,000 cusecs/min.) had been designed to be discharge through the 26 vents of the spill ways, having radial crest gate of size 15 m x 15.25 m with crest level at RL 50.016 mtrs out of 519.60 mtrs. Total catchment of Almatti reservoir is 359.25 sq. kms. (138.71 sq. miles). Rain fall 635 cms. In Bagalkot District and it is recorded 50 cms in Dam site during September 2009^{1,2}.

River Krishna divides Jamkhandi taluk in to two equal parts, and the city is interior of 10 kms from Krishna river belt, where the municipal pipe lines connected and Krishna river water act as life-line for the public for their domestic needs and drinking purpose. The river Krishna flow gradually began to rise in June, pick up in July and over flow in August and September, the flood lift reached maximum height and gradually falling through, October to January and by February found to be almost dry or lean flow. Hence, due to irregular water supply of water by municipality in summer season, the public residing in and around the city depended upon Bore well water for drinking and cooking purpose. In the view of the above the present investigation is under taken to study the water health conditions (Physico-Chemical parameters) of Bore wells, open well and municipal waters from the different Colonies and different locations of the Jamkhandi city.

II. EXPERIMENTAL

An investigation was conducted to know the Physico-Chemical parameters and the effect of conjunctive use of Ground (Bore) water. Bore water samples and others were collected from various colonies of Jamkhandi city in March 2013 and April 2013. Samples were collected in plastic bottles and brought to the research laboratory for further analysis and for quality assessment the standard methods were followed ^{3,4}. Temperature, pH, EC, and TDS were analyzed on the sampling site. The water samples brought to the laboratory for DO, COD, BOD measurements. The samples for DO were fixed in BOD bottles at the site and analyzed the parameter by Winkler method. All the parameters were analyzed within

Author α σ : comm., B.H.S. Arts and T.G.P. Science College, Jamkhandi, Dist: Bagalkot.

Author ρ ω : Research Scholars, Department of Chemistry, Bharathiar University, Coimbatore.

Author ¥ : P.G. Studies in Department of Chemistry, Karnataka University, Dharwad.

a day; the observed results were compared with WHO⁵, ISI⁶ drinking water standards.

III. RESULTS AND DISCUSSION

For the Assessment of water quality in and around Jamkhandi city, the city is equally divided into five suitable residential zones (regions), each zone contains eight Colonies. The water quality assessment results obtained from 62 water samples of 40 colonies of Jamkhandi city. The zone wise analysis reports are given in Tables 1 to Table 5 for Bore wells, Table 6 for Open wells; Table 7 showed the water quality assessment report of Municipal water and Table 8 indicates the water quality standards for references. A comparison of the physico-chemical data of ground (Bore) water samples, open well water and municipal water samples have been made with drinking water standards^{7,9}.

All the samples were collected during the months of March 2013 and April 2013. All the drinking water samples were clear, colorless and odorless except one ground water sample located at Govt. Primary School near Jumma Masjid (Mudhol Road) of Jamkhandi city.

a) Temperature

Temperature is an important biologically significant factor, which plays an important role in the metabolic activities of the organisms¹⁷. The water Temperature ranged from 24°C to 29°C in all the samples.

b) pH Values

pH is considered as an important ecological factor and provides an important piece factor and piece of information in many types of geochemical equilibrium or solubility calculation¹⁸. pH is a term used universally to express the intensity of the acid and alkaline condition of water samples. Most of the waters of open wells were slightly alkaline due to the presence of Carbonates (CO_3^{2-}) and Bicarbonates (HCO_3^-). The pH values of Bore wells water samples ranged from 6.34 to 8.0, all the samples pH values were within the permissible limit except two colonies such as Kumbhar galli and Gouwali galli bore wells, where as the pH values were recorded to be 6.2 and 6.4 respectively which are acidic in nature. The pH values of few bore wells were exceptional and may reflect contamination by strong bases such as sodium hydroxide and calcium hydroxide¹⁰.

