CHAPTER-1

INTRODUCTION

1.1 General :-

The ground water is an integral part of environment and there has been lack of adequate attention to the health hazard in the areas where ground water is at shallow depth with special reference to northern alluvial plains of India and applicable to similar other geological setups worldwide. The major concentration of the present research work pertains to health hazard of inhabitants in the vast area considered in this research work, due to contamination by bacterial seepage and harmful chemicals from surface water, drains, septic tanks & soak-pits into the shallow ground water level, resulting in the spread of water borne diseases and high mortality rate.

Water from a properly located and constructed well should not contain coliform bacteria. If present then it indicates transportation from surface source. The other non- bacterial contaminants could be present in the water supply. The diagram (Figure 1.1 and 1.2) depicts possible inflow of coliform bacteria in a pumping system, polluting the naturally existing bacteria free aquifer.

Therefore the theme of this research work pertains to health hazard of inhabitants in a vast area due to contamination of water by bacterial seepage (including harmful chemicals and minerals) from surface ponds, drains, septic tanks and soak-pits into the shallow ground water aquifer. The seepage of pathogen results in to water borne diseases and thus cause a high mortality rate,
particularly among children. The human excreta contains entero virus that causes viral encephalitis among 45% children in eastern parts of northern Indian alluvial plains [13].

Figure 1.1  Assembly of Hand Pump
The report from these areas indicates, as of now, 6-7% cases of Japanese Encephalitis, which is vaccine preventive and about 45% among the patients who have suffered from entero-viral encephalitis, and about 2% reported cases have a non-viral cause, such as malaria & tuberculosis [13]. These areas are in particular the Tarai-Region’ of Himalayan foothill alluvial plains. The actual cause of the epidemic in the area is still unknown but there are indications that it may be water borne disease. The groundwater is otherwise naturally safe and free from bacterial infection. The water is being drawn in the area from shallow depths below 10 to 30 feet (about 3.0 to 10 meters) by a
cheap cast iron made hand pump which is not only cheap, but is easy to install at any place in the region, as the water table is at 10-15 feet depth. This strata is assumed to be free from bacterial infection due to the permeability barrier of soil. In the natural process the flow of sub-surface contaminants to ground water table is not possible unless an un-natural conduit or passage is available, either due to some natural phenomenon or any man made device, like the pipe connecting strainer to surface of a hand pump or casing of a tube well (Annexure Figure 1.1.1 to 1.1.9).

Through this work, pathogenic contamination of ground water have been confirmed and a protective device have been designed to conceal the leakage in the borehole for isolating the surface flow of contaminated water to the aquifer.

The most commonly known water related diseases from a surface source are Cholera, Hepatitis, Round worm infection, Hook worm infection, Trachoma, Guinea worm, Schistosomiasis, Leishmaniasis, Limphatic Filariasis, Florosis, Blue babies, and probably the latest reported cases of encephalitis.

1.2 Importance of the Present Work:-

The aim of investigation is to search possible occurrence of pathogens causing infection in potable ground water (at shallow depths), which may be one of the source of the general viral and epidemic diseases in the flood zones of alluvial planes of north Himalayan foothills of India.

The availability of pure drinking water is a societal issue for health and prosperity. Much attention has been given to environment protection, of which ground water is also one of the component but it is generally neglected. The emphasis has been given in this research to amend existing “pollution Control Acts’ and its strict implementation to ‘Ground Water’ exploration. At present
the ground water is out of the purview of environment related laws in most of the nations.

The importance of the present work is that, no previous research has been carried out earlier regarding ground water pollution due to pathogens from surface drains of a vast area of investigation and in the similar geological setup globally.

1.3 Scope of the Problem:-

This research work also includes the study of pathogen’s growth in drain water which is being transported to underground strata and thus may further pollute the ground water reserves. There is further scope for doing research in this field by developing alternative and improved designs of shallow and deep bore-well installations of ‘Hand Pumps’ and ‘Tube Wells’.

The present investigation includes a concept of pathogenic pollution of ground water in Tarai Region from North to North-East India, which is other than the known pollutants like fluoride, arsenic and other harmful chemicals in the aquifer zones.

