MICROBIOLOGICAL STUDY

The accelerated industrialization, urbanization and the consequential population boom has ever put under strain on the water and other natural resources. The resulting growth has greater impact on the water demand for various uses in industrial as well as domestic purpose. Fulfillment of the need of clean and sufficient water is a great concern today. Management of water pollution problems need not to be emphasized. There are severe water pollution problems in industrial areas due to continue and uncontrolled discharge of effluents, industrial, domestic and other activities; thereby contaminating the adjoining water bodies, ground water, rivers etc.

Industrialization and man’s activities have partially or totally turned our environment in to dumping sites for waste materials, as a result many water resources have been rendered unwholesome and hazardous to man and other living systems (Bakare et al, 2003). The toxic substances discharged into water bodies are not only entering through the food chain (Odiete, 1999), but may also exceeds its limit and produce impact on populations of microorganisms (Okafor, 1985).

Water supports life on earth and the entire fabric of life. The requirement of water in all lives, from microorganism to man, is a serious because all water resources have been reached to a point of crisis due to unplanned urbanization and industrialization (Singh et al., 2002). Generally speaking, water pollution is a state of deviation from pure condition, whereby its normal functioning and properties are affected. Aggravated environmental problems often reflect the misuse or misunderstanding of technology (Petak, 1980).

Good quality of drinking water is of basic need of to human being and existence of any animal very much depends on its availability (Lamikanra, 1999; FAO 1997). The provision of potable water to rural and urban population is basic necessity to prevent health hazards (Nikoladze and Akastal, 1989; Lemo, 2002). Before water can be described as potable, it has to comply with certain physical, chemical and microbiological standards, which are designed to ensure the water is
safe for drinking (Tebutt, 1983). Potable water is defined as water that is free from
diseases producing microorganisms and chemical substances deleterious to health
(Ihekoronye and Ngoddy, 1985). Water can be obtained from a number of sources,
among which streams, lakes, rivers, ponds, rain, springs and wells are involved (;
Kolade, 1982). Unfortunately, clean, pure and safe water only exists briefly in
nature and immediately pollutes by prevailing environmental factors and human
activities. Water from most sources is therefore unfit for immediate consumption
without some sort of treatment (Raymond, 1992).

Water is required for all the living beings, without which neither the life nor
any development is possible. The daily demand of drinking water of a man is
normally 7% of his body weight. Thus it is a vital for a healthy growth but may get
contaminated with harmful or toxic substances and pathogenic microbes’ couple
with poor sanitation (Gupta and Gupta, 1997).

The most important source of drinking water about 70% of Indian
population is groundwater and is considered to be less polluted. But, lack in of
sanitation, improper waste and surface water management, 40% or more of the
disease outbreaks are attributed to polluted groundwater consumption (Narain Rai
and Sharma, 1995). Water used for agriculture and recreational purposes are
monitored microbiologically using bacterial indicator systems (Godfree et al.,
1997).

The alarming situation of today’s world is pollution and potable water. With
active urbanization, water quality and safety has become a major concern of the
public water management systems of the cities in the developing nations. Bacterial
contamination of aquatic system also results into a store homes entry and
dissemination of spate of microorganisms in water which are responsible for many
diseases. The ever expanding industrialization, urbanization and developmental
activities and consequent pollution of water resulted into water crisis. Pollution
and contamination of water resulted into water crisis, dissemination of harmful
microbes responsible for diseases like typhoid, cholera, filariasis (Stainer et al.,
Microbial flora of the aquatic environment changes the properties and quality of water. Although aquatic microbes degrade and stabilize organic matter but still they leave many chemicals undegraded. These degraded materials pose serious hazards to aquatic environment. Most of the water bodies like rivers and lakes receive a large quantity of domestic waste, industrial waste and chemical substances (Sharma et al., 1981). City wastes and effluents play a dominant role in deteriorating the water quality (Tarzwell and Gauffin, 1953; Mittal and Sengar, 1991). Organic pollution influences the type of aquatic community present in streams. Organic pollution presents a threat to the survival of aquatic lifer in streams (Hynes, 1960).

Micro organisms are considered to be biological monitors and can act as indicators in selected situations (Moore, 1960). Bacteria, specifically, E.coli or faecal Streptococci, are well known indicators of sewage pollution in drinking and bathing water, and have been widely used as tool in different ways. Most Probable Number (MPN) of coliform organisms present in 100ml of sample is an accepted test for examination of water. It is because presence of coliform in water is always an indication of faecal pollution (Geldreich and Clark, 1972).