c) Electrical Conductivity (EC)

It is an indicator of the degree of mineralization of water. The EC is correlated with total dissolved solids¹⁹. It is a measure of water capacity to convey electric current. It signifies the amount of total dissolved salts. Presence of high EC values in water indicates the presence of high amount of dissolved inorganic substances in ionized form. Electrical Conductivity

values ranged from 0.428 to 2.094 m mhos and indicate the presence of some ionic matter such as Calcium, Magnesium, Chloride, Sulphate, carbonate bicarbonate and some trace elements. All the EC- values of water samples were within the legal limit, most of ground (Bore) water content substantial amounts of dissolved CO_2 , HCO_3^- and Hydroxides, these constituents are the results of dissolution of minerals in the soil and atmosphere¹¹.

d) Total Dissolved Solids (TDS)

TDS indicates the salinity behavior of ground water. Water containing more than 500 ppm of Total Dissolved solids is not considered desirable for drinking water supplies, but in unavoidable case 1500 ppm is also allowed¹⁴ for domestic use. In the presence investigation the TDS values of water samples of all bore wells except few colonies bore waters found more than 500 ppm. The TDS values of bore located at Professor Colony (213 ppm), Rameshwar colony (401 ppm) Saradha colony (447 ppm), Siddarameshwar colony (285 ppm). In general the TDS values of collected water samples ranged in between 213 ppm to 1164 ppm.

e) Total Alkalinity (TA)

Alkalinity of water is its capacity to neutralize a strong acid and it is normally due to the presence of CO_3^{2-} , HCO_3^- and hydroxides and the presence of cations such as Calcium, Sodium and Potassium content in the water samples. In the present study the Total Alkalinity and the Total Hardness of water samples were ranged from 5.6 ppm to 34 ppm and 47.5 ppm to 153.03 ppm were found to be within the permissible limit respectively. In 5 colonies the TH values found around 180.0 ppm to 182.5 ppm also found within the prescribed limit. High alkalinity in water bodies leads to sour taste and salinity.

f) Total Hardness (TH)

Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water¹⁵. The total hardness may be due to the presence of divalent cations like Calcium, Magnesium found abundant in ground water. In the present investigation the TH of water samples ranged in between 47.5 ppm to 153.03 ppm this indicates that out of 62 samples (40 colonies) 05 samples were fall under very hard category above 180 ppm. (Locations: Arali katti Bore well near Kadasiddeshwar mangal Karyalaya, Bore well at Govt. Primary School near Jumma Masjid Awati Galli (Mudhol Road), Bore well at Kosti galli in front of Hittinmath swamiji house, and Bore well at Gauwalli galli near Banashankari Govt. School, and Bore well located at Kumbhar Galli).

g) Calcium and Magnesium Hardness

Calcium hardness ranged from 4.3 ppm to 51.60 ppm these values were close resembling and were within the permissible limit. Magnesium hardness

values ranged from 3.1 ppm to 22.8 ppm and were within the permissible limit of 30 to 150 ppm (WHO). Jain et al¹² and others reported that high concentration of hardness (150 to 300 ppm) may cause heart diseases and kidney problems.

h) Chloride content

The Chloride concentration serves as an indicator of pollution by sewage. Chloride occurs in all Ground waters widely in varying concentration. Excessive chloride in potable water is not particularly harmful. Chloride in excess (more than 250 ppm) impart a salty taste to water, People accustomed to higher Chloride in water are subjected to Laxative effects¹⁶. In the present investigation the chloride values ranged from 6.4 ppm to 65.32 ppm all the samples were within the permissible legal range.

i) Dissolved Oxygen (DO)

It is very important parameter, The DO values indicate the degree of pollution in water bodies. The low values of DO in water indicate the heavy contamination of organic matter and such water sample possesses bad smell, this is due to anaerobic decomposition of organic waste¹³. In the present study DO values of water samples ranged in between 4.8 ppm to 7.0 ppm, out of 62 samples 57 samples were within the permissible limit by WHO and ISI standards while 05 samples were < 3.5 ppm which exceeds the permissible limit.

j) Sulphate

Sulphate of water samples were recorded and ranged in between 17.8 ppm to 52.5 ppm in ground water, 14.85 ppm to 61.82 ppm in open well water and 28.92 ppm to 68.42 ppm all the values found within permissible limits. Sulphate concentration in water samples around 1000 ppm; it has Laxative effect and causes gastro intestinal irritation²⁰.

