Research Article

Quality Assessment of Drinking Water in Different Localities of Manjeri

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ABSTRACT

Water samples are collected from the wells in different places of Manjeri, Malappuram district. The safety and accessibility of drinking-water are major concerns throughout the world. Health risks may arise from consumption of water contaminated with infectious agents, toxic chemicals, and radiological hazards. Improving access to safe drinking-water can result in tangible improvements to health. The objective of this study is to assess the quality of drinking water by comparing with International standards of drinking water issued by W.H.O.

Keywords: Total dissolved solids, total hardness, alkalinity, turbidity.

INTRODUCTION

Drinking water is water intended for human consumption for drinking and cooking purposes from any source. It includes water supplied by pipes or any other means for human consumption by any supplier. Drinking water is safe enough to be consumed by humans or used with low risk of immediate or long term harm. In the US, the daily intake for water is 3.7 liters per day (L/day) for human males older than 18, and 2.7 L/day for human females older than 18. The amount of water varies with the individual, as it depends on the condition of the subject, the amount of physical exercise, and on the environmental temperature and humidity. The BIS drinking water specification (IS 10500:1991) was drawn up in 1983 and its most recent revision dates back to July 2010 (Amendment No. 3). The standard was adopted by the Bureau of Indian Standards with the following objectives -

- To assess the quality of water resources, and

- To check the effectiveness of water treatment and supply by the concerned authorities[2].

Chloride which is in small amount and these elements play a role in body metabolism. Fluoride present in low concentration is beneficial and at high levels dental problems and other issues will occur.

The human body consists of 55% to 78% water, depending on body size. The functions of water in human body are vital. The water helps to transports nutrients and oxygen into cells, moisturizes the air in lungs, helps in metabolism, protects our vital organ, helps our organs to absorb nutrients better, regulates body temperature, detoxifies, protects and moisturizes our joints etc.

Every cell in our body needs water from head to toe. This shows that evaluation of water is of great importance.

MATERIALS AND METHODS

Water samples were collected in cleaned glass bottles, washed and dried in sunlight. The programme was conducted for five different months from the month of January, April, July and December between 9.30 to 12.30 pm from different wells having different depths. The collected water sample was brought to the lab of Pharmaceutical Analysis, for the study of properties of drinking water. Drinking water samples were transported to the laboratory on the same day. Representative samples of water shall be drawn as prescribed in IS 1622:1981 and IS 3025 (part 1):1987[2].

pH of the samples was analyzed using Systronics-MK VI pH meter. The pH meter was calibrated before using 4.01, 7 and 10.01 buffer solutions. Temperature was measured using digital auto thermometer. Total hardness was determined by complexometric titration, in this the collected sample were titrated against EDTA using Erio-chrome Black-T as the indicator.

Turbidity was measured by Nephloturbidimeter and the alkalinity was determined by titrating with N/10 sulphuric acid using phenolphthalein as indicator

The chloride content in the sample was determined by titrating the sample against standard silver nitrate using potassium chromate as indicator. Sulphate, nitrate, fluoride, iron were determined by spectrophotometric technique as per the methods described by the American Public Health Association (APHA1995).

Lead (Pb) was measured using atomic absorption spectrophotometer (AAS) by direct aspiration.

Here, the drinking water quality evaluation was based on WHO (1996) and Bureau of Indian Standards (BIS2003)[3].

Table 1: Properties of drinking water collected in the month of JAN

Properties	W1	W2	W3	W4	W5
Depth	15 mt	13 mt	13 mt	12 mt	11 mt
Temp	27	27	27	27	27
pH	7.3	7.1	7.1	7.5	7.4
Total hardness	112	97	152	232	121
Total alkalinity	202	168	145	153	186
Turbidity(NTU)	02	01	03	05	01
TDS(mg/l)	174	251	118	372	149

In the month of January, the total hardness varies from 97 to 232 and the total dissolved solids varies from 118 to 372

Table 2: Properties of drinking water collected in the month of APRIL

Properties	W1	W2	W3	W4	W5
Depth	15 mt	13 mt	13 mt	12 mt	11 mt
Temp	32	32	32	32	32
pH	7.8	7.5	7.8	7.3	7.5
Total hardness	267	141	139	218	155
Total alkalinity	145	164	132	173	135
Turbidity(NTU)	0.5	01	0.2	0.9	0.7
TDS(mg/l)	375	551	134	259	126

In the month of April, the total hardness varies from 155 to 267 and the total dissolved solids vary from 126 to 551.