The scope of this research work may be summarized as under;

a) The work may be useful to bore-well planners and designers to protect leakage and connectivity of polluted surface strata to aquifer.

b) This is a pioneer research work that may further lead to researches in the area, prone to epidemic and infectious water borne diseases possibly due to seepage of surface pollutants in the first strata of ground water and to check the ingress of pollutants into the water body by providing protective casing pipe and its sealing techniques to tap the potable water.

1.4 Present Status of Unhygienic Drinking Water as Published in the Newspapers and Magazines :-

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“The pumping diseases for decades”. Pumping underground water from shallow depths of 10 ft. using common cast iron hand pumps have been reported by Shailvee Sharda to be responsible for the spread of viral diseases. (Times of India Oct.18, 2011).

The vicious circle of the common encephalitis, which has become synonymous with death in the eastern part of Uttar Pradesh (India), begins with a hand pump, locally known as Kichwa. This hand pump is the main source of water borne disease in the region. “Prof. KP Kushwaha,[13], head of paediatric department, B.R.D. Medical College, Gorakhpur, which bears the maximum burden of disease in U.P. These cast iron pumps sucks underground water from a depth of just 10 feet unlike the India Mark-II hand pumps that need 20-50 meter deep boring. This is mainly because the ground level in the region is 10-15 feet deep. But, while the high groundwater levels ensure easily availability of water, they are also prone to contamination. “Open defecation and unhygienic practices leads to seepage of faeces and urine in the earth, which mixes with the ground water. The phenomenon becomes rampant during rainy season, when ground water levels rises up further,” as stated by Mr. K. Ravindra Naik, commissioner, Gorakhpur division, who has sent a proposal worth Rs. 276 crore to the union ministry of rural development to replace kichwa-pumps with India Mark-II model hand pumps. A separate proposal for a dedicated total sanitation campaign exercise in the region has also been sent. But the state government has to forward and pursue these proposals seriously. Local administration imposed a ban on use of kichwa-pumps and several FIRs were also lodged under section 304-A of the Indian Penal Code (Culpable homicide not amounting to murder) to instill fear among the
residents against the use of the hand pump. But the idea did not work out on a large scale because of poor understanding of the preventive aspect of health due to low literacy rate.

The status of mortality is many people fall prey to the diseases. Particularly the children, among them more males than females, are susceptible to entero-viral diseases. Recovery from such diseases is inversely proportional to age,” said Dr. P.K. Gupta, president of Lucknow Association of Practicing Pathologists and Microbiologists. Since the cause of disease is well known, checking its spread and saving at least half the children is possible. “Social interventions and initiative from the local authorities is a prerequisite,” said Dr. RN Singh, who has been working to create awareness against encephalitis for the last 25 years. Every year funds worth crores are sanctioned to the state governments to ensure supply of safe drinking water and improve sanitation. But, instead of sitting over the grants and sending the unutilized budget, time has come to brainstorm and use the money in public interest.

The Times of India, Lucknow, [106], May 22, 2012: U.P. clears Projects worth Rs.600 Crore for J.E.(Japanese Encephalitis):

Title: “CHECKING THE FATAL MENANCE”

(Two Dreaded Diseases Have Claimed Lives Of More Than 5,000 Kids Besides Affecting 22,000 Persons In Seven Years).