In general Open well waters are not safest for drinking purpose, this is because the contamination of organic matter, the development of algae, fungi and microorganism. The organic waste and unknowingly dumping E-waste in water body, the water constituency may change as result the development of Bactria like Mico-colifurom (M-Coli), Escherichia-Coli (E-Coli) and

pseudomonas aeruginosa. Hence, the development of ammonia in the water body due to the decomposition of organic matter and leads to bad odour of the water. In the present investigation the pH and EC found in between 7.02 – 7.74 and 0.2 – 1.32 respectively. The TDS found more than legal limit ranging in between 679 ppm 1121 ppm, the total alkalinity ranged in between 26 ppm – 75 ppm. The total hardness found in between 61.8 ppm 306.12 ppm the total hardness of open well located at Jambukeshwar temple were found to be 306.12 ppm, which is more than legal limit.

Calcium and Magnesium hardness in open wells ranged in between 13.06 ppm – 121.31 ppm and 11.65 ppm to 81.32 ppm, the open well water located at Jambukeshwar temple were found very hard and not fit for drinking and cooking purposes. The DO values of open well ranged in between 4.4 ppm – 6.5 ppm. Chloride and Sulphate ions found in between 42.60 ppm to 174.32 ppm and 14.85 to 61.82 ppm respectively and such ions concentration found within the prescribed limit.

The municipal waters pH and EC values are within the range of standards. TDS found slightly more than the legal limit. DO found in between 4.1 to 6.1 ppm, Chloride, Sulphide ions also found within the legal limit. Calcium hardness and Magnesium hardness were also found within the permissible limit.

COD determines the organic load where present in the water samples. The COD values found within the 6.1 ppm to 6.8 ppm within the permissible limit. The BOD determination indicates the amount of oxygen utilized by micro organisms. In the present investigation the BOD values ganged in between 1.5 ppm to 1.8 ppm, within the legal limit. The presence of trace elements in water samples of three sources, all the values were found within the permissible range. The data of COD, BOD and Trace elements were not shown in the Tables.

Figure 1 and Figure 2 indicate the Comparison between the Physical parameters of Ground water (GW), Surface water (SW) and Municipal water (MW) and the Chemical parameter, Hardness of Ground water (GW), Surface water (SW) and Municipal water (MW) respectively.

Table 1 : Physico-Chemical parameters of Bore well water of Jamkhandi city at various locations.
(Zone: South region of the city)

Location	pH	EC	TDS	TA	TH	DO	Ca ⁺⁺	Mg ⁺⁺	Cl ⁻	SO ₄ ⁻
Zum Zum Colony	7.0	1.510	790	18.00	93.0	5.3	16.84	10.31	48.2	48.12
Awati galli	6.7	1.683	786	11.15	182.5	3.2	42.74	30.26	34.6	41.2
Azad nagar	6.6	1.570	723	28.00	75.4	5.1	16.46	13.70	28.5	38.2
Momin Galli	7.1	1.360	634	20.00	83.4	5.4	20.05	13.32	32.2	28.2

Ullagaddi oni	6.7	1.710	778	10.11	100.7	4.9	24.06	16.22	41.8	35.9
Metri Galli	6.9	1.510	821	12.01	88.3	4.2	16.80	18.53	38.9	46.3
Kosti Galli	7.0	1.950	900	20.02	181.3	3.2	46.38	26.14	37.5	28.2
Baghash Galli	6.5	1.820	839	12.10	59.5	5.1	15.80	18.00	27.3	21.3

