Shallow groundwater Monitoring

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THE DAILY INCREASING rural migration in developing countries such as Nigeria, goes with the high rate of population growth in the urban areas. This gives rise to environmental degradation resulting from uncontrolled release of wastes into the environment. Pollution of water sources is one of the consequences of poorly planned waste disposal system. Bacteriological analyses of hand dug well water were carried out in Mando and Kawo areas of Kaduna metropolis during rainy and dry seasons, from 1998 to 2002. The indicator organisms analysed for were faecal coliforms and faecal streptococcus. Membrane filter technique was used and Eosin Methylene Blue (EMB) agar was the culture medium used. There was increase in the bacterial counts from dry to rainy season in th five years of study. The environmental conditions at the well sites, activities of the inhabitants that affect the water quality and possible control measures were highlighted in this study.

Introduction

The rapid urban population growth in the study area – Kawo and Mando has given rise to serious deterioration of the sanitary condition of the environment aggravated by improper town planning and improper waste management and disposal in the area. The need for this study arose from a World Health Organization's (WHO) report, stating that about 4.2 million children under the age of five die each year in developing countries from diarrahoal diseases, largely as a result of poor sanitation and contaminated drinking water. The report went further to say that infectious diseases linked to water are the third leading causes of productive years lost to morbidity and mortality in developing countries (Carl B et al 1994).

Ground water can be considered one of our "hidden" and priceless resources (USEPA 1990). It is a fragile resource. It's purity and availability are often taken for granted. But the fact is, ground water can be exposed to many hazards. Improperly handled chemicals and wastes can trickle down and harm ground water.

Ground water often moves only a few feet per year, so pollutants that get into it are not quickly flushed out or diluted. Pollution of ground water may not be noticed until it reaches a well and by this time it may have been widely spread. Once ground water becomes polluted it is difficult and costly to clean and in some cases, cleaning may be impossible (C.G.W.M. 1990).

A faecally polluted water source is known to contain an array of pathogenic microorganisms such as bacteria, viruses, cysts of protozoans and helminth eggs. Feachem (1982) stated that bacteria can cover up to 30m in sand and fine soils and up to several hundred meters in gravel and fractured rocks; and despite their tendency to become adsorbed onto soil particles, viruises may travel through soil for longer distances than bacteria. Karant (1993) indicated that coliforms in humans and other warm blooded animals are transmitted through faecal matter. Unless they leave their natural habitat, the coliforms are harmless. Their presence in water indicates the possibility of the presence of pathogenic microorganisms.

Until 1970s, ground water was believed to be naturally protected from contamination. Between 1971 and 1985, 245 ground water related disease outbreaks, with 5,281 associated illnesses were reported in the United States of America. About 10% of all ground water, public wa.ter supply systems are in violation of drinking water standards for biological contamination. In addition, approximately 74 pesticides, a number of which are known carcinogens, have been detected in the ground water of thirty eight (38) States (EPA 1990). In a study by Andrew (2000) covering the low income area of Angwa Rimi, Kaduna, it was revealed that 80% of the samples analysed did not conform with the WHO Standards. The major sources of contamination were attributed to the existence of pit latrines, stragnant dirty water in gutters and heaps of refuse. 90% of the houses investigated have wells 5-15m away from pit latrines, either in the house or in the neighbourhood.

Methodology

Membrane filter technique was used in this study, with Eosin Methylene Blue (EMB) agar as the medium of growth for the coliforms. Temperature of 37 °C and incubation period of 18-24 hours were used.

The average of the coliform counts in the five years of study in the locations were plotted as shown in figs. 1 & 2.

Interpretation of results

As can be seen from figures 1 and 2, the bacterial counts were generally higher in the rainy seasons. About 50% of the average coliform counts in Kawo did not conform with WHO standard during the rainy seasons. About 8% were within the acceptable limit during the dry season. In Mando area about 46% fell outside, the acceptable limit in the rainy season. In the dry season all fell within the acceptable limit.

The highest count average in Kwada well in Kawo area must be due to the continuous contamination of the well with the faecal matter from the abattoir in operations. The high average counts in some areas like JK01, AB2 and G2 in Kawo and FG 9 and LBS2 in Mando, in the rainy season must be due to wash-ups from the refuse dumps by the rain water, infilterating the ground along with the contaminants. During the rainy season the water table in both the wells and pit latrines rise. There is infilteration of water from the put latrines into the wells.

In the two areas, some places have very low average counts like in Nasarawa in fig. 1, FG1, NJ1, NJ5, LBS4 and LBS6 in fig 2, most probably due to improved sanitation and lower population densities in comparison with the areas.

Conclusion and recommendations

Solution to problem of water related diseases lies in the provision of potable water and improved sanitation. To be sure of portable water, the contamination of water can be prevented at the source and between collection and use. Water from a good source like groundwater, may become unsafe at any point between collection and use. The first possible point of contamination may be the source and immediate surrounding.

The sources of groundwater contamination in Kawo and Mando are mainly from human activities and well location. As the two areas are not properly planned in terms of building arrangement and refuse disposal and management, most of the areas have the pit latrines/soakaways located less than 30m from the wells and the refuse are dumped indiscriminately.

The following recommendations would go a long way in preventing disease outbreaks especially during the rainy season.

(a) Proper hygiene education should be organized fro the dwellers from time to time, on the need for using clean drawing vessels, building well heads, cementing the surrounding to avoid water logging around the wells, repairing cracks in the wells. There is need for washing, bathing etc. to be done some distance away from the wells and the wells should be closed when not in use.

(b) Pit latrine/soakaways should be at least 30m away from the wells.

(c) Water Agencies should create a monitoring scheme for wells.

(d) There should be a routine house to house inspection of sanitary condition and the inhabitants should be provided with refuse collecting centers that should be serviced regularly.

Portable water is as important as water itself is essential for life.

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