HEALTH HAZARDS AND USE OF DRINKING WATER IN KUMARGRAM BLOCK, ALIPURDUAR DISTRICT, WEST BENGAL: AN EMPIRICAL ANALYSIS

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Abstract

Safe drinking water is vital for our survival. Access to safe purified water is not easily accessible in the backward regions of Alipurduar district due to lack of purchasing power and awareness. Water borne diseases like digestion problems, kidney ailments, hepatitis, jaundice etc. are common in Kumargram block of Alipurduar district. There are issues such as, ground water contamination due to dolomite intrusion in ground water as a result of continued erosion in the hills of Bhutan and Dooars. Besides, population explosion has caused increasing pollution in the rivers and groundwater also. Thus the health issues are studied with the help of case studies in sample villages involving 553 families of Kumargram block including the tea gardens, tribal areas, major hamlets and trading centers etc. The sample villages are selected by stratified random sampling method. Studies have also been conducted in the hospitals and health centers for getting patient related information. The objective of the research is to focus on several parameters, i.e. source of drinking water, family economic background and use of safe water, awareness, level of education, distance from major habitats, caste, religion etc. Statistical tool such as regression has been used for analysis of the problem. The study has also used secondary studies done in the region mainly involving water quality analysis and related health hazards. The objective of the research is to focus on several parameters, i.e. source of drinking water, family economic background and use of safe water, awareness, level of education, distance from major habitats, caste, religion etc. Statistical tool such as regression has been used for analysis of the problem.

Keywords: drinking water, health hazard, dolomite, Kumargram, pollution

1. Location

Kumargram (community development block) is an administrative division in Alipurduar subdivision of Alipurduar district in the Indian state of West Bengal. Kumargram police station serves this block. Headquarters of this block is at Kumargram. As per 2011 Census of India Kumargram CD Block had a total population of 199,609 of which 174,058 were rural and 25,551 were urban. There were 102,592 males and 97,017 females. Scheduled Castes numbered 71,417 and Scheduled Tribes numbered 59,877. There is one census town in this block: Uttar Kamakhyaguri. Gram panchayats of Kumargram block/ panchayat samiti are:
Chengmari,
Kamakhyaguri I,
Kamakhyaguri II,
Khoardanga I,
Khoardanga II,
Kumargram,
Newland,Kumargram Sankosh, (NKS),
Rydak,
Turturi Khanda,
Valka Barovisha I
Valka Barovisha II.

2. Physiography

The study block is in Dooars region. The Dooars or Duars form the floodplains as well as foothills of the eastern Himalayas in North-East India around Bhutan. *Duar* means 'door' in Assamese, Nepali, Bengali, Maithili, Magahi, Bhojpuri, and Telugu languages, and the region is the gateway to Bhutan from India. There are 18 passages or gateways through which the people of Bhutan can be in touch with the plain living people. This region is divided by the Sankosh river to form the Eastern and the Western Dooars, which consist of an area of 8,800 km² (3,400 sq miles). The Western Dooars is called the Bengal Dooars and the Eastern Dooars as the Assam Dooars. Dooars is identical with the term Terai used in Nepal along with northern India and has the only nitrate rich soil in India. The altitude of Dooars ranges from 90 to 1,750 metres. Countless streams

and rivers flow through fertile plains from the mountains of Bhutan. In Assam, the major rivers are known as Brahmaputra and Manas. In northern part of West Bengal, the major river is the Teesta, besides many others e.g. the Jaldhaka, Murti, Torsha, Sankosh, Dyna, Karatoya, Raidak, and Kaljani rivers, among others.

The area under study is situated in the unstable foothill terrain (Bhutan Himalaya) and has produced a range of wonderful landscapes both physical and cultural involving various cycles of fluvial erosions. It is also marked by the incidences of quite a few environmental hazards e.g. flood, shifting of the channels, landslides, riverbank erosions, and soil erosion including the accelerated soil erosion as a result of the neotechtonic movements and anthropogenic interference[i].