Table 2: Physico-Chemical parameters of Bore well water of Jamkhandi city at various locations.
(Zone: West region of the city)

Location	pH	EC	TDS	TA	TH	DO	Ca ⁺⁺	Mg ⁺⁺	Cl ⁻	SO ₄ ⁻
Siddamuthy oni	7.6	1.46	820	26	80.3	5.3	14.40	17.72	29.9	17.8
Ramadev Galli	7.0	2.08	942	24	52.6	6.1	14.43	16.61	31.3	33.4
Gadad Galli	6.7	1.72	790	20	136.3	6.0	40.01	6.61	32.8	52.5
Mallappana Oni	6.7	1.61	835	20	104.9	5.7	25.24	16.70	29.8	41.8
Kumbar oni	6.2	2.09	956	11	181.5	3.3	23.90	22.8	29.2	19.9
Market Galli	6.5	1.58	891	28	91.2	5.8	29.80	6.69	33.4	21.3
Nyamagoudar Oni	7.1	1.87	869	34	92.9	5.2	17.72	19.42	38.8	28.3
Arali katti oni	7.5	1.83	956	14	180.0	3.4	48.76	23.64	23.6	24.8

Table 3: Physico-Chemical parameters of Bore well water of Jamkhandi city at various locations.
(Zone: East region of the city)

Location	pH	EC	TDS	TA	TH	DO	Ca ⁺⁺	Mg ⁺⁺	Cl ⁻	SO ₄ ⁻
Gouli Galli	6.4	2.49	1164	18.2	182.0	3.2	49.63	23.17	31.2	32.4
Jolad Bazar	6.6	1.22	981	19.8	142.7	5.6	39.36	17.72	42.6	36.1
Barapet Galli	6.7	1.72	790	21.2	64.0	6.1	19.42	6.16	42.6	45.2
Maratha Galli	6.8	1.13	872	24.0	85.9	6.2	19.81	14.56	34.6	38.9
Bara Imam Galli	7.2	1.15	786	28.0	151.0	5.4	43.71	16.70	34.8	28.9
Korawa Galli	6.6	1.20	584	18.0	145.7	5.3	51.60	6.69	28.4	25.4
Halyalkar GalliS	6.8	1.25	912	32.0	153.1	4.8	41.79	19.42	36.1	26.5
Sabade Galli	6.8	1.81	833	30.0	115.1	4.6	26.23	19.81	39.76	31.2

Table 4: Physico-Chemical parameters of Bore well water of Jamkhandi city at various locations.
(Zone: Central region of the city)

Location	pH	EC	TDS	TA	TH	DO	Ca ⁺⁺	Mg ⁺⁺	Cl ⁻	SO ₄ ⁻
Ganapati Galli	6.7	1.943	9.4	26	98.6	5.1	29.64	9.81	36.92	41.8
Hokkala Bhavi	6.8	1.130	892	30	116.9	5.2	33.03	13.72	56.08	44.5

Jambakeshwar Galli	6.7	1.721	790	20	121.1	6.2	26.84	21.60	65.32	39.1
Paga Galli	6.5	1.251	798	32	150.5	4.9	14.40	19.81	61.32	32.5
Mali Galli	6.6	1.223	725	34	98.1	5.3	21.52	17.72	58.32	41.8
Prabhath Nagar	8.0	1.228	640	19	56.2	5.5	16.30	6.16	16.32	25.5
Teacher Colony	6.3	1.422	849	6.4	81.0	4.9	27.8	4.6	17.60	34.8
LIC Colony	6.8	1.323	912	12.1	100.6	5.8	25.6	14.56	21.50	28.9

Table 5 : Physico-Chemical parameters of Bore well water of Jamkhandi city at various locations.
(Zone: North region of the city)

