Rural communities' knowledge on water quality and water borne disease: the case of Bungamati Locality in Kathmandu Valley, Nepal

B. Pradhan[1], R. Gruendlinger[2], I. Fuerhapper[3], P. Pradhan[4] and S. Pradhanang[5]

[1]*Institute of Medicine, T.U, bandana@healthnet.org.np,* [2]Holzforschung, Austria R.Gruendlinger@holzforschung.at, [3]Holzforschung, Austria, Inge.Fuerhapper@das.at [4]*Department of Geography, T.U. puba@mail.com.np,* [5]*Department of Environment, T.U.*

Abstract

This study is an attempt to investigate the quality of drinking water used by the communities and their knowledge towards water quality and water borne diseases. The results are that the physical and chemical parameters of the sample water of different water sources are found lying within the WHO guideline value and the values of the bacteriological parameters such as coliform bacteria and E.coli are above the WHO guidelines. So, the drinking water is not potable. The communities are unaware of the quality of water they have used. Incidence of water borne diseases appears to be the common health problem among the sample households in the study region. It is found more serious during the dry summer. Open defecation is still one of the common sanitation problems of the area. The solar disinfection (SODIS) method has been introduced among the local communities for water disinfection.

Introduction

Drinking water quality is a major issue in rural areas of Nepal. The Government of Nepal has supplied drinking water to about 67 percent of total population. Other inhabitants have to depend on other sources such as spring, stream and tube well for drinking and household uses. The per capita water consumption in the rural area is 45 liters as compared to 60 liters in the urban area of Nepal.

Studies carried out in rural areas of Nepal by ADB (1985), IUCN (1991), Pradhan (2000), and MOPE (2001) show that rural people use the most convenient sources of water in their areas irrespective of quality due to lack of piped water. Other studies conducted by CEMAT (2000), ENPHO (1999), DOHS (2001) and CBS (1999) indicate that about one third of the total death of children under five years of age in rural region of Nepal is due to water borne diseases, such as cholera, typhoid, dysentery and gastro-entities. Yet, the vital connection between water and health is given little emphasis in the government policy (UNICEF 1987, NPC 1998, and MOPE 2001).

This study investigates the quality of the drinking water used by the communities and their perception towards the quality of the water, water borne disease and sanitation.

Methodology

During the field survey carried out in March 2003, information on knowledge of rural communities towards water quality and water borne diseases was acquired by administering structured questionnaires to 110 sample rural households out of 1,101 total households of Bungamati Village Development Committee (VDC) of Lalitpur district, Kathmandu Valley (*Figure 1*). An observation checklist was used to record environmental conditions of their locale. Twenty-five water samples at sources and consumption points representing all sources, wells, stone spouts, ponds, streams, and public and private taps used by the communities were collected and analyzed in the laboratory for physical, bacteriological and chemical parameters.

Bungamati VDC consists of three major village localities, Bungamati, Chundevi and Phasidol. The rural communities use water from all sources for different purposes such as drinking, cooking, washing and bathing. The Nakhu River is used by communities for bathing and washing particularly during dry and cold season. Agriculture is the main economic base of the rural communities.

Analysis of Drinking Water Quality

The results of the physical and chemical parameters (*viz.* temperature, pH, iron, chlorine, total hardness, chloride, N-NH_4, PO_4–P and fluoride) of the water samples as shown in table 1 are found lying within WHO guidelines. But the values of the bacteriological parameters (*coliform bacteria* and *E.coli*), which are indicators of faecal contamination and measured in terms of presence and absence of bacteria by Hydrogen Sulphide Paper Strip Method (H_2S Method) and colony forming unit (cfu) per 100 ml of E.coli by membrane filter technique on Chromocult have shown values above the WHO guidelines. Particularly in case of some sample taps, the coliform bacteria was absent (negative) at source point but was present (positive) at consumption point. In other cases, although a great variation in number of E.coli bacteria - all above zero occurred, the water of all sources found to be not potable in terms of bacteriological point of view.