3. Drinking Water hazards in Dooars region

The region has a major disadvantage due to anthropogenic activities such as, mining in the hills of Bhutan, due to which the dolomite intrusion takes place in the rivers of this region. Studies have revealed that some vital parameters like TDS, Chloride, Total Hardness, Phosphate, Alkalinity, and the indicator parameters like BOD, COD explain minimum and maximum concentration for pre-monsoon season. The variation in parameter of water in pre-monsoon is not constant for minimum and maximum concentration during post-monsoon. Post-monsoon characteristics of river water if compared with pre-monsoon shows augmented concentration of EC, TDS, TH, Cl, PO4, BOD and COD etc. This variation may be attributed to the activities like discharge of sewage in the river, decreased and periodical flow of river after monsoon season. The health effects of drinking impure water can range from almost no physical impact to illness or even death.

Many factors affect the probable impact on health such as, age along with general health status of the person, the nature of pollutant, the amount consumed, as well as how long the person has been drinking the impure water. Some of the outcomes of drinking contaminated water can be abrupt, while others may not be noticed for several years. These health outcomes can include gastrointestinal and stomach complaints like vomiting, nausea, cramps, and diarrhoea. Total coliform bacteria, if present, point toward disease-causing organisms (bacteria, viruses, parasites) that could potentially be present in water supply. *E.coli* bacteria live in the intestines of warm-blooded animals including humans. If *E.coli* bacteria is found in a water sample, it is assumed that human sewage and/or animal faeces have contaminated the water. The presence of nitrates in well water is frequently the outcome of farming activities like fertilisers, or seepage from septic systems. If nitrates are present above 10 milligrams per litre of water, an infant may experience a situation known as “blue baby syndrome” or methaemoglobinaemia. Herbicides and pesticides from both agricultural and household-use can pollute wells if used inappropriately or excessively.

The State of Environment Report West Bengal (2016) report reveals that West Bengal covers an area of 88,752 km^2 and the average annual precipitation is 1,795 mm. The precipitation varies extensively across the districts. While Jalpaiguri district receives 3,899 mm of annual rainfall, Purulia in South Bengal receives 1,329 mm rainfall. About 77 per cent of the annual rainfall is received during four monsoon months and only 23 per cent rain falls during remaining eight months. In West Bengal, soil erosion means erosion by water which is the key soil degradation factor in hilly areas of Darjeeling and rolling terrains of south-western plateau. Out of four erosion classes identified, two need instant soil and water conservation measures. The supply of drinking and domestic water has always been concern for the government. The Government of West Bengal has set target of supplying 70 litres of water per capita daily in rural areas under its “Vision-2020 Plan”. The surface water generated from rainfall is not totally accessible for human use. About 22 per cent of the precipitation can infiltrate through soil and recharge the ground water and 33 per cent usually goes back to atmosphere through evapotranspiration. The source of this ground water is quickly getting reduced because of rising demand for irrigation purpose, fast industrialisation and urbanisation as well as arbitrary use of water in all the domestic and non-domestic spheres. Overexploitation of ground water, cultivation of high water-intensive crops like rice in all the agricultural seasons; i.e. pre-kharif or summer, kharif or rainy and rabi or winter and boro exclusively for dry season, dependence on groundwater, unwillingness to water saving technologies are the major causes behind water crisis (quantity factor) and water quality (quality factor like arsenic, fluoride and heavy metal poisoning etc.). Eutrophication, the ecosystem's response to the addition of synthetic or natural nutrients, mainly phosphates, through detergents, fertilisers or sewage to an aquatic system causes explosive growth of some aquatic plants and algae. It eventually impedes the growth of the aquatic flora and fauna, resists infiltration of solar radiation inside the water body and produces hypoxia. Intensive farming, rapid soil and water erosion, unpredictable rainfall, population explosion and increasing livestock population also have contributed to unsustainable land use leading to degradation of this precious resource in West Bengal. Measures need to be taken to check erosion through conservation of soil by utilizing these lands through growing diverse medicinal and aromatic plants, bio-diesel crops and also grasses like vetiver and sabai. Promising results are found in combating river bank erosion through vetiver plantation. Both the grasses are extremely profitable and have shown their possibility in employment growth and livelihood development aspects in the adjacent villages of the rivers. Agro-forestry is also a good choice for these eroded areas. Chemical pesticides and fertilisers have played a noteworthy role in the development of crop yields worldwide along with India in addition to West Bengal during the last five decades. The major causes of ecological pollution due to haphazard use of pesticides and chemical fertilizers may be attributed to farmers’ ignorance about fertilisers and pesticides use, e.g. method, time and quantity; lack of awareness about integrated nutrient, water and pest, e.g. weed, insect, disease, rodents management; inappropriate storage and mishandling of such chemicals, improper disposal of empty containers, unwillingness vis-à-vis lack of awareness amongst farm families regarding pesticide pollution in their daily food and water. So, the following measures are important to mitigate the ill effects on the sectors mentioned below. Careful application of pesticides and chemical fertilisers benefits the soil water-plant-animal-human continuum. Integrated strategy in pest management at the early stage and ultimately switching over from chemical farming to organic farming by means of integrated management systems are the need of the hour.

