Chapter-IX

Summary and Conclusion
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Introduction:

Water is the essential ingredient of all life on the earth and it is one of the most important resources for potable purpose. Fresh water for human consumption is a fragile resource. Ground water is the world's largest source of fresh water. The demand for fresh water continues to grow with the population explosion. In view of the increase in population, the rivers and ground water resources can easily become polluted with untreated domestic and industrial wastes as well as the use of chemical fertilizers and pesticides for agriculture crops. Pollution from the above sources are found to be a matter of great concern.

The present investigation is undertaken in order to assess and to monitor the quality variations in ground water caused by natural and anthropogenic activities in the study area. In this study a multidisciplinary approach has been adopted involving the major physico-chemical and biological parameters and trace metals. This investigation is great effort towards the understanding of various natural and anthropogenic processes influencing the ground water quality in the study area.

The study on ground water quality of Jagalur taluk for a period of two years has revealed variations among the different parameters seasonally at different study locations. For the analysis of ground water, 50 sampling sites were selected. The study includes the collection of the water samples following the random sampling method. Few of the parameters were analyzed on the spot and the remaining parameters were analysed in the laboratory within 24 hours as per the standard methods. The trace metal analysis was made by the standard methods using atomic
absorption spectrophotometer (AAS). The biological parameters MPN and E.coli
were also measured.

The interrelationship between the various physico-chemical and biological
parameters in the ground water has been evaluated. Further, the ground water was
classified on the basis of USSL and Handa’s classification. The following observation
have been made.

1) Among the physico-chemical parameters studied, the mean values of pH in water
found alkaline in pre-monsoon season and slightly alkaline in monsoon and post
monsoon seasons. The study also revealed that most of the water samples
exhibited the alkaline pH range and nearer to neutral.

2) The Electrical conductivity values showed that 18-20% of the samples were
belonged to permissible and most of the samples were belonged to brackish
category. Further, it has been observed that the electrical conductivity values have
exhibited an increasing trend in post-monsoon season when compared to pre-
monsoon and monsoon seasons. This is due to the fact that during post-monsoon
season the dissolution of minerals, salts and other soil constituents increase as a
result of increase in ground water table.

3) The values of TDS showed that 75% of the water samples were found in fresh and
25% in brackish categories. Further, it has been observed that the TDS values
exhibited an increasing trend during post-monsoon season as compared to that of
pre-monsoon and monsoon seasons. This is due to the fact that the dissolution of
more quantity of constituents of soil particles as ground water table increases
during post-monsoon season. It represents the variation among the seasons
4) The DO of the water from the study sites is found to be in the consumable range. Further, the values of DO decreased in post-monsoon season as compared to pre-monsoon and monsoon seasons. This may be attributed to the precipitation and surface water run-off that rises water table through percolation.

5) The values of COD showed that 20% of the water samples in pre-monsoon and monsoon seasons and 23% in post-monsoon season and have crossed the safe limit of drinking water standards (10 mg/L, BIS). The type of percolation of the water and the dissolved organic matter had contributing the COD and this can be attributed to the rainfall and the type of the geological features.

6) The values of Total hardness showed that 45% of water samples in pre-monsoon season, 40% in monsoon season and 52% in post-monsoon season and crossed the excess permissible limit of drinking water standards (600 mg/L, BIS). More than 75% of the water samples belonged to very hard category (>300 mg/L) and the remaining to the hard category. It has significant positive correlation with calcium, chlorides and sulphates. Along with the total hardness, the calcium and magnesium concentration were exceeded in 22% and 12% of total samples in pre-monsoon season, 20% and 10% in monsoon season and 32% and 25% in post-monsoon season respectively.

7) The observed values of chloride ion concentration has shown an increased trend during monsoon season when compared to post-monsoon and pre-monsoon seasons. This is due to the fact that the dissolution of chloride contents in the soil by percolation. However, chlorides concentrations are well within the safe limit of drinking water standards.
8) In the study sites, the values of sodium and potassium were well within the excess permissible limits for drinking water standards (BIS). Similarly, phosphate and sulphate concentrations were found within the permissible limits.

9) In the present study, the mean values of alkalinity in pre-monsoon, monsoon and post-monsoon seasons showed 290.76mg/L, 272.98mg/L and 335.54mg/L respectively. The observed values of alkalinity showed an increased trend during post-monsoon season compared to pre-monsoon and monsoon seasons. The fluoride concentration was exceeded in more than 50% of the water samples in all the three seasons.

