HYGIENE OF DRINKING WATER IN THE RURAL SCHOOLS OF GJILAN MUNICIPALITY, 2006-2012

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Abstract

Introduction: Rural residents in Kosovo are exposed to constant danger of disease from contaminated water. According to WHO, 88% of diarrhea are caused by contaminated drinking water; Improving drinking water may reduce this problem for 35 to 39%. European Union's goal is that by 2020 all settlements of Kosovo be included in hygienic water supply networks.

AIM: The aim of this study is to determine the prevalence of bacterial contamination of drinking water in rural schools, and the level of physical and chemical contamination as well as the identification of the most frequent causes of bacterial contamination above allowed values.

Material and working methods: Retrospective study type, the statistical data were obtained in Gjilan Regional Institute of Public Health; Water samples for laboratory analysis was taken based on the WHO guidelines: standard method for sampling of drinking water sources. Colimetry is applied as working technique.

Results: Data were obtained from the examination of drinking water samples taken at different checkpoints. From 275 analyzed water samples (equal bacterial and chemical), 81.09% have not responded to the norms for drinking water. Among common isolates were found: Citrobacter freundii by 26.8%, E. coli by 18.12% and Enterobacter 10.6%, Acinetobacter and Streptococu faecalis 3.7%, Bacillus subtilis, Pseudomonas spp. and Klebsiella spp 2%. Among the isolated chemical contaminants have been found: 40.66% Nitrates, 24.18% Nitrites, 13:55% Manganese and the Chlorides and ammonia 2%;

Conclusions: The results of the survey indicate a relatively high degree of bacterial and chemical contamination of drinking water in rural schools of the municipality of Gjilan with direct risk to the health of school children. Results indicate the necessity of taking immediate precautionary measures and to improve the quality of drinking water.

Keywords: Water, samples, contamination, bacteria, rural.

Introduction

In Gjilan Municipality, 25% of schools are supplied with drinking water from the central water supply, while the rest (75%) of schools supplied with water from individual wells or local water supply, which are not managed or controlled.

Providing quality water and sanitation facilities in schools are first step towards a healthy environment, and important step on reduction of the incidences of diseases caused by water contaminants. (1)

About 1.1 billion people globally do not have access to reliable sources of water, while 2.4 billion people have no access to any kind of sanitation facility. About 2 million people die every year due to diarrheal diseases; most of them are children less than 5 years. Most affected are the populations in developing countries, usually peripheral-urban or rural residents. (2)

Initiatives for managing and supplying quality water, supports not only public health but also promotes socio-economic development, the protection and promotion of human health. (3)

The aim:

The aim of this study is to determine the prevalence of bacterial contamination of drinking water in rural schools, and the level of physical and chemical contamination as well as the identification of the most frequent causes of bacterial and physic-chemical contamination above allowed values.

Materials and working methods:

Retrospective study type, the statistical data were obtained in Gjilan Regional Institute of Public Health. Water samples for laboratory analysis was taken based on the WHO guidelines: standard method for sampling of drinking water sources. Colimetry is applied as working technique.

Results

During the period of time January 2006 - December 2012, were taken 275 samples for bacteriological analysis and 275 samples for physic-chemical analysis of drinking water from school buildings which weren't tied in the central water supply system. Of these samples, micro-biologically out of standards have been 223 (81.09%) samples, and physic-chemically out of standards have been 127 (48.36%) samples.

The most isolated Bacteria have been: Citrobacter freundii with 26.8%, E. coli with 18.12%, Enterobacter 10. 6%, Enterococcus faecalis 2.68%, Acinetobacter 3.7%, Bacillus subtilis and Pseudomonas with 1.3%, Klebsiella spp and Proteus mirabilis with 1%

With physic-chemically analysis have been found follows contaminants: 40.36% Nitrates, Nitrites 24.09%, 13.45% Manganese, Blur 8.73%. Conductivity 4.73%, 4% $KMnO_4$, 2.18% Chlorides 1.82% ammonia;

Graph number 1: Ratio (%) of physicochemical and bacteriological samples which were fulfilled/ unfulfilled required standards for drinking water.

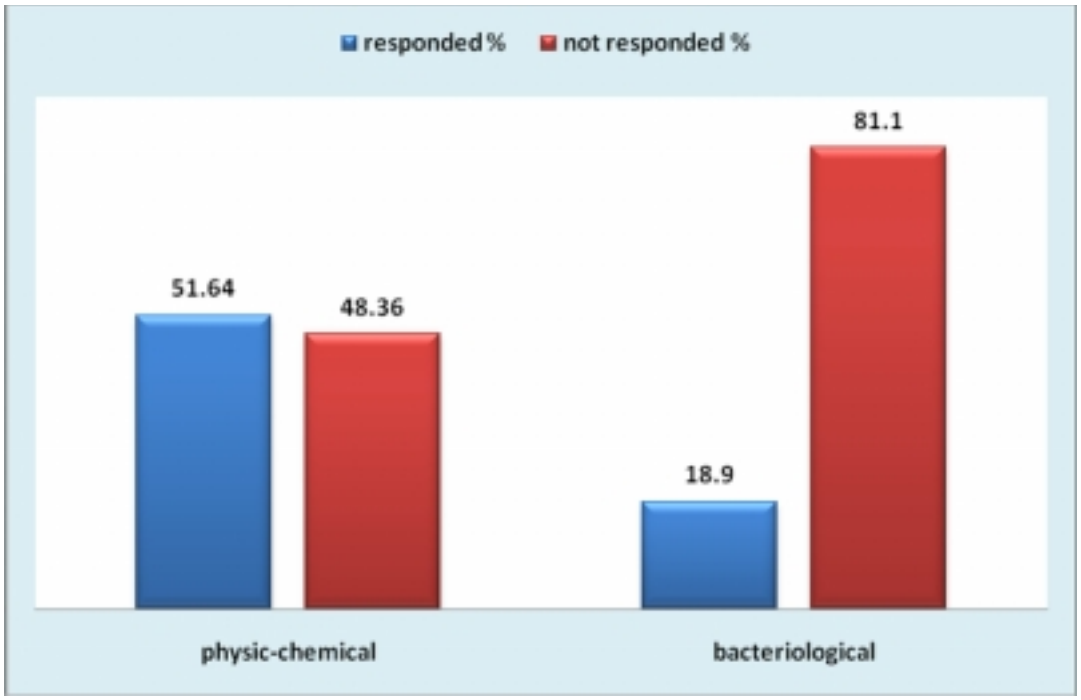
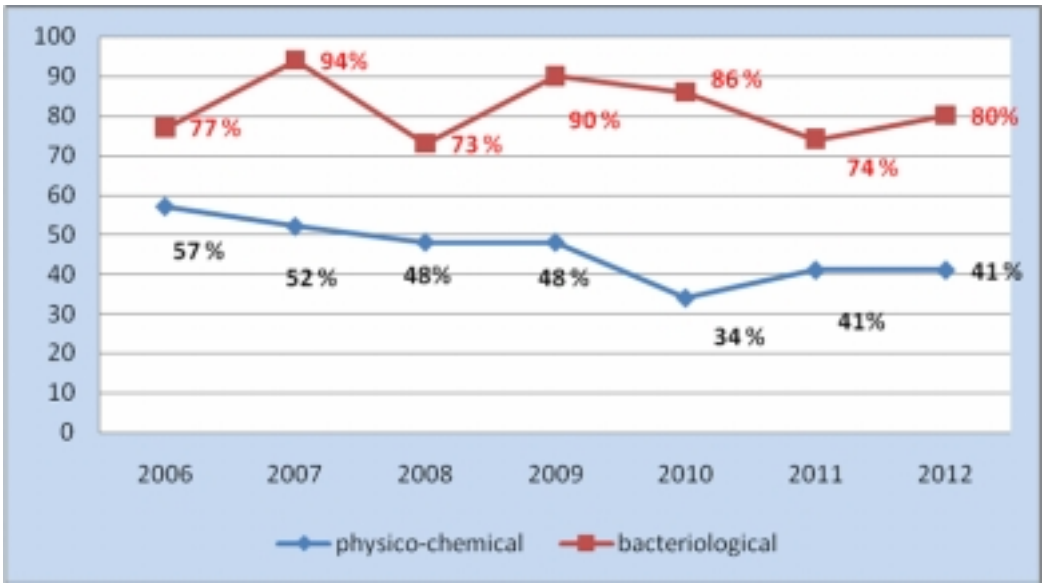