The North Bengal covers an area of about 21,763 km^2 has four major rivers originating from the Himalayas and their numerous tributaries. The major rivers are Teesta, Mahananda, Jaldhaka and Raidak-Torsa. Mahananda drains to the Ganga,

whereas the other three rivers drain into the Brahmaputra. All rivers deposit sediment load in this stretch as a result of declining slope and flood is an expected hazard every year. The DO level in four rivers is well above the minimum tolerable level and the BOD level is within the maximum tolerance threshold limit. The waters of these rivers, in terms of bacteriological parameters, are unhealthy for human use. The human activities in both sides of these rivers cause the major sources of pollution. Nevertheless, these rivers maintain a healthy aquatic life throughout the year.

The National Water Policy (2012) proclaimed that there is a need for all-inclusive legislation for optimum improvement of inter-state rivers and river valleys to help in inter-state coordination which ensure scientific planning of land and water resources taking basin/sub-basin as unit with unified viewpoint of water in all its forms; including precipitation, soil moisture, ground and surface water. The strategy ensures holistic and evenhanded development of the catchment as well as the command areas. Such legislation requires, inter alia, dealing with and allowing establishing of basin authorities, with appropriate powers to plan, manage and control utilisation of water resource in the basins. This issue needs to be implemented at the national level. The growth of population and the demand of water are interlinked. A plan for revitalisation of our conventional water conservation system would be economically feasible and ecologically sustainable. An exemplar shift from current supply side management requirements to be relooked and alternative cropping pattern may reduce the demand. The amount of water needed to produce 15 quintals of bodo rice may be utilized to produce 36 quintals of wheat along with 20 quintals of pulses. The careful and productive use of inadequate irrigation water is imperative. The National Water Policy (2012) has suggested that planning, development and management of water resources should be governed by common integrated outlook bearing in mind local, regional, state and national background, having an environmentally sustainable basis, keeping in view the human, social and economic demands.

The farthest northern part of the Alipurduar district is underlain by crystalline metamorphic rock of the Himalayan range. It is followed southward by a wide zone of piedmont deposits known as the ‘Bhabar’ and the ‘Terai’, merging with the southern alluvial plains. The piedmont zone is made of unconsolidated assorted materials such as, gravels, pebbles and cobbles etc. These materials were deposited by the torrential hill streams, for example, Raidak, Torsa and Teesta originating from the Himalayas. The subsurface consists of very coarse material, e.g. boulders occurring at an average depth of 65 m. below this, granular zone gravel, pebbles and boulders are encountered with clay.