Table 3: Properties of drinking water collected in the month of JULY

Properties	W1	W2	W3	W4	W5
Depth	15 mt	13 mt	13 mt	12 mt	11 mt
Temp	29	29	29	29	29
pH	7.1	7.1	7.1	7.6	7.8
Total hardness	304	287	126	263	158
Total alkalinity	241	224	256	113	64
Turbidity(NTU)	0.3	0.1	0.1	0.5	0.3
TDS(mg/l)	215	263	471	321	358

In the month of July, the turbidity varies from 0.1 to 0.5 and the total dissolved solids vary from 215 mg/l to 358 mg/l.

In the month of December, the turbidity varies from 0.1 NTU to 1 NTU and the total hardness varies from 129 to 247.

In the month of January, the total chloride amount varies from 52(mg/l) to 284(mg/l), sulphate amount varies from 68(mg/l) to 218(mg/l), Flouride content varies from 0.4(mg/l) to 1.1(mg/l), the amount of calcium varies from 21(mg/l) to 74(mg/l), nitrates varies from 16(mg/l) to 36(mg/l), lead was not detected in well 2 and well 4,

amount of iron remains constant for well 1, well 3 and well 4.

Table 4: Properties of drinking water collected in the month of December

Properties	W1	W2	W3	W4	W5
Depth	15 mt	13 mt	13 mt	12 mt	11 mt
Temp	28	28	28	28	28
pH	7.1	7.8	7.3	7.2	7.4
Total hardness	131	247	129	171	163
Total alkalinity(mg/l)	143	124	200	53	213
Turbidity(NTU)	0.2	0.1	0.1	0.9	01
TDS(mg/l)	328	452	82	359	413

Table 5: Major and Minor constituents present in drinking water (Collected in the month of January)

Properties	W1	W2	W3	W4	W5
Chloride(mg/l)	195	52	219	284	72
Sulphate(mg/l)	68	99	125	218	117
Flouride(mg/l)	0.4	0.6	1.0	0.7	1.1
Calcium(mg/l)	21	58	43	74	34
Nitrates(mg/l)	32	16	27	37	36
lead(mg/l)	0.003	0.000	0.005	0.000	0.002
Iron(mg/l)	0.001	0.003	0.001	0.001	0.000

Table 6: Major and Minor constituents present in drinking water collected in the month of April

Properties	W1	W2	W3	W4	W5
Chloride (mg/l)	233	241	127	138	196
Sulphate (mg/l)	23	41	74	331	249
Flouride (mg/l)	0.7	0.5	0.8	1.1	1.0
Calcium(mg/l)	42	34	29	47	73
Nitrates(mg/l)	46	22	43	24	35
lead (mg/l)	0.001	0.029	0.003	ND	0.006
Iron (mg/l)	0.008	0.002	0.007	0.000	0.003

In the month of april, the total chloride amount varies from 127(mg/l) to 241 (mg/l), sulphate amount varies from 23 (mg/l) to 331(mg/l), Flouride content varies from 0.5(mg/l) to 1.1(mg/l), the amount of calcium varies from 29(mg/l) to 73(mg/l), nitrates varies from 22(mg/l)) to 46(mg/l), lead was not detected in well 4, amount of iron varies from 0.00 to 0.008(mg/l).