Location	pH	EC	TDS	TA	TH	DO	Ca ⁺⁺	Mg ⁺⁺	Cl ⁻	SO ₄ ⁻
Rudra Math Oni	7.9	1.170	718	12.5	134.0	6.1	36.90	16.7	23.4	32.5
Professor Colony	7.0	0.428	213	6.7	19.8	6.2	14.80	3.1	6.4	19.2
Rameshwar Colony	6.6	0.915	401	6.8	116.5	6.3	28.61	18.0	13.6	16.8
Sarada Colony	6.4	0.855	447	7.4	47.5	6.4	10.71	8.3	13.8	26.6
GLBC Colony	7.1	1.126	612	11.2	93.5	6.5	25.82	11.6	15.6	27.8
Siddarameshwar Colony	6.3	0.535	285	5.61	19.8	7.0	14.32	3.6	8.2	35.5
Post Colony	7.0	1.310	761	9.8	98.7	6.1	32.80	6.7	21.5	48.2
APMC Yard	7.2	1.780	912	11.4	62.0	5.9	16.54	8.3	20.2	18.9

Table 6 : Water quality parameters of Open wells in Different parts of Jamkhandi City

Location	pH	EC	TDS	TA	TH	DO	Ca ⁺⁺	Mg ⁺⁺	Cl ⁻	SO ₄ ⁻
Girish Nagar	7.74	0.48	864	26	145.1	4.8	32.80	25.22	46.80	14.85
APMC Yard	7.41	0.64	746	31	61.8	5.0	13.06	11.65	56.82	24.69
Kadapatti Temple	7.30	0.20	679	28	98.9	5.2	19.46	20.10	42.66	48.15
Mendigeri Bhavi	7.16	0.29	912	62	112.6	4.6	25.60	19.45	59.81	38.69
Jambakeshwar Temple	7.02	1.32	1121	45	506.6	4.4	121.31	81.32	174.32	61.82
Vittal Mandir	7.12	0.51	923	53	188.1	5.8	49.61	25.61	76.03	54.96
AkkaTangi Bhavi	7.58	0.62	825	75	241.5	6.2	64.12	32.49	126.52	63.18
P & T Dept.	7.36	0.92	764	36	156.3	6.5	36.31	26.21	56.82	51.98

Table 7 : Municipal water quality report at few locations in the Jamkhandi City

Location	pH	EC	TDS	TA	TH	DO	Ca ⁺⁺	Mg ⁺⁺	Cl ⁻	SO ₄ ⁻
Hanuman Temple	6.72	1.10	713	28	137.7	4.8	26.48	28.58	38.28	44.21
Sajji Hanuman Temple	6.92	1.08	816	35	188.9	5.0	40.10	35.47	29.76	38.64
AmbaBhavani Temple	6.58	1.23	769	42	69.4	5.2	14.43	13.34	15.56	28.92
Jagadayallamma Temple	7.01	0.93	964	20	84.8	4.9	15.23	18.69	29.76	58.86

Yallaling Math	6.59	0.98	1124	45	65.9	4.1	10.401	15.99	26.92	61.14
Rameshwar Colony	7.14	1.01	1021	62	139.5	4.5	21.65	34.14	72.36	68.42
B.L.D.E. A'S College	7.30	1.05	992	58	99.9	5.3	20.02	19.95	29.76	49.92
Nandikeshwar Temple	6.89	0.99	1002	46	154.0	5.8	27.26	34.32	38.28	39.38
Kadapatti Basavanna temple	6.92	0.86	981	25	221.9	6.1	9.65	78.79	81.94	45.46

Table 7: Municipal water quality report at few locations in the Jamkhandi City

Parameters	Unit	WHO (1961)	ISI (1991)
pH	6.5 – 8.5	6.5 – 8.5
EC	ds/m $\mu\text{S/cm}$	1.4 1400	1.4 1400
TDS	Ppm	< 500	< 500
TA	Ppm	75 – 120	75 – 120
TH	Ppm	500	300
DO	Ppm	4 – 6	7
Ca ⁺⁺	Ppm	75	75 -100
Mg ⁺⁺	Ppm	50	30 -150
Cl ⁻	Ppm	200	250
SO ₄ ⁻	ppm	150	150 -250