10) In the present study, the mean values of nitrate concentration showed 40.84 mg/L in pre-monsoon season, 47.46 mg/L in monsoon season and 41.72 mg/L in post-monsoon season. The observed values of nitrate showed an increasing trend in monsoon season compared to pre-monsoon and post-monsoon season. This may be due to seepage of domestic water, agricultural run-off and septic effluents during rainy season.

11) The values of MPN were present in samples number 5,14,19,20,21,28,37,40,43,47 and 48. E-coli was found only in few samples number 5,14,17,19,20,21,28,37,40,47 and 48. In other sites the E-coli were absent. Hence with reference to the E-coli number, the sample which does not possess them is preferable for the drinking purposes.

12) In the present findings, the BOD values varied from a minimum of 1.1 mg/L to a maximum of 4.1 mg/L with a mean value 2.199 mg/L in pre-monsoon season. During monsoon season, it ranged between 0.9 mg/L and 3.8 mg/L with a mean
value 2.122 mg/L and in post-monsoon season, it ranged between 1.3 mg/L and 4.5 mg/L with a mean value 2.426 mg/L.

**Trace metal distribution:**

In the present investigation, the values of trace metals such as iron, zinc, copper, lead and chromium are well within the permissible limits prescribed by the BIS standards. However, the concentrations of cadmium, arsenic and nickel in the ground water samples of the study area were found to be below detectable level.

**Significance of Results:**

- The results of major physico-chemical parameters of the three seasons exhibited an increasing trend during post-monsoon season compared to monsoon and pre-monsoon seasons. This is due to the dissolution of minerals and salts in soils during the discharge of ground water through precipitation i.e the increase of ground water table in post-monsoon season dissolves more minerals and salts from the soils.

- The observed TDS values exhibited an increasing trend during post-monsoon season compared to that of pre-monsoon and monsoon seasons. This is due to the dissolution of more quantity of constituents of soil particles as ground table increase during post-monsoon season.

- The observed dissolved oxygen values have indicated decrease in concentration during post-monsoon season compared to monsoon and pre-monsoon season. This is due to the fact that during post monsoon season, the dissolution of minerals and salts of soil increases by utilizing dissolved oxygen and rising of ground water table.
• The present investigation revealed that, in more than 50% water samples, the fluoride concentration is higher than the prescribed standards of BIS for drinking water. This is due to the geological strata of these regions associated with schist belt and igneous rocks such as granites.

• The observed values of total harness revealed that 75% of water samples belong to very hard category.

• The recorded values of calcium revealed that, in 14-18 sampling locations, the values are more than the prescribed standards of BIS for drinking purposes.

• In the present investigation, eleven sampling stations are contaminated. With E.coli in all the three seasons.

• The study has revealed that 75% of water samples are non potable by one parameter or the other. Only 25% of water samples are potable as per the limits fixed by the Bureau of Indian Standards.
CONCLUSION:

In the present investigation, a sincere attempt has been made to evaluate the concentration of major physico-chemical parameters, biological parameters and also trace metals in the ground water of Jagalur taluk. The following are the conclusions drawn from the investigation.

Increasing in population, intense agricultural activities and irrigation drainages in rural parts are the major threats for ground water pollution in the study area.

- In the study area, intense agricultural activities, indiscriminate application of chemical fertilizers and the lack of scientific knowledge of the people are found to be other category of sources for contamination of aquifer systems.

- A seasonal variation has been observed for most of the physico-chemical and biological parameters analysed. This is probably due to increase in ground water table in monsoon and post-monsoon seasons as compared to pre-monsoon season.

- The findings of the present study with regard to the nutrients and trace metal concentrations in most of the sampling sites have been influenced by anthropogenic activities in polluting the overlaying environment.

- High level fluorides concentration has been noticed in most of the sampling stations of Jagalur taluk. This is due to the geological strata of the study area.

- It is evident from the investigation made that there is also a correlation between the geology of the study area with the physico-chemical parameters analysed.

- In the study area, due to the lack of sanitation which leads to the deterioration to the quality of ground water. Polluted water plays a key role in the direct transmission of various diseases. The Jagalur town and the villages of Jagalur taluk facing lack of hygiene at the surroundings of bore wells. In general, poverty, illiteracy and lack of awareness influence the quality of water.