Research Article

Bacterial contamination of drinking water used at dairy farms in Quetta, Balochistan

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Abstract

Drinking water is one of the main sources of bacterial organisms in farm animals. A study was carried out to observe the presence of *Coliform* bacterial species from drinking water samples obtained from randomly selected dairy farms at Quetta. *Coliform* bacterial species were identified by performing the different cultural, staining and biochemical tests. Among 100 water samples obtained from different dairy farms of Quetta, 17 samples were contaminated with *Coliform* bacteria. It was observed that buffalo farms were the most contaminated (22%) than the cattle farms (12%). Of 50 water samples studied from buffalo farms, the prevalence of *Coliform* bacteria was recorded in 11 samples (22 %). While 50 water samples were obtained cattle farms showed 6 (12%) the presence of *Coliform* organisms. The contamination of water samples with *Coliform* bacteria was found higher in buffalo farms than cattle farms. The bacterial load in ml⁻¹ water sample of buffalo farms the mean number of 197 colonies was counted while bacterial counts were recorded as 3.29X10⁴ and the mean number of 167 colonies ml⁻¹ was recorded at cattle farms. While bacterial counts was recorded as 2.93X10⁴. Overall, drinking water samples collected from different dairy farms in Quetta contaminated with *Coliform* bacteria. The bacterial load/population in water samples of different dairy farms at Quetta was detected higher than standard bacterial concentration level by WHO.

Keywords: Water; Contamination; *Coliform*; Bacteria; Dairy farms

Introduction

Water is highly multifaceted molecule act as a paramount for the sound health. Water is needed for survival of all living forms.

Almost 75% area of the earth is covered with water. Water has a great importance in all fields of life help to maintain the integrity of the living bodies [1]. It is

involved in metabolic reaction, stabilize plasma membrane, maintain homeostasis, sustain macromolecule frame work, transport nutrient and manage various activities in living body [2]. Water is also a major need of the cell. More than 70% in human and almost 80% weight of the microorganism consisted of water. Water engage in human and animal bodies to carry out various activities; maintains body temperature and biological functions [3]. Water is the basic and essential need for every living organism in order to sustain their living activities. However, contaminated water may be a big threat to human and animal health. The drinking water quality differs place to place and time to time due to various reasons [4].

Pakistan have five provinces among all Balochistan is the largest with 347,190 square km area. The population of Baluchistan is 6.6 million that covers 4.96% of the total population of Pakistan [5]. Water quality is deteriorating and less liable for drinking. In Balochistan there are different sources of water such as surface water, rivers, ponds or lacks storage reservoir, infiltration well, ground water, spring, wells, hand pumps and tube wells [6]. Normally Coliform bacteria shed in the feaces of healthy livestock, including dairy cattle. The poor hygienic condition of animals, contaminated water, unsanitary milking practices and managerial conditions may increase *Coliform* count [7]. The contamination of drinking water with microorganisms especially with bacteria is a great concern for human and animal health. Great amount of bacteria are there in water because large amount of nutrient are present in water especially *Coliform* bacteria [8]. These bacteria have a great ability to live in different organs of the body and become opportunistic pathogen [9]. In the rainy season the *Coliform* bacteria become the part of drinking water because of open sewage, drain rusted pipelines are the major

source to contamination of water [10]. *Coliform* is a group of Gram-negative, facultative anaerobic rod-shaped bacteria that ferments lactose to produce acid and gas within 48 hours at 35°C incubation [11]. *Coliforms* are found large amounts in the feaces of warm-blooded animals, aquatic environment, soil and on vegetation. Enumeration of coliforms has been adopted as a more convenient standard of sanitary significance by United States Public Health Service [12]. Keeping in views all above facts, the present research has been designed to determine presence of *Coliform* bacteria in water samples from different dairy farms of Quetta.

Materials and methods

Present study was conducted at Center for Advanced Studies in Vaccinology and Biotechnology (CASVAB) University of Baluchistan, Quetta to isolate and identify the *Coliform* bacteria from water used at randomly selected dairy farms of Quetta. Overall randomly (n=100) water samples were collected 50 samples from each buffalo and cattle dairy farms of Quetta city in sterile 200ml capped glass bottles. The sampling was carried out according to standard routine procedure. The samples were preserved under refrigeration (Ice boxes/ containers) and after collection transferred to laboratory within hour for the isolation and identification of *Coliform* bacteria at CASVAB Quetta, Baluchistan. Biochemical tests for the identification of *Coliform* bacteria were performed using procedure described by Baur et al, (1996), Abro et al (2009); Khalil and Gabbar (1992) [13-15]. There are different methods used for counting the number of bacteria in a sample. A viable plate count method was used to identify the number of actively growing bacteria in a sample. Dilution tubes containing 9ml of sterile normal saline solution were added with 1 ml of the sample and further dilutions were performed for different concentrations. Approximately, 0.5

ml from each diluted sample was cultured on nutrient agar and incubated at 37°C for 24 hours. Following the incubation the colonies were counted on the nutrient agar plate that shown growth. The plate that contained lower than 30 colonies were not accounted for the counting and more than 300 colonies often results in overlapping colonies and imprecision in the count. Therefore, 30-300 colonies were taken into consideration for viable count. The number of colonies counted was then multiplied with the dilution factor to get the number of bacteria per ml of the sample.