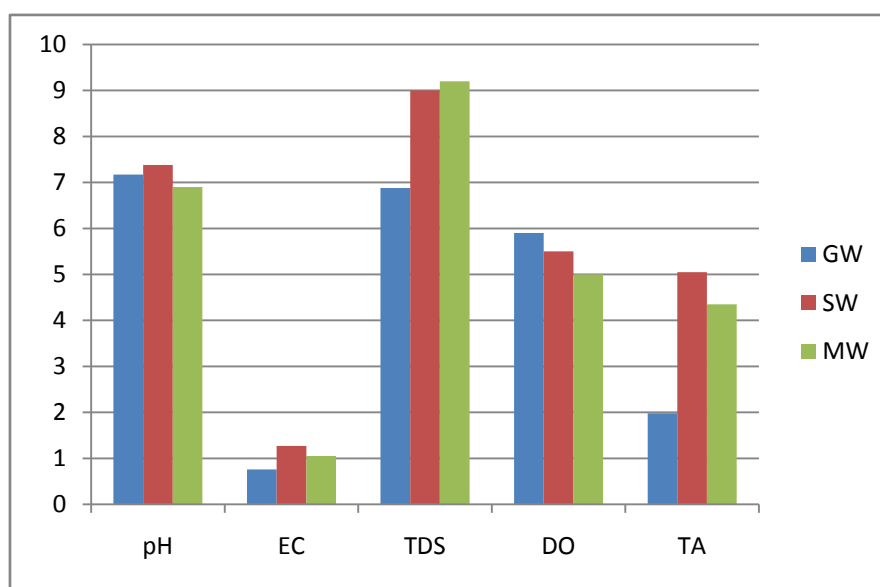


Figure 1 : Comparison between the Physico-Chemical parameters of Ground water (GW), Surface water (SW) and Municipal water (MW)

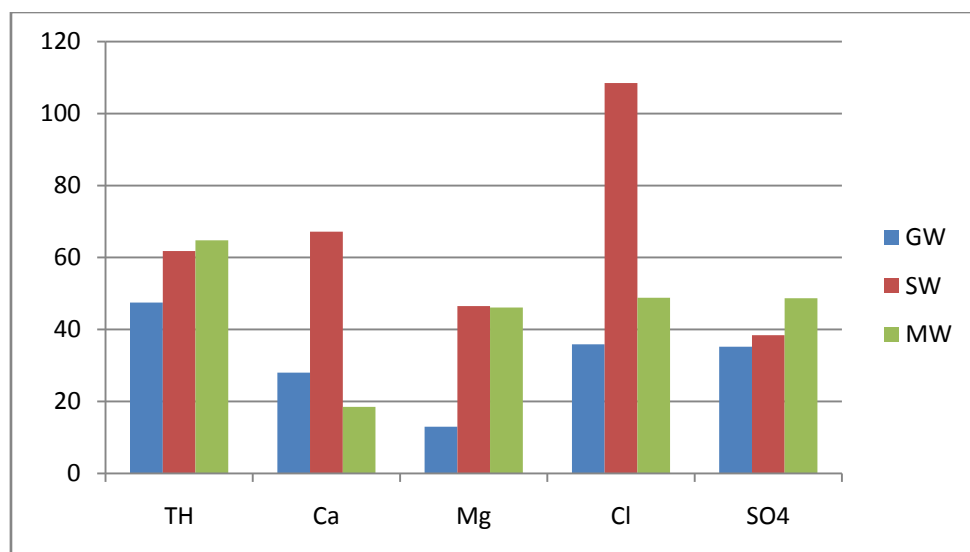


Figure 2 : Comparison between the Chemical parameter and Hardness of Ground water (GW), Surface water (SW) and Municipal water (MW)

IV. CONCLUSION

Due to the absence of Chemical Industries in the nearby place of this city, no toxic ions were identified even in trace amounts, the Fluoride ion concentrations of these samples were very low (<0.04 ppm to <0.06 ppm) and all these facts showed a good sign for the uses of water for drinking and cooking purpose.