In Darjiling, and Jalpaiguri districts, groundwater in the near surface aquifer has high iron with concentration above 3 mg/l. It is alarming that places of high arsenic concentration, iron concentration is also very high. Another important type of groundwater pollution is bacteriological pollution. Groundwater under unconfined situation, particularly in the rural areas, is open to major bacteriological contamination due to nonexistence of human excreta disposal amenities. Contaminated water may contain several bacteria and viruses able to cause water-borne diseases such as dysentery, typhoid fever, diarrhea, cholera, and hepatitis. In ‘Safe’ blocks in Darjiling, Jalpaiguri, Alipurduar and Cooch Bihar, there is scope for large scale groundwater development.

Mandal et al. (2011) have found alarming pollution in the rivers of Alipurduar. The high level of pollution in the rivers signifies health hazards the drinking water in the region causes. The general population in the rural areas access drinking water from rivers, wells etc. The maximum value of the water pH samples was 8.16 at station “C” in April and minimum water pH was 7.76 at station “C” in May. For drinking water, the pH value of 6.0-8.5 is suggested. The alkaline water neutralizes acids. The alkalinity is due to the salt of carbonates, bicarbonates, borates, silicates and phosphates together with hydroxyl ions in the free state. The high alkalinity is due to cattle bathing and laundering of clothes. Biochemical oxygen demand may be defined as the amount of oxygen needed by bacteria for stabilizing the decomposable organic matter. BOD indicates the extent of pollution. The BOD was in the range of 0.73.4 ppm, which indicates that pollution impacts water quality. The chemical oxygen demand is for measurement of oxygen equivalent to the need of oxidizing organic substance by a strong chemical agent. The COD test helps in indicating toxic situation in addition to the presence of biologically opposing organic substances. The nitrites in water indicate organic pollution. Biological decomposition of all nitrogenous organic matters like sewage and animal wastes add nitrite values in water. Their presence points to that the nitrogenous organic stuff undergoing oxidation or nitrification and that the process is not comprehensive. The presence of higher value in water indicates pollution in the river. In Kaljani river water nitrite was 11.5 ppm at station “A” and 37 ppm at station “B”, where the middle stream was polluted. The phosphate content of water bodies was in the range of 594.2 to 3113.6 ppm. The highest value was at station “C”. The United State Public Health standards has set limit for phosphates in drinking water as 0.1 ppm. So, it is not within the satisfactory limits. This greater deviation is due to the use of fertilisers in the catchments areas. According to WHO, the ideal number of faecal coliform in 100 ml of water should be zero. The study found 5the values of FC/100 ml varied between 900 at site “A” to 54000 at site “C” which makes water of inferior quality. The fecal contamination by slums located along the river bed is probably the reason of higher values. The high coliform counts may also be as a result of pollution by the tributaries. Ammonia usually generates from aerobic and anaerobic decomposition of nitrogenous organic matters. Urine yields large quantities of ammonium carbonate and thus sewage has plenty of free ammonia. Free ammonia indicates aquatic pollution and the concentration of ammonical-nitrogen was found 7.829 ppm at “B” as a result of piles of municipal mess discharge into the river by the drains. The lower concentration of ammonical nitrogen was 0.781 ppm at station “A”, i.e. upstream of the river. The results of the study showed that the nutrient parameters of water in downstream were elevated than upstream which shows that the quality of Kaljani River at Alipurduar is being unfavorably affected by discharge of domestic, agricultural and municipal sewage because of extended urbanisation. The river water requires complete treatment as few parameters are not within standard range before its use for any human purpose. The water quality index at different sites also revealed alarming pollution at study area. The water of Kaljani River is highly unhygienic at all stations during the course of study and so it is not suitable for consumption, domestic and irrigation purposes. Singh et al. (2015) found that water is essential for the survival of human life. The use of water is diverse i.e. domestic, industrial, leisure and for aesthetic purposes. Among the various aspects of uses of water, the availability of good quality water for consumption is of utmost importance for sustenance of human life and for dynamic wellbeing. Supplying safe drinking water is consequently a key issue for sustainable development

which requires unambiguous emphasis on quality. Presence of zooplankton and phytoplankton are also major causes of water contamination in this area.

