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RESEARCH ARTICLE

Assessment of physical status of ground water samples in Kanpur Metro, U.P.

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SUMMARY: The present work was undertaken to analyze the different water quality parameters, *viz.* pH, electrical conductivity (EC), total dissolved solids (TDS), total alkalinity (T.alk.) and total hardness (TH). Ground water samples were collected from different residential areas of Kanpur city, U.P. (India). The results were compared with the values stipulated by World Health Organization (WHO) for drinking water quality. It was found that the ground water was contaminated at few residential areas, while others showed physical parameters within the water quality standards and the quality of water was good and it was fit for drinking and irrigation purpose.

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Protection and management of ground water quality are emerging as a great public concern in India. People are becoming more conscious about the nature of ground water and its usage; regarding its future utility which is not only affected by our human activities but also by its current uses of extravagance and over expectation especially in urban areas. Recently there was a great hue and cry about presence of pesticide residues in bottled mineral water is obtained from ground water, then processed and packed.

A result of urbanization is the increase in demand and creation of potential with possibility of ground water pollution. A number of studies in the past have an impact on the quality of ground water. A similar situation is being encountered in most of the metropolitan cities with growing urban centers. Ground water contaminated from aforesaid sources is injurious to human beings if it does not satisfy the prescribed drinking water standards. It is essential to demarcate the potable and non-potable ground water zones based on desirable and maximum permissible limits of various physico-chemical parameters for implementing necessary remedial measures to prevent the occurrence of adverse conditions.

Kanpur, the major industrial town of Uttar Pradesh, is infested with industries like tanneries, cloth mills, foundries, chemicals factories etc. Untreated effluents from these sources and domestic sources not only pollute surface water but also percolate down to ground water adversely affecting its physico-chemical and biological characteristics. So, the present research work has been undertaken in an attempt to study the extent of diffuse pollution that has threatened the existing ground water resources and to use the data so obtained in prediction and protection of this invaluable resource.

Studies regarding the ground water quality analysis have been made by many authors like Singh and Kapoor (1989), Ravichandran and Pundarikanthan (1991), Latha *et al.* (2002), Gupta and Saxena (1996), Gupta and Gupta (1999), Rajasekara Pandian *et al.* (2005).They concluded

that it is the high rate of exploration than its recharging, inappropriate dumping of solid as well as liquid wastes, lack of strict enforcement of law and loose governance are the cause of deterioration of ground water quality.

EXPERIMENTAL METHODOLOGY

Area under study:

The present study covers the entire urban area of Kanpur metro.

Selection of sampling points :

After a survey of the city, five types of locations were chosen for collecting groundwater samples. Each type of location has five sampling stations which included mostly the hand pumps, and some dug wells. The sampling points were classified occupation wise using stratified random sampling techniques as HIG (I-IV), MIG (I-V), LIG (I-V), JJ (I-V) and IA (I-V).

Sample collection :

Samples from various groundwater sources were collected for the evaluation of physical parameters.

Analytical procedure :

The collected samples were analyzed in the laboratory as per standards methods.

pH (Hydrogenion concentration) :

It was determined with the help of a pH meter using a glass electrode and reference electrode. The pH meter was calibrated by buffer solutions (Borax buffer). After calibrating, the pH meter with buffer solutions, the electrode assembly was removed and washed with distilled water. Now, it was dipped into the water sample and the pH of the sample was read from the meter.

Electrical conductivity :

It is the measure of the ability of an aqueous solution to carry the electric current. It was determined by conductivity measurement method :

$$k = \frac{1{,}000{,}000x}{Rm[1 + 0.0191(t - 25)]}$$

where,

k = Conductivity in μ mhos/cm at 25^0C .

x = Cell constant in cm^{-1}.

Rm= Measured resistance of sample in ohm.

t= Temperature of measurement.

Total dissolved solids (TDS) :

The TDS in water samples were estimated as the residue left after the evaporation of filtered sample.

$$\text{Total dissolved solids (mg/1)} = \frac{(B - A)X1000}{v}$$

where,

A= Initial mass of evaporating dish (g).

B= Final mass of evaporating dish (g).

V= Volume of water sample taken in ml.

Total alkalinity (T.alk.) :

It is the quantitative ability of water to react with a strong acid at a designated pH. It was determined by neutralization titration with a strong acid H_2So_4 using methyl orange and phenolphthalein indicators.

$$\text{Total alklinity (T.alk.)} = \frac{1}{50} X \frac{(A + B)}{100} X\ 50\ X\ 1000\ ppm$$

where,

A= Volume of N/50 H_2So_4 used to phenolphthalein end point (ml)

B=Additional Volume of N/50 H_2So_4 used to phenolphthalein end point (ml)

Total hardness (TH) :

The total hardness of water refers to the sum of concentrations of alkaline earth metal cations present in it. The TH was determined by complexometry using EDTA as titrant.

