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Bacteriological Survey of 15 Springs of Kashmir

Ishrat Latief, Manzoor A. Thokar* and A. R. Yousuf

Centre of Research for Development, The University of Kashmir, Srinagar, India
*Department of Medical Microbiology, SKIMS, Soura, Srinagar -190011, India

ABSTRACT

Water samples from 15 springs of Kashmir valley were analyzed for presumptive coliform and total coliform count. Coliform most probable number (MPN/100ml) ranged from 92 to >180/100ml of water, thereby indicating that all the 15 springs surveyed are contaminated. Very high values were recorded from grossly contaminated springs.

Key words: Kashmir, springs, bacterial contamination.

INTRODUCTION

Springs have been an important source of potable water in Kashmir Himalayas, especially in the rural areas. However, indifference of people and the government has greatly harmed these resources. Many springs of the region have got already dried up and others are receiving large quantities of surface run off containing domestic sewage from the neighboring areas, which has resulted in contamination of many of them by faecal matter.

Faecal contamination of water can introduce a variety of pathogens into the water, including bacteria, viruses, protozoans and parasitic worms (Mason 1992). Water borne diseases remain a major health hazard in many parts of the world, especially Asia. The identification and isolation of the pathogenic bacteria from potable waters is not an easy job. However, the occurrence and abundance of coliform group in any water body gives a rough estimate of the intensity of faecal contamination, thereby indicating whether the water is safe for drinking or not. A number of workers have reported on the bacteriology of drinking waters of the country (Kaushik and Bewtra, 1964; Mathur and Ramanathan, 1966; Mishra and Roa, 1967; Thapliyal *et al*, 1972; Somashekar *et al*, 1984; Reddy *et al*, 2000). However, not much literature is available on the subject from the valley of Kashmir. During 2002, an attempt was made to asses the bacteriological quality of 15 important springs of Kashmir, most of which are used for drinking, bathing, washing of clothes, recreation, etc. The present article is based on the data collected during this study.

MATERIAL AND METHODS

15 Springs of Kashmir (Table 1) were selected for the study of water quality with respect to bacterial load in them. Extreme precautions were taken while collecting the water samples for bacteriological analysis. The samples were collected about 2m away from the bank in heat - sterilized bottles of 100ml capacity. Analysis was done in highly aseptic conditions in accordance with ICMR (1963) and APHA (1976).

Presumptive Coliform Count: Equal volumes of sample water were inoculated into 50ml, 10ml and 5ml volumes of double - strength Mac Conkey medium in tubes, containing inverted Durham's tubes and incubated aerobically at 37 °C. After 24hrs and 48hrs of incubation the samples were tested for the production of acid (colour change to yellow) and gas (a bubble filling the concavity of Durham's tube). The acid and gas producing cultures were considered presumptive positive growths of coliforms. Cultures showing no production of acid and gas in 48hrs were considered negative. Most probable number (MPN) of presumptive bacilli present in 100ml of sampled water was calculated by comparison with Mc Cardy's Table (Senior, 1989).

Faecal Coliform Count: The positive tubes from MPN test were inoculated to fresh Mac Conkey double broth and incubated for 48 hours at 44 °C in a water bath. The gas production was taken as the criterion to differentiate faecal and non- faecal coliforms. Chlorine-treated water samples from SKIMS - hospital were used as control.

Faecal Streptococci Study: Subcultures from all positive bottles in the presumptive coliform test were made into tubes containing 5.0 ml of glucose azide broth and checked for gas production within 18hrs at 45 °C.

Eijkman Test: For determining whether the coliform detected in the presumptive test were *E. coli*, subcultures from tubes showing acid and gas production were made. Varying quantities of water samples in question were incubated in litmus milk medium anaerobically at 37 °C for 5 days. Absence of stormy fermentation ruled out *Clostridium welchi*.

Table 1. Coliform most probable number/100ml (MPN/100ml) in 15 springs of Kashmir

No.	Spring	Distance from Lal Chowk (km)	MPN / 100ml	Remarks
District Srinagar				
01	Cheshma Shahi	5	>180	G
02	Mokhtipokhir (Nowshahra)	10	>180	G
03	Vicharnag (Nowshahra)	11	>180	G
04	Nagraj (Saidpur)	13	>180	G
05	Malik sahib (Saidpur)	14	161	C
06	Nagibal (Ganderbal)	19	>180	G
07	Beehama (Ganderbal)	19	>180	G
08	Safapur (Safapur)	32	>180	G
09	Repur Nag (Safapur)	32	92	C
10	Narayan Nag (Wangat)	57	161	C
District Pulwama				
11	Doodnag (Gangoo)	39	161	C
12	Tral Nag (Tral)	40	161	C
District Islam Abad				
13	Achabal (Anantnag)	58	>180	G
14	Verinag (Anantnag)	70	161	C
15	Kokernag (Anantnag)	75	92	C

C = Contaminated & Unsatisfactory for drinking
G = Grossly Contaminated & Unsatisfactory for drinking.

RESULTS AND DISCUSSION

The data regarding the most probable number of the coliform bacteria in the water of the 15 springs are given in (Table 1). United States Public Health Services (cf. Thokar *et al*, 2000) have categorized drinking water into four types on the basis of bacterial load.

Group 1: waters which are free from contamination.

Group 2: waters having monthly average coliform count of 13-50 /100 ml.

Group 3: waters in which monthly average coliform density ranges between 90-5000/ 100ml.

Group 4: waters where coliform density exceeds 5000/ 100ml.

As per the data given in Table 1 all the 15 springs investigated fall in the Group 3 and are unfit for drinking without treatment. All these waters need to be treated by conventional rapid sand filtration followed by continuous chlorination. Plate counts in plates at 37 oC showed more than 10 colonies in all the samples, thus confirming the bacteriological pollution.

Faecal and domestic wastes introduce a number of pathogens into the spring waters (Mullins, 1971). In addition to native bacteria springs get contaminated by a variety of bacteria from external sources due to human activities like bathing and washing of utensils and clothes (Burrows, 1961; Kremesy, 1984; Someshekher *et al*, 1984). In recent past large out-breaks of gastroenteritis were reported from various regions of Kashmir (Koul, 1986). These out-breaks were directly related with the consumption of untreated water. Since many of the springs included in the present study are tourist spots and attract a large number of people, both local and non-local, immediate attention is needed to check the entry of surface run off into the springs. Further, human activity within their basins, like washing of clothes and utensils, also needs to be controlled. Springs at Achabal, Cheshma Shahi, Kokernag and Verinag attract a large number of tourists, including school going children, round the year and if necessary steps are not taken for abatement of pollution, these visitors may get easily affected while using the spring waters for different recreational activities.

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