Results and discussion

The prevalence of bacterial organisms in water samples of different dairy farms at Quetta

During this research total of 100 water samples were randomly collected 50 from each buffalo and cattle farms of Quetta Baluchistan for examination of bacterial contamination. The data regarding prevalence of bacterial species in water samples of different dairy farms are presented in Table- 1. Among 100 water samples from different dairy farms of Quetta n=17 were *Coliform* positive. It was observed that samples obtained from buffalo farms were the most contaminated (22%) than the cattle farms (12%). Of 50 samples studied from buffaloes farms, the prevalence

Table 1. The prevalence of bacterial organisms in water samples of buffaloes and cattle farms at Quetta

Water samples source	Total No. of samples collected	No. of positive samples	% of positive samples	No. of negative samples	% of negative samples
Buffalo farms	50	11	22	39	78
Cattle farms	50	06	12	44	88
Total	100	17	17	83	83

The findings of this study revealed that drinking water used at some of the dairy farms contained microbial contamination. *Coliform* bacteria contaminate drinking water due to of open sewage, drain rusted pipelines, and water toughs used at livestock farms [23]. In this study, the contamination

of *Coliform* bacteria was recorded in 11 samples (22 %) while in cattle farms 50 samples were examined, 6 (12%) showed the presence of *Coliform* organisms. The contamination of water samples with *Coliform* bacteria was found higher in buffalo farms than cattle farms. The findings of this study are in accordance with Din *et al.* (2015) [16], they identified *Coliform* bacterial species *E. coli* (28.8%), *Enterobacter* (28%), *Klebsiella* (19.2%) *pseudomonas* (08%), and *Salmonella* (04%) from drinking water. It has been reported that *E. coli* was frequently transmitted through intake of contaminated feed and less extent with drinking water and direct contact in dairy cattle [17]. As the farm animals are the *Escherichia coli* O157:H7 and the exposure associate to distribute the bacterial specie in the farm environment [18, 19]. The occurrences of *Escherichia coli* contamination in drinking water of dairy cattle were observed by previous studies [18-20]. The bacterial species of the *Coliform* bacteria are pathogenic and their isolation might be of importance due to their contribution to water borne infections. *E. coli* was one of the bacteria usually found to be the main contaminant in dairy farms [21, 22].

of water samples with coliform bacteria was found higher in buffalo farms than cattle farms. The lower contaminations of drinking water in cattle farms may be due to these farms were more organized than buffalo farms in Quetta.

Total bacterial load in water samples of buffaloes and cattle dairy farms at Quetta

The data regarding bacterial load in water samples of different dairy farms are presented in Table 2. In ml⁻¹ water sample of buffalo farms the mean number of 197 colonies was counted for organism while bacterial counts were recorded as 3.29X10⁴.

For the mean number of cattle 167 colonies ml⁻¹ was recorded. While, the bacterial counts was recorded as 2.93X10⁴ (Table-2). The bacterial load/population in water samples of different dairy farms at Quetta was detected lower than standard bacterial concentration level by WHO.

Table 2. Total bacterial load in water samples of buffaloes and cattle dairy farms at Quetta

Water samples source	No. of positive samples	Mean No. of Colonies	Total bacterial count/ml
Buffalo farms	11	197	3.29X10 ⁴
Cattle farms	06	167	2.93X10 ⁴

Little information is actually available concerning the microbiological quality of water offered to cattle. Previously, the microbiological quality of drinking water accessed at dairy cattle farms in Shambat, Helat Kogaly, Alsamrab, Alhalfaia and Helat Koko Sudan [24]. They observed that mean bacterial viable counts were found 12X10⁷, 37X10⁶, 22X10⁶, 22X10⁶, 20X10⁶ (cells/ml) for Shambat, Helat Kogaly, Alsamrab, Alhalfaia and Helat Koko areas respectively. In comparison to results reported by El-Emam & El-Jalii (2010) [24], the bacterial loads were lower in drinking water samples obtained from dairy farm in Quetta in this study. Overall, the bacterial load/population in drinking water samples of different dairy farms at Quetta was detected higher than standard bacterial concentration level by WHO should be zero in 100 ml of drinking water sample [25].

Conclusion

In summary, drinking water samples collected from different dairy farms in Quetta contaminated with *Coliform* bacteria. The bacterial load/population in water samples of different dairy farms at Quetta was detected higher than standard bacterial concentration level by WHO. In this study, the contamination of water samples with *Coliform* bacteria was found higher in buffalo farms than cattle farms.

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Authors' contributions

Conceived and designed the experiments: M Khan, SH Abro, R Rind & MK Taj. Performed the experiments: M Khan & MK Taj. Analyzed the data: H Baloach, SA Tunio, MR Rind & R Abro. Contributed reagents/ materials/ analysis tools: M Khan & MK Taj. Wrote the paper: R Abro, SH Abro, H Baloach, SA Tunio, MR Rind & R Rind.

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