In the month of July, the total chloride amount varies from 55(mg/l) to 284(mg/l), sulphate amount varies from 21(mg/l) to 53(mg/l), Flouride content varies from 0.3(mg/l) to 1.0(mg/l), the amount of calcium varies from 32(mg/l) to 68(mg/l), nitrates varies from 13(mg/l) to 42(mg/l), lead was not detected in well 3 and well 4, amount of iron remains constant for well 1 and well 2.

Table 7: Major and Minor constituents present in drinking water collected in the month of JULY

Properties	W1	W2	W3	W4	W5
Chloride(mg/l)	55	284	132	217	76
sulphate(mg/l)	21	26	42	53	34
Flouride(mg/l)	0.8	0.7	0.8	1.0	0.3
Calcium(mg/l)	32	54	54	68	43
Nitrates(mg/l)	13	42	31	41	15
lead(mg/l)	0.001	0.001	ND	ND	0.002
Iron ((mg/l)	0.002	0.002	0.004	0.2	0.003

Table 8: Major and Minor constituents present in drinking water collected in the month of December

Properties	W1	W2	W3	W4	W5
Chloride(mg/l)	147	242	132	135	231
sulphate(mg/l)	134	168	133	97	125
Flouride(mg/l)	0.9	0.9	1.1	1.1	0.8
Calcium(mg/l)	67	56	86	89	35
Nitrates(mg/l)	37	14	26	8	35
lead(mg/l)	0.00	0.001	0.002	0.00	0.00
Iron(ppm)	0.002	0.007	0.004	0.003	0.002

In the month of December, the total chloride amount varies from 132(mg/l) to 242(mg/l), sulphate amount varies from 97(mg/l) to 168(mg/l), Flouride content varies from 0.8(mg/l) to 1.1(mg/l), the amount of calcium varies from 35(mg/l) to 89(mg/l), nitrates varies from 8(mg/l) to 37(mg/l), lead was not detected in well 1, well 4 and well, amount of iron remains constant for well 1 and well 4.

RESULTS AND DISCUSSION

The normal pH of the water is between 6.5 and 8.5. Beyond this range the water will affect the mucous membrane or water supply system and no relaxation is given in accordance with IS: 10500, 1992. High pH is normally associated with a high photosynthetic activity of water.

If the turbidity goes above 5, the consumers will not accept. According to IS 10500, 1993 specification turbidity of drinking water has the minimum limit of 1 and maximum limit of 10. According to IS: 10500 max permissible limits for dissolved solids in drinking water is 500mg/l and for the alternate source it extends to 2000mg/l.

If the amount exceeds, palatability decreases and may cause gastro intentional irritation. In such cases water have a positive saturation index. Hardness is contributed by calcium and magnesium ions. Water with high values of alkalinity is not fit for large scale irrigation purpose.

Major and minor constituents have different roles. Calcium has a major role in human nutrition.

As per the I.S. code the desirable limit of iron content in drinking water is 0.3 ppm. Beyond 0.3 ppm that water is not allowed for drinking purpose. If the chloride content goes above 250 mg/l, it may results in corrosion and palatability. In case of sulphate if the limit beyond 200 mg/l it results in gastric irritation[3]. High fluoride content results in flourosis. Excess amount of nitrates results in methanoglobinemia. According to IS: 10500 no relaxation has been given for the amount of lead content in drinking water. It is highly toxic.

CONCLUSION

Drinking water collected from different wells situated in Manjeri is of good quality. pH, total hardness, total alkalinity, turbidity, total dissolved solids, chloride, sulphate, Flouride, calcium, nitrates, lead, iron were on the acceptable limit as per IS:10500. The primary concern for nitrate and nitrite is that infants less than 6 months are susceptible to blue-baby syndrome, which is potentially fatal if not treated. The primary source of nitrate and nitrite would be agricultural runoff, poorly maintained septic systems, sewage disposal, and acid solutions in injection fluids, urban runoff, and natural deposits. This research helps to safe guard health by determining the quality of water resource and it helped to know the pollution status of Manjeri.

REFERENCES

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