The assessment of water quality and Evaluated parameters reveals that among the three sources (ground, open and municipal waters), the safest water should be ground water, because of its quality and physico-chemical parameters found within the prescribed limit except few bore wells already discussed in detail. It is necessary to improve the water quality of open well (Surface) water by adapting Chlorination. Which helps to control the growth of microbial and should be avoided the decomposition of organic matter were present in the water body.

River Krishna is the main source for water supply to Jamkhandi city. Hence, municipal water quality found to better during full flow of the river (rainy season), the municipality authorities supplies the water to the public after filtration through filter bed. It is suggested that the municipal authorities should follow the technical methods like chlorination which helps to control the development of microbial and bring down the hardness of water. During the lean flow of river water has contamination of maximum percentage of organic matter and inorganic ions make the municipal water unfit for drinking and cooking purpose.

V. ACKNOWLEDGEMENT

Authors express their sincere thanks to Dr. C.N.R.Rao, National Research Professor, Chairman Vision Group on Science and Technology, Bangalore

and Dr. Ananth Raj Executive Secretary VGST group, Bangalore for providing financial support in terms of Major Projects. The authors are also thankful to Dr. B.G.Mulinami Vice- Chancellor and chief Administrative Officer, S.H.Lagali and S.K.Biradar Administrative Officers BLDE'S Association Bijapur and Principal Dr. S.S.Suvarnakhindi for providing necessary facilities and financial support required to carry out this research work.

REFERENCES RÉFÉRENCES REFERENCIAS

1. Capacity Evaluation of Almatti and Hippargi Reservoirs – Water Resource Department, Govt. of Karnataka State. 2009-10.
2. Global Journal of Science Frontier Research (B). Volume XII issue VI Version 1 Year 2012.
3. APHA- AWWA, Standard methods for the examination of water and waste water. 21st ed. American Public Health Association, Wasington, DC., 2005.
4. R.K. Trivedi and P.K. Goel, Chemical and Biological Methods for water pollution status. Environmental publication, Karad (India), 1984.
5. Gaidlines for drinking water quality, World Health Organisation, Genevo 2nd edition, 1,56,1961.
6. Indian Standard for drinking water, Bureau of Indian Standard, New Delhi India, 1-9, 179, 1991.
7. Guidelines for drinking water quality, World Health Organisation, Geneve 2nd edition, 1,56,1961.
8. Indian Standard for drinking water, Bureau of Indian Standard, New Delhi India, 1-9, 179, 1991.
9. Manual of standards of quality of Drinking water supplies, Indian council of medical research, New Delhi, 1975.
10. D. Langmuir, Aqueous Environmental Chemistry. Prentise Hall, Inc. New Jersey, 1997.

11. Nagaraju, S.Suresh, K. Killham and K.Hudson Edward, Turkish J. Eng. Env. Sci., 30, 203, 2006.
12. C.K. Jain, K.K.S. Bhatia, Y. Vijay, Ind. J. Envi. Health, 39(3), 182, 1982.
13. A.J. Salke, water borne diseases in Fundamental Principles of bacteriology, 7th edition, Tata McGraw. Hill Publishing Company Ltd New Delhi.
14. Shrinivas Rao B. and Venkateswaralu P, Indian J. Environ Prot., 20(3), 1617, 2000.
15. Trivedy R.K. and Goel P.K. Chemical and Biological methods for water pollution studies Environmental publication, Karad, 1986.
16. Sudhir Dahiya and Amarjeet Kaur, J. Env. Poll., 6(4), 281, 1991.
17. H. Murhekar Gopal Krushna, Res.J. Chem. Sci. 1(4), 117, 2011.
18. S.Arya, V.Kumar, Minaskhi, A. Dhaka, Int. Multidiscipl. Res. J., 1(7), 11, 2011.