Table 1: Water quality analysis of drinking water

Parameter	Water source				WHO values
	PVT TW n = 14	PB TW n = 6	Well n = 3	S. Spout n = 2	
pH	6.5-8.2	6.5-7.5	7.5	7.5	6.5-8.5
Temp (°C)	13-18	12-15	15-18	15-18	25
Iron (mg/l)	ND-0.3	0.3	0.3	0.3	0.3 - 3
Chlorine mg/l	ND	ND	ND	ND	0.2
Chloride mg/l	10-30	22-45	26-27	23-45	250
N-NH_4 (mg/l)	ND-0.2	0.2	0.2	0.2	0.04-0.4
PO_4 – P (mg/l)	0.1	0.1	0.1	0.1	0.4-5.0
Coliform bacteria (WS)	+/-	+	+	+	-
Coliform bacteria (CW)	+				-
E. coli cfu/100 ml	10-131	3-20	48-200	58	0

Note: PVT TW = private tube well, PB TW= public tube well, S = Stone

The observation indicated that the factors responsible for contaminating drinking water at source points included lack of protection and proper treatment of water, leakage in pipe distribution system, intermittent supply of water, poor drainage system and poor environment surroundings of water sources. The contamination at consumption point within house was due to lack of proper cleaning of water containers, personal habit, lack of awareness of cleanliness, etc.

Local Communities' Perception towards Water Quality

Incidence of water borne diseases including diarrhoea is one of the basic health problems in the study area. As the perception of the local communities towards water borne diseases analysed in terms of relative proportion method, eating more food, eating stale food and eating in restaurant were important causes of diarrhoea (Table 2). Other causes included dirty surrounding, religious belief, polluted air and contaminated water. The customs surrounding traditional or deeply rooted religious beliefs have been found as a main cause of diarrhoeal disease.

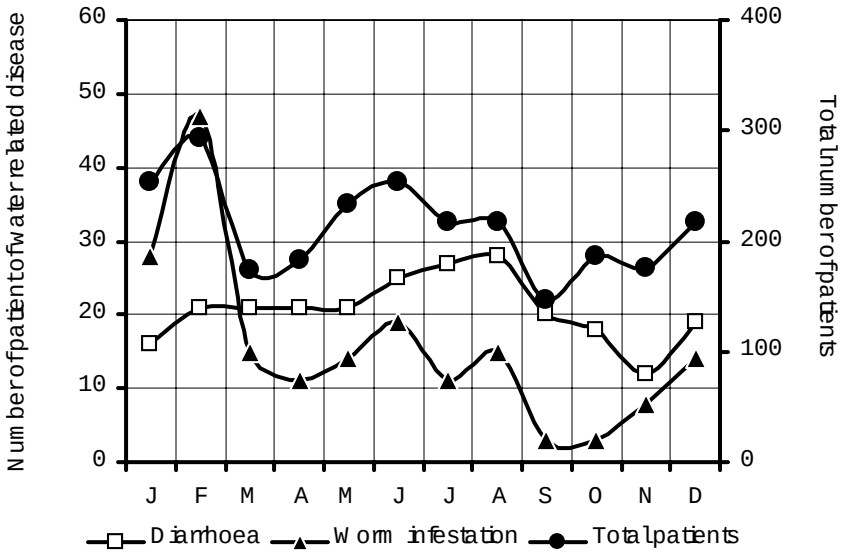
Table 2: Communities' perception toward diarrhoeal disease

Reasons of diarrhoea disease	Illiterate (n = 46)	Literate (n = 24)	1-5 grade (n = 16)	6-10 grade (n = 24)	O*f*	MP*f*	CI (%)
Eating more food	73.9	62.5	87.5	83.3	83	110	75.5
Eating stale food	71.7	62.5	62.5	58.3	72	110	65.5
Eating in restaurant	56.5	62.5	87.5	62.5	70	110	63.6
Dirty surrounding	32.6	45.8	75.0	54.2	51	110	46.4
Religious belief	37.0	66.7	50.0	41.7	51	110	46.4
Polluted air	23.9	62.5	62.5	58.3	50	110	45.5
Contaminated water	10.9	33.3	68.8	54.2	37	110	33.6
Observed frequency	141	95	79	99	414	770	53.8
Sample size (n)	46	24	16	24	110		
MP frequency	322	168	112	168	770		
Cumulative index	43.8	56.5	70.5	58.9	53.8		

Note: Of = observed frequency; MPf = maximum possible frequency, CI = cumulative index.