The U.P. Government on Monday cleared projects worth Rs.602 crore to check the dreaded Japanese Encephalitis which has claimed more than 5,000 lives in the past seven years. An inter-departmental committee
headed by chief secretary Jawed Usmani finalized the projects for twenty affected districts of the state. Except for the project worth Rs. 23 crore regarding construction of 10-bedded pediatric intensive care unit in ten worst-hit district, all other projects would be sent for a final approval by the centre. “At a meeting held on May 16, the Union ministry officials have agreed in principle to allocate funds generously to save children from the acute encephalitis syndrome (AES) and Japanese encephalitis (JE),” said Mukesh Meshram, Director, National Rural Health Mission, which would be coordinating all the projects. The two diseases- JE and AES- have killed more than 5,000 children besides affecting some 22,000 persons in past seven years (2005-2011). Although no case of JE has been reported in 2012, AES has killed 69 of the 290 patients affected so far. Experts at the BRD Medical College, Gorakhpur, that bears maximum load of patients, blame enterovirus (a group of virus mainly responsible for polio) for the disease to a great extent. The safe drinking water in the area has been a major thrust area. The said virus travels through the oral-fecal route. In the affected area where ground water levels are high and open defecation was common, the virus travels quite easily through shallow tube wells called ‘Khichwa’. This was ensuring that all the projects are cleared. Out of this plan, the repairing work and construction of 4.10 lakh drinking water sources in 20 districts was the most ambitious one. The total cost of the said project is of Rs. 328 crores. While the health department would be coordinating the activity, the project was mooted by the state panchayati raj department. According to officials, a rate of Rs. 8,000 per unit has been fixed for the purpose. The construction of mini public water supply system is implemented in the affected villages and hamlets, is the other major
In this, a total of Rs. 3.0 lakhs per unit has been allocated. This activity involves installation of submersible water pump, construction of a small over-head tank and chlorination of water in the tank. The project cost as it was proposed by the state rural development department had been estimated to cost Rs.100.71 crore. Considering ‘Khichwas’ or locally made shallow tube wells as the ‘route to disease’ the rural development department had proposed replacement of all khichwas with India Mark-III model hand pumps. As per a survey undertaken by the office of commissioner, Gorakhpur Division, in 20 affected districts, there are more than 18,882 shallow tube wells in the affected region. The government has asked for a grant of Rs. 58.34 crore from the centre. Besides, a sum of Rs. 48.74 lakhs has been sought for solid waste management set-ups in all 20 districts while projects to the tune of Rs.29.55 crore are being finalized for sensitization of stakeholders and awareness of the people. The committee also felt that water supplied in the region should be regularly monitored. In this regard, the committee has proposed setting up of an advance lab for water testing which would be equipped to detect viruses present in water. The said lab, which is expected to come up at BRD Medical College, is claimed to be first of its kind in state. About the proposal to build 10-bedded intensive care units in nine affected districts. A new 100 bedded JE/AES management ward is coming up at the Gorakhpur medical college.

The summary of activity under above programme is as follows:

a. Improving drinking water supply system,

b. Mini public water system,
c. Replacing shallow tube wells (Khichwa) with India Mark-III hand pumps,
d. Solid waste management,
e. Community awareness (stake-holder wise), 10-bedded pediatric ICU in 9 district hospitals,
f. Advance viral water testing lab,
g. Additional IEC activity,
h. Biological removal of mosquito.

Health; DISTRICT ADMINISTRATION (BAHRAICH); Flood-proof hand pumps and toilets have controlled the outbreak of diseases during and after the floods that are an annual feature in Bahraich (U.P.). These were installed at the initiative of Rigzin Samphel, who was DM here till Feb, 2011. According to report about 4.5 lakh people have gained from this scheme.

The Times Of India, Lucknow,[108]- Dated 18.10.2011: “KHICHWA : Pumping Diseases For Decades” SUCKING UNDERGROUND WATER FROM DEPTH OF 10 FEET, THIS CAST IRON HAND PUMP RESPONSIBLE FOR SPREAD OF VIRAL DISEASE.

Lucknow/Gorakhpur: The vicious circle of encephalitis, which has become synonymous with death in the eastern part of Uttar Pradesh, begins with a hand pump.

This research work was initiated on the basis of above study and reports. To understand actual problem and the ground facts, extensive field work has
been done to find out the probabilities. On the basis of initial studies, it was
decided to select a suitable area from where study and data collection could be
easy and convenient. Therefore the area of the region selected is, Village-
Pyarepur-Geographical Coordinates, Lat. 27.32601° North: Long. 81.58652°-
East, Village-Mohri- Lat. 27.21181° North, Long. 81.564497° East and Village –
Nandilia- Lat. 27.211816° North, Long. 81.564501° East, Dist. Bahraich, U.P.
India.

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