CHAPTER IV
CONCLUSION AND RECOMMENDATION

During the field visits in the selected study villages for water sampling, it was observed that most of the households didn't offer any treatment to supplied drinking water. Few people were using cotton cloth as filter, and few rarely used alum. The treatment was given specially during monsoon season when turbidity levels were high, and where the source was tap water. It was also seen that the people used to store the supplied drinking water in different kinds of many smaller containers made of steel, plastic, aluminium, copper or brass in the form traditional 'ghagars', or vessels. The contamination of household water was possible through handling of these storage vessels, when proper hygienic conditions are not maintained. It was also noticed that the concerned people, in the Gram Panchayat in the villages, engaged in supply of drinking water did not have proper idea about the dosage of bleaching powder and chlorination treatment to be given in the village water storage tank, and this treatment was often arbitrary or at times inadequate.

It was noted in the water sample analysis from the study area that few changes in parameter values took place during pre and post monsoon seasons in both the years. Few villages showed rise in Turbidity, TS and TSS and microbial parameters like SPC, MPN and Fecal coliforms in post monsoon season as compared to pre monsoon season. This may be due to soil erosion and contribution of suspended solids from sewage and solid waste through surface runoff from the catchment area of the source of drinking water.

It was observed that the average pH in the study area was 7.2 with very little fluctuations in value during the study period and all the water samples showed pH within WHO limit. The Temperature values did not fluctuate much and apparently had no correlation with values of other parameters. Since the drinking water was stored in the containers made of different materials and the temperature of drinking water sample reflected ambient air temperature in the surrounding, which again might depend upon the storage space and type of construction of the kitchen. Depending on the factors like

type of container, volume of water stored, storage place, etc. It was observed that the average temperature of the samples was around 25.2 °C.

Turbidity is a measure of the cloudiness of water and to be used as measure of the intensity of pollution. Surface runoffs and domestic waste discharge mainly contribute to the increase in turbidity and can interfere with disinfection process and provide a medium for microbial growth. The Turbidity values from all the sites fluctuated between 4.3 -15.8 NTU with an average of 9.4 NTU. The water sample from Nagdevwadi showed minimum value i.e. 4.3 NTU, while Ambewadi water sample showed maximum Turbidity i.e. I.e.15.8 NTU. The turbidity changes were more in Post monsoon season at Ambewadi, due to rise in total solids in river water after rainy season, which is the prime source of drinking water to Ambewadi village. All the samples, except from Nagdevwadi village, showed turbidity values higher than the permissible value of 5 NTU as per WHO guidelines for drinking water. This makes the water from remaining five villages unfit for drinking on account of Turbidity parameter.

It was also observed that among all the sites, maximum value of Total Solids (TS) i.e. 367.9 was observed in Shiroli village and minimum value of TS i.e. 152.8 was observed in Nagdevwadi village. However, all the TS values from the study villages were much lower than the WHO permissible level. The maximum Total Dissolved Solids (TDS) value 170.5 mg/lit was recorded in Sarnobatwadi village and minimum of 71.9 mg/lit was from Tamgao village. In case of Total Suspended Solids (TSS) maximum value of 253.1 mg/lit was reported from Shiroli village and minimum of 74.1 mg/lit from Nagdevwadi village. All the values of TS and TDS from the study area were within the WHO standards. However, in case of Total Suspended Solids (TSS) there is no specific WHO guideline or IS 10500 standard for its presence as upper limit in drinking water.

Generally estimation of hardness is important for ground water, which is normally harder than surface water. The hardness value of water from Kandalgao village i.e. 377.9 mg/lit was maximum while the minimum value of 29 mg/lit was seen for Shiroli village. Since both the samples collected from Kandalgao households were from Well

water while the samples in Shiroli were from Tap water and Bore water sources, obviously Kandalgao village water samples showed maximum hardness. However, the water analysis showed that all these drinking water samples i.e. between 377.9 mg/lit. - 29 mg/lit were within WHO permissible limit (500 mg/lit). Average Chlorides value in the study area was 48.8 mg/lit. with highest Chloride concentration in Sarnobatwadi village i.e.104.6 mg/lit. and the minimum of 21 mg/lit. in Nagdevwadi village.

WHO guidelines and the Food Act, 1983 do not state the limit of total viable count i.e. Standard Plate Count (SPC) for drinking water. Therefore, for the study purpose the European Union (EU) criteria was used to make comparison of SPC values, in which EC/EU does not allow more than 10 cfu/ ml in potable drinking water. In Nagdevwadi village sample a minimum SPC of 95.8 cfu/ml was observed while the maximum value of 695 cfu/ml was reported in Sarnobatwadi village sample. The average SPC count for the study area was 407.4 cfu/ml, and all the values reported from the study area were much higher than EU standard for potable water.

The presence of coliforms in drinking water in the study area showed that water had come in contact with any of the materials like human faeces, soil or litter and ppositive presence of coliforms in treated water indicates treatment ineffectiveness. All the water samples analysed during the study were with variable counts, and all being positive with respect to the coliform occurrence well above the permissible limits of WHO standards for drinking water quality. It was revealed from the study that the maximum MPN value and Fecal coliform value among the six villages was 337.4 /100 ml and 134/100ml respectively in Shiroli village. While minimum of 58/100 ml MPN and 25/100 ml Fecal coliform value was from Ambewadi village. It is interesting to note that Ambewadi village is up stream and Shiroli village downstream of Kolhapur city along Panchganga River, where Kolhapur is main culprit of dumping untreated sewage into the river. Various other causes of bacteriological contamination in the study area are old and rusted water mains, lying of water supply pipes close to sewer lines, intermittent water supply system, seepage of sewage through soil and inadequate storm drainage in the study area.

It is concluded on the basis of this study that the four major parameters, among all the 15 studied for drinking water quality, namely Turbidity and three Microbial parameters like SPC, MPN and Fecal Coliforms should be taken into considerations as they were above the WHO limits. There was positive correlation among these parameters. Similar positive correlation was also seen between Turbidity and TSS, Turbidity and SPC, Turbidity and MPN, TS and SPC, TS and TSS and MPN and fecal coliform.

RECOMMENDATION

The recommendations are based on the field observations, results of the laboratory analysis of water samples, and social survey in the representative villages on the outskirts of Kolhapur city, which is being expanded in the near future. It is hoped that the quality of drinking water in the area would improve significantly when the results of the study are considered and implemented by the concerned authorities.

1. The SPC, MPN and Fecal coliform values of the study samples were much above the prescribed drinking water quality limits of WHO and EU.

2. There is urgent need of proper chlorination process to be followed in the village main water supply reservoir, wherever exists, which needs to be regularly monitored to avoid ad hoc dosage of chlorine. The chlorination should be done by a trained and knowledgeable person before drinking water distribution in the village.

3. There must be periodic strict drinking water quality monitoring by professional staff in all villages, as the current practice of testing water by the kit provided to village Gram Panchayats is not effective or functional in some cases.

4. Since water contamination increases, especially during monsoon season, and leads to spread of water borne diseases. The Gram Panchayats should take extra care during supply of treated drinking water, or the villagers should carry out some appropriate water purification methods at household level.

5. Turbidity is one of the major problems in the study area which is responsible for rise in number of microorganisms. At least some basic techniques like cloth filtration, and use of alum for filtration and sedimentation respectively to be practiced at household level throughout the year. This would provide basic protection and reduce this problem.