

Water quality & health hazards- The Andaman perspective

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Inadequate drinking water supply and quality and poor sanitation are among the world's major causes of preventable morbidity and mortality. According to the World Health Organization (WHO) estimates, basic hygiene-related diseases have a significant impact on human health. Diarrhoeal disease alone causes 2.2 million of the 3.4 million water-related deaths per year. Many of the deaths involve children less than five years of age and the poorest households and communities. Many outbreaks remain undetected, and it is likely that, beyond the reported outbreaks, there is an unrecognised background burden of disease.

Water-related issues were high on the international policy agenda in the 1970s, following the first international conference on the environment, held in Stockholm in 1972. However, by the time of the International Drinking Water Supply and Sanitation Decade (1981-90), interest had begun to wane. In the industrialised nations, concern focused on chemical contamination, and the international agenda moved increasingly towards major environmental issues such as global climate change, ozone depletion and desertification. Water and health have again moved up the international policy agenda as part of a more comprehensive understanding of sustainable development. The 1998 OECD Interlaken Workshop confirmed the need for better microbial monitoring parameters and methods for assessing the safety of drinking water and monitoring and responding to adverse events. Most importantly, given the numbers of pathogens which cannot specifically be tracked by conventional methods, especially viruses and parasites such as *Cryptosporidium* and *Giardia*, the workshop recommendations pointed out that "business as usual" was no longer a viable option.

Water, sanitation and health is a vast subject area and it is beyond the scope of any symposium to cover all aspects associated with it. The issues being discussed here are therefore limited only to microbial contaminants & their impact on health, sources of contamination, measurement of contamination, the situation in the Andaman & Nicobar Islands and control measures.

A given water sample is said to be microbially contaminated when it is infested with disease causing organisms or pathogens. Most of these contaminations occur through faecal discharges. Sources may be sewer overflows, unsewered residential and commercial areas, failing private, household and commercial septic systems, and practice of open defaecation. Other sources may include agricultural runoffs, animal faecal wastes, wildlife wastes and direct human contact, such as swimmers/bathers

with illnesses, cuts or sores, or from direct discharges, for example from tanks or ballasts of ships and other vessels.

A wide variety of water borne pathogens is known and several new pathogens are emerging. Among these are parasites, viruses and bacteria. Detecting each of these individual pathogenic organisms in water sources is practically impossible. Therefore, the "indicator organism" concept has been adopted for monitoring microbiological quality of water. The primary tool used at present to evaluate water quality is the estimation of the level of faecal contamination, the commonest source of pathogenic microbial contamination. The primary indicator organisms used are "faecal coliforms", "*Escherichia coli*" and "enterococci". These are considered indicative of faecal contamination and possible presence of intestinal-disease-causing organisms. *E.coli* count is the most valuable test for routine quality checks of water supplies. Two principal techniques are generally used, - the multiple tube/most probable number (MPN) method and the membrane filtration method. Choice of technique is driven by cost, accuracy, adaptability, speed and simplicity of these tests.

The Regional Medical Research Centre has identified several outbreaks and initiated basic and applied research on their aetiological agents in these islands. The most important contribution of the RMRC is in the field of leptospirosis which is a water-borne zoonosis. The annual outbreaks of the then unknown "Andaman Fever" during the 1980s and 1990s was identified by the RMRC as cases of leptospirosis and the pulmonary form of the disease was documented during the late 1990s. Awareness has been created among local population about the transmission dynamics of the disease that involves interplay between water/moist soil contaminated with animal and rodent urine and humans.

The RMRC has identified outbreaks several water-borne diseases in these islands like those of diarrhoea due to shigellosis during 1995-96 in Port Blair and Bambooflat, Cholera in Nancowry group of islands in 2002 and again in Brookshabad in 2006 and rotaviral diarrhoea in Mus village of Car Nicobar post-tsunami in 2005. Shigellosis is endemic in these islands and routine bacteriological surveillance has showed upto 30% of cases of diarrhoea in children are due to shigellosis. *Vibrio cholerae*, *V.parahaemolyticus* and *Salmonella* are recently being isolated from clinical cases of gastroenteritis from these islands. There are also numerous clinically suspected cases of Hepatitis A in these islands.

The RMRC has tested several water samples from across the islands as part of outbreak investigations. During 1999, water sources from five places in Calicut area of South Andaman was tested. All the water sources were found to be contaminated with faecal coliforms including *E. coli*. In Nov 2002, as many as 53 drinking water sources (wells, tanks, taps, streams) were tested in different tribal villages of Champin and Nancowry Islands for contamination and 38 (69.1%) were found to be contaminated with *E. coli*. In January 2005, drinking water samples from 5 of the 6 wells supplying water to a Tsunami Relief camp in Mus village in Car Nicobar showed contamination with coliforms. In Nov 2006, water samples were collected from a stream, the main drinking water

source in Brookshabad, above a check dam from where water is pumped to a storage tank and distributed after passing through sand filters and also from several tanks and tested for contamination with coliforms using a rapid kit. All the samples except one were found to be contaminated. Several random water samples from wells, tanks, streams and dams have also been tested over the years and we found most of them to be microbiologically contaminated. Treated water samples, however were satisfactory. It is therefore believed that unless properly treated, the common water sources of Andaman & Nicobar Islands are contaminated with common microbial pathogens.

People should be advised to use only treated water for consumption and should be encouraged to practice boiling of water or disinfecting them through chlorination. Not only should safe water supply be ensured, betterment of environmental sanitation proper disposal of human excreta and practice of personal hygiene should also be encouraged.

In a just concluded study the RMRC, jointly with the Directorate of Health Services has shown that incidence of diarrhoea in the Andaman Islands has shown a sharp decline after the tsunami. The reasons attributed to this observation are the revamped sanitation measures taken by the local administration after the tsunami destruction, stepped up surveillance, proactive chlorination of water sources by the authorities and NGOs, and increased awareness among people. The study highlights the importance of public health and sanitation measures after a natural disaster in reducing morbidity due to one of the commonest childhood diseases. It also encourages health and sanitation authorities and non-governmental organizations in their effort to make these islands one of the cleanest and safest place on earth.