The coliform group of bacteria includes a number of different organisms from Enterobacteria. The coliform group is constituted of all aerobic and facultative anaerobic, gram negative, non spore forming, rod shaped species which ferment lactose with the production of acid and gas within 48hrs at 37°c. The important members found in polluted waters are Escherichia coli, E. freundii and Enterobacter aerogens. While some coliform (E-coli) have also been designated as typical or non faecal (E.aerogene) as they are also normal inhabitants of soil and vegetation (Salle, 1974). The total coliforms should not be considered as specific indicator of faecal pollution, and faecal coliform should be used to support it. The faecal coliforms are reported to be only reliable indicators of faecal pollution (Clerk and Kebler, 1964; Dufour, 1977). Effluent from distillery and dairy plants contain a
high concentration of potentially toxic wastes rich in phosphate, ammonical nitrogen which support growth of algae, yeast and cyanobacteria.

The occurrence of these microbes in the effluent leads to excess oxygen demand loading and also disturb the ecological equilibria of the receiving waters with much loss of aquatic life and intense pollution menace. It has both health and economic consequences.

Physicochemical quality of water represents regulated the microbial growth. The elevated turbidities are often associated with the possibility of microbiological contamination, as high turbidity makes it difficult to disinfect water properly. (Van Loon, 1982; Quality of domestic water Supplies, 1998). Coli forms are the major microbial indicator monitoring water quality (Brenner et al., 1993 and Grant, 1997). Colifroms bacteria are a natural part of the microbiology of the intestinal tract of warm-blooded mammals including man can be found in their wastes.

The bacteriological examination of water has a special significance in pollution studies, as it is a direct measurement of deleterious effect of pollution on human health, for assessment of water quality. It is not only the physico-chemical characteristics of water but also obtain formation on whether conform to prescribed standard of microbiological water quality.

The effluent discharged from distillery and dairy industry, contains organic and inorganic compounds, moreover the effluent contain organic and inorganic residual nutrients, which provide ample opportunity to flourish a variety of pathogenic micro-organisms. The extent of bacteriological change due to mixing of industrial effluent in water is not known. In many developing countries, availability of water has become a critical and urgent problem and it is a matter of great concern communities depending on non-public water supply system. Conformation with microbiological standard is of special interest because of the capacity of water to spread diseases within a large population, although the standards vary from place to place. The objective anywhere is to reduce the possibility of spreading water borne diseases, pleasant to drink, which implies that it must be wholesome and
palatable in all respects (Edema et al., 2001). A good knowledge of the chemical qualities of raw water is necessary so as to guide its suitability for use. This work is therefore, in an attempt to examine the distillery effluent sample and dairy effluent sample and other two contaminated ground water sample ie. Well water and borewell water samples from nearby areas where industrial and domestic waste water was discharged, to assess the seasonal bacteriological variables.
RESULTS

Microbiological analysis were summarizes in Table No.15 and Table No. 16 in which MPN values from distillery effluent sample at site (S1) Dairy industrial effluent sample at site (S2) and well water sample at site (S3) and Borewell water sample at site (S4) were enumerated by standard methods, which is presumptive evidence of the presence of coliform bacteria in the samples. The MPN index per 100ml for the water sample collected seasonally during the year 2004-05 and 2005-06.

1. Distillery effluent (S1)

At the site (S1) total coliform count was found maximum in monsoon and minimum in winter and summer during the year 2004-05 and 2005-06 shown in Table No.15 and 16

2. Dairy effluent (S2)

At the site (S2) coliform count was found maximum in the monsoon winter and summer season during the year 2004-05 and 2005-06, shown in Table No. 15 and 16.

3. Well water (S3)

At the site (S3) coliform count was found maximum in the monsoon and minimum in winter and summer, during the year 2004-05 and 2005-06 shown in Table No.15 and 16.

4. Bore well water (S4)

At the site (S4) coliform count was found maximum in the monsoon and minimum in winter and summer season, shown in during the year 2004-05 and 2005-06 shown in Table No.15 and 16.
DISCUSSION

When water supplies contain coliform bacteria at the levels greater than one per 100ml of water, the water contains pathogens that cause acute intestinal illness. While generally considered a discomfort to health these infections may be fatal in infants, the elderly and those who are sick (Olowe, et al., 2005).

The discharge of polluted water from factories would cause a physical, chemical and biological deterioration of recipient water surfaces.

To detect the degree of fecal contamination in industrial effluent and ground water, it is important to determine the coliform type predomination in the sample. Generally \textit{E. coli} is regarded as a typical fecal strain indicating fecal or domestic contamination whereas \textit{E. aerogenes} as the typical non-fecal strain usually indicate more widespread contamination of food products by soil, water, dust and air borne contamination (DiLiello, 1982).