EXPERIMENTAL FINDINGS AND DISCUSSION

The results obtained from the present investigations have been discussed in the following sub heads:

pH:

The results presented in Table 1 revealed that the pH range in the five residential areas under investigations was between 7.03 and 8.7

Table 1 : The range of pH values of different five types of residential areas of Kanpur city

Sr. No.	Residential areas	pH range		Annual mean
		Lowest	Highest	
1.	Higher income group (HIG)	7.72	8.06	7.19
2.	Minimum income group (MIG)	7.72	8.05	8.02
3.	Lower income group (LIG)	7.02	7.9	7.14
4.	Juggi Jhopari (JJ)	7.19	8.21	8.4
5.	Industrial area (IA)	7.30	8.70	7.9

It is safe from the point of view of potability and plant growth as well. Infact lightly alkaline water is better for plant growth compared to acidic water (pH<7.0). It goes that the pH of ground water over the year in all the five residential areas is

well within the desirable range.

Electrical conductivity (EC) :

High EC values make water unsuitable for irrigation, boilers etc. The mean EC values of ground water samples collected round the year are given in Table 2.

Table 2: The ECvalues of different residential areas of Kanpur city

Sr. No.	Residential areas	EC (µmhos/cm) Lowest	Highest	Annual mean
1.	Higher income group (HIG)	1006	1666	1395
2.	Minimum income group (MIG)	820	2276	1651.8
3.	Lower income group (LIG)	1128	2463	1729
4.	Juggi Jhopari (JJ)	1195	2496	1724.2
5.	Industrial area (IA)	1363	2663	1822

The maximum permissible limit of EC is 400µmhos/cm

From Table 2 it is clear that the mean value of industrial area was the highest. It may be attributed to large amount of industrial waste seeping into ground to contaminate water with heavy metal ions and anions.

Total dissolved solids (TDS) :

In the present investigations, the mean values of TDS were found in various localities (Table 3).

Table 3: The TDS values of different residential areas of Kanpur city

Sr. No.	Residential areas	TDS (mg/l) Lowest	Highest	Annual mean
1.	Higher income group (HIG)	592	840	720
2.	Minimum income group (MIG)	678	1132	804.6
3.	Lower income group (LIG)	828	1291	551.6
4.	Juggi Jhopari (JJ)	869	1342	1018.3
5.	Industrial area (IA)	890	1392	1052

Maximum permissible limit = 500mg/l

TDS of more than 500mg/l make the water undesirable for drinking purposes. Present investigations have revealed that maximum was from the sample collected from JJ and industrial area where TDS was as high as 1342 and 1392 mg/l, respectively.

Total alkalinity :

The result presented in Table 4 revealed that the lowest mean values of T.alk. was found for the HIG areas and the highest for the JJ area. It was definitely on the higher side.

Table 4 : The alkalinity range of different residential areas of Kanpur city

Sr. No.	Residential areas	T.Alk. (mg/l) Lowest	Highest	Annual mean
1.	Higher income group (HIG)	125	160	152.25
2.	Minimum income group (MIG)	396.8	720.12	605.40
3.	Lower income group (LIG)	379.34	702.08	668.55
4.	Juggi Jhopari (JJ)	406.3	760.8	645.8
5.	Industrial area (IA)	434.6	756.3	552.55

Maximum permissible Limit = 500mg/l

Total hardness :

Present studies have revealed (Table 5) that TH of ground water in HIG and MIG areas were well within the prescribed limits.

Table 5 : Mean figures for total hardness in five type of residential areas of Kanpur city

Sr. No.	Residential areas	TH(mg/l) Lowest	Highest	Annual mean
1.	Higher income group (HIG)	203	290	141.8
2.	Minimum income group (MIG)	203	292	218.5
3.	Lower income group (LIG)	278	468	221.7
4.	Juggi Jhopari (JJ)	470	1420	471.7
5.	Industrial area (IA)	622	2441	589.6

Maximum permissible Limit = 300mg/l

It was slightly greater in LIG but there was no cause for alarm. However, in the JJ and I, areas it was alarmingly high. Water with excess hardness is known to cause heart disease and kidney problems.

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REFERENCES

Gupta, A.K. and Saxena, G.C.(1996). Evaluation of groundwater pollution potential of Agra due to demo-economic factors. *IJEP,* **16** (6): 419-422.

Gupta, B. K. and Gupta, R.R. (1999). Physic-chemical and biological study of drinking water in Satna, Madhya Pradesh. *Poll. Res*., **18**: 523-525.

Latha, M.R., Indarni, R., Sheeba, S. and Francis, H.J. (2002). Groundwater quality of Coimbatore district, Tamil Naidu. *J. Ecobio*, **14** (3): 217-221.

Ravichandra, S. and Pundarikanthan, N.V. (1991). Studies on ground water quality of Madras. *Indian J. Environ. Health*, **33** (4):481-487.

Rajase kara Pandian, M.G., Sharmila Banu, Kumar,G. and Smila, K.H. (2005). Physico-chemical characteristics of drinking water in selected areas of Namakkal town (Tamil Nadu), India. *Indian J. Environ. Prot.*, **10** (3): 789-792.

Singh, R.P. and Kapoor, R.C. (1989). Ground water quality of Kanpur City, *Proc.Nat. Acad.Sci., India,* **59** (B). II.

WHO(1984).Guidelines for drinking water quality recommendations, **81:** Geneva.

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