The pattern of incidence of water borne diseases is varied remarkably among the months of a year. On the whole, there is higher incidence of patients' visits during the month of February than other months. Incidence of diarrhoea disease was the largest in the month of May, just before the beginning of summer rainfall.

Figure 1: Patients' Visits in the Health Service Centre,



Sanitation Status

Environmental sanitation is essential to promote health and prevent diseases. It is described in terms of personal hygiene, toilet facilities and surrounding environment. In the study area, 71 sample households (65%) had accessed to latrine facilities such as pit and water seal. The condition of toilets was also not so hygienic due to shortage of water. The members of the households without toilets go to nearby open field for defecation.

The local communities' awareness toward sanitation is analysed in terms of their practices. The reasons for not having toilets included preferred open field, bad smell of toilet and lack of money. The first two reasons can be related to lack of awareness, whereas the last one to poverty. Nearby open field and riverbank were two major places used by the communities for defecation. Information was also sought on hand washing practices after defecation. There were four different hand-washing practices such as soap, ash, water and soil. It is encouraging to note that majority of the households (36%) have used soap after defecation. Using ash after defecation was in second position, which is also encouraging. Hand-washing practices by water and soil after defecation combine together to represent 35%, warranting an educational programme, particularly among the children.

Conclusions

Incidence of diarrhoea appears to be the most acute problem in rural region of Nepal. It is found more acute during the dry summer months. Yet, the majority of the households are not aware that water contamination as a main cause. Inadequate supply and poor quality of drinking water were major causes of poor personal hygiene and environmental sanitation. Open defecation at nearby field or on the riverbank was the only option for the households with no toilets. The reasons for not having toilets included preferring open field, bad smell of toilet and lack of money. Over one-third of the sample households had used hand-washing practices by water and soil after defecation, which might be a major cause of water borne diseases. Lack of awareness and poverty are considered for poor environmental sanitation and personal hygiene. Awareness programs for the local communities are necessary for improving environmental sanitation and personal hygiene.

References

ADB (Asian Development Bank), 1985. *Nepal Water Supply and Sanitation Sector Profile*. Manila.

CBS (Central Bureau of Statistics), 2001. *Statistical Year Book of Nepal.* Kathmandu

CEMAT, 2000. *Report on Surface Water Quality Monitoring Works of Kathmandu Valley*, Urban Water Supply Reforms in the Kathmandu Valley Project, Kathmandu.

ENPHO (Environmental and Public health organization), 1999. *Monitoring of Groundwater Quality in the Kathmandu Valley*, ENPHO, Kathmandu, Nepal.

IUCN, 1991. *Environmental Pollution in Nepal: A Review of Studies,* IUCN/NPC, Kathmandu: Nepal.

MHPP (Ministry of Housing & Physical Planning), 1998. *National Water Supply Sector Policy* (Policies & Strategies), His Majesty's Government of Nepal, Kathmandu.

MOPE, Ministry of Population and Environment of Nepal, 2001. Nepal: State of Environment Report 2001. UNEP, ICIMOD, MOPE, SACEP and NORAD

NPC (National Planning Commission), 1998. *The Ninth Plan (1997-2002).* His Majesty's Government of Nepal, Kathmandu.

Pradhan, B., Sherchand J., Shrestha MP, Pradhanang S., 1995. Water Quality and People' Knowledge about Water-related Diseases: the case of Kirtipur locality, Kathmandu, Nepal, *Journal of the Institute of Medicine*.17: 26-31.

Pradhan, B., 2000. *Drinking Water Quality in Kathmandu Valley, Nepal.* Health Prospect New Vision for New Century. *Kathmandu: Vol. 2. No. 2*

UNICEF, 1987. *Children and Women of Nepal: A Situation Analysis*. Kathmandu: UNICEF