4. Survey findings and recommendations

The survey has been done in the households of Kumargram block on the basis of stratified random sampling. The major findings are mentioned below. About 65% of the households belong to SC households, 31% belong to ST community. About 82% of the ST households do not have access to safe filtered drinking water. About 93% of the surveyed H/H belong to Hindu and rest of the H/H are Christians. About 7% of H/H above Rs.30,000 income p.m. level depend on drinking water without filtration; whereas 84% of the H/H do not have access to filtered water. Educational levels are also directly related to safe filtered drinking water. The qualification of the head of the H/H has positive relationship with the access to safe water. Educational levels of XII and above have high impact on access (78%) to safe drinking water. Most of the households use water from tubewells. Deep tubewells are not available in this area due to the presence of impermeable rock just 18 feet below earth crust. Presence of iron is an obvious problem here. About 13% households use tap water available as a common resource. During last 5 years, 14% households suffered from jaundice or hepatitis, chronic diarrhoea is found among 27% households probably due to water related infection by amibiosis. PHC is the most important health service provider, although private health care is also common. Ayurveda services are nowadays available in PHCs.

The village needs public access to safe drinking water, and for that at least, three to four common filtered water facility need to be available for common people. Poor people have low access to safe water; hence they suffer from poor health and low immunity. All these increase their cost of living owing to increased medical expenditure.

The people has been divided as follows (i), cannot sign [illiterate] (ii) can sign, (iii) without any standard, (iv) I-IV [primary], (v) V-VIII [junior high] (vi) IX-X [secondary] (vii) XI-XII [higher secondary] (viii) graduate (ix) other [any other educational qualification].

Traditional therapies used by tribal society are common, even though the uses of these medications are slowly becoming less accepted nowadays. Tribal people have a developed pharmacopoeia and some elementary knowledge of medical techniques, i.e. magico religious and herbal medicines are used to cure sick either together or separately. Along with all these belief patterns socio-cultural practices of tribals have influenced the concept of health and hygiene. Sometimes it also acts as preventive medicine. In the case of diarrhea, the root extract of Sadhimodi is prescribed twice or thrice daily up to complete remedy. In the case of dysentery, the extract of the Butasingh stem is prepared. If the patient suffers from jaundice; Rhizome or root of Aing root is taken. In the event of gastroentites, Eoying leaf is used. According to the traditional belief, ingestion of the prepared food reinforces the digestive power of the body. The Stomach ache is cured by Kartal/ Kapate (root portion). Twig or young leaf of Gua tree is grinded and the patient takes the extract twice a day. Bikoma is prescribed in extreme stomach ache. The paste of Bikoma is mixed with water and the patient takes the solution once a day in empty stomach. Urinary problem has been cured by Eyanasim leaf is used.

Regression analysis has very strong relationship with the use of safe purified water with level of education above 10^{th} class (0.87) and family income (0.83). The relationship is weaker vis-à-vis use of pure water in the case of less educated families (0.11), families with low level of income, location of households etc. The caste status, i.e. SC, ST has barely any impact on the access to pure filtered drinking water (0.32). Some families in the block have become neo rich by selling their land to the government for projects. Irrespective of their low level of income, they have become habituated using purified water.

The policy needs to take care of the urgent requirements of the villagers. The 'Sulabh Drinking Water' project can convert pond water into safe drinking water and it can be sold at only 50 paise/litre. This is a pioneering model developed by France-based organisation '1001 Fontaines'. The similar project may be implemented in the villages under study for improving health and wellbeing of the villagers. The community–led drinking water project called as ‘Swajal’ aims to provide sustainable and sufficient drinking water in an integrated manner to the rural masses on pilot basis. It is visualized that the state government in partnership with rural people; shall plan, construct, design, operate and maintain their water supply and sanitation schemes. The concerted efforts can result in the supply of safe drinking water in the villages of Alipurduar.

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