The presence of \textit{coliforms} groups in this water samples generally suggest that a certain section of water might be contaminated with faeces either of human or animal origin. Other more dangerous microorganisms could be present (Richman, 1997), due to discharge of sewage waste in the nearby river the well and borewell water also contaminated by faecal matter.

Jai Prakash et al., (2007) studied the bacteriological status of drinking water with reference to \textit{Escherichia coli} in and around Chikmaglur area, Karnataika. They stated that the \textit{E. coli} bacteria are varied 1 to 2 numbers per 100ml of water sample in bore well and open well samples respectively. Similar results observed by Ghosh \textit{et al.}, (1889), Folkmare and Kulkarni (1990).Gastric distribution of bacteria exhibited maximum availability of \textit{E. coli} in open well water and minimum of it in bore well water. The survival of \textit{E. coli} in samples indicated the chance of pathogenicity and causing diarrhea in the community (Shah and Patil 1989 and Pharande \textit{et al.;} 1989). All well water samples collected from indifferent locations found contained \textit{E.coli} exceeding the water quality standards i.e. 1/100ml for safe drinking water act (George and Schroeder, 1985, depicting the pollution of
open well water, However occurrence of *E. coli* in 20% in bore well and 100% in open well water samples highlighting more severe environmental problems in the region through faecal contamination and human anthropogenic activities.

Ram Chandra *et al.*, (2006) studied the growth of many pathogenic and non pathogenic bacteria of health hazards with contamination of pulp paper waste in aquatic ecosystem within the vicinity of pulp and paper mill industry. They stated that coliform bacteria shows irregular pattern of their occurrence in different sample. The highest coliform was noted in monsoon season. These indicate the mixing of some domestic sewerage during the overflow or run off water in monsoon time. The irregular variations in the coliform bacteria due to seasonal changes also support the findings of (Legendre *et al.*, 1984 Barcina 1986 and Ramanibai, 1996). High BOD and COD in any effluent do not much support for bacterial growth but after mixing in water support the bacterial growth due to addition of organic compounds in appropriate concentration.

Okonke *et al.*, (2008) studied the samples of tap, well; stream and waste waters were collected from Abeokuta and Ojota (both in Nigeria state) and analyzed microbiologically and physico-chemically using standard methods. They stated that the most probable number (MPN) for the presumptive total coliform count of the water samples ranges from 16 to 44 MPN/100ml to 39MPN/100ml.owing the total coliform count of untreated water samples were grossly contaminated.

In the present study, the Most Probable Number (MPN) for the presumptive test for total coliform count of distillery effluent sample (S1) ranges to 120 to 225 MPN/100ml throughout study due to organic matter present in the effluent.

In Dairy effluent sample at the site (S2) Most Probable Number for the presumptive test for total coliform ranges to 120 to 275 MPN/100ml due to high content of organic load.
The well water samples (S3) ranges from 120 to 550MPN/100ml it indicates that from well water has maximum total coliform counts Owing that, the total coliform count found grossly contaminated. Well water is open to various uses and gross contamination from river sukhana which is contaminated through discharge of industrial effluent from nearby industries and sewage waste from residing villages, which result from the presence of high levels of organic waste matter.

Borewell water sample (S4) having 75 to 175MPN/100ml, Owing that, the total coliform count found grossly contaminated. Borewell water is open to various uses and contamination through Sukhana River which is contaminated by sewage waste and industrial discharge, which result from the presence of high levels of organic waste matter. The recommended standard for water is less than 2MPN/100ml (FAO, 1997).

Verma and Dixit (2006) were found total coliform (MPN) the ranges of 1800-3000 per 100ml at the surface and 1800-3500per 100ml at the bottom layer from the lake water.

Al-Sa’ed (2007) studied that the potential pathogen in raw, treated and reclaimed wastewater at Albierch urban wastewater treatment and observed that, faecal coliform bacteria were detected in numbers similar to those for sanitary wastewater (Bitton 1993 and Feachem et al., 1983). Fecal coliform were the most numerous of the indicator bacteria and their removal was 25% an average, the same range as fecal streptococci(29%) while E. coli removal was slightly lower (12%).

During the present investigation distillery effluent sample site (S1), dairy effluent sample site (S2), well water sample site (S3) and borewell water sample site (S4) assessed for MPN, presumptive test was found positive. From the above respective sites well water sample at site (S3)and borewell water sample at site (S4)was contaminated by industrial and sewage water discharge. Due to contamination of waste water into the well and borewell water it’s not used for potable purpose, but the residing nearby people used this water for domestic
purpose. Beside that water should meet different quality specifications depending on the particular uses, thus potable and domestic water should be harmless for the health of man and should have proper organoleptic properties and should be suitable for domestic use. Present study, put forth that an idea of possible number of coliform organisms present by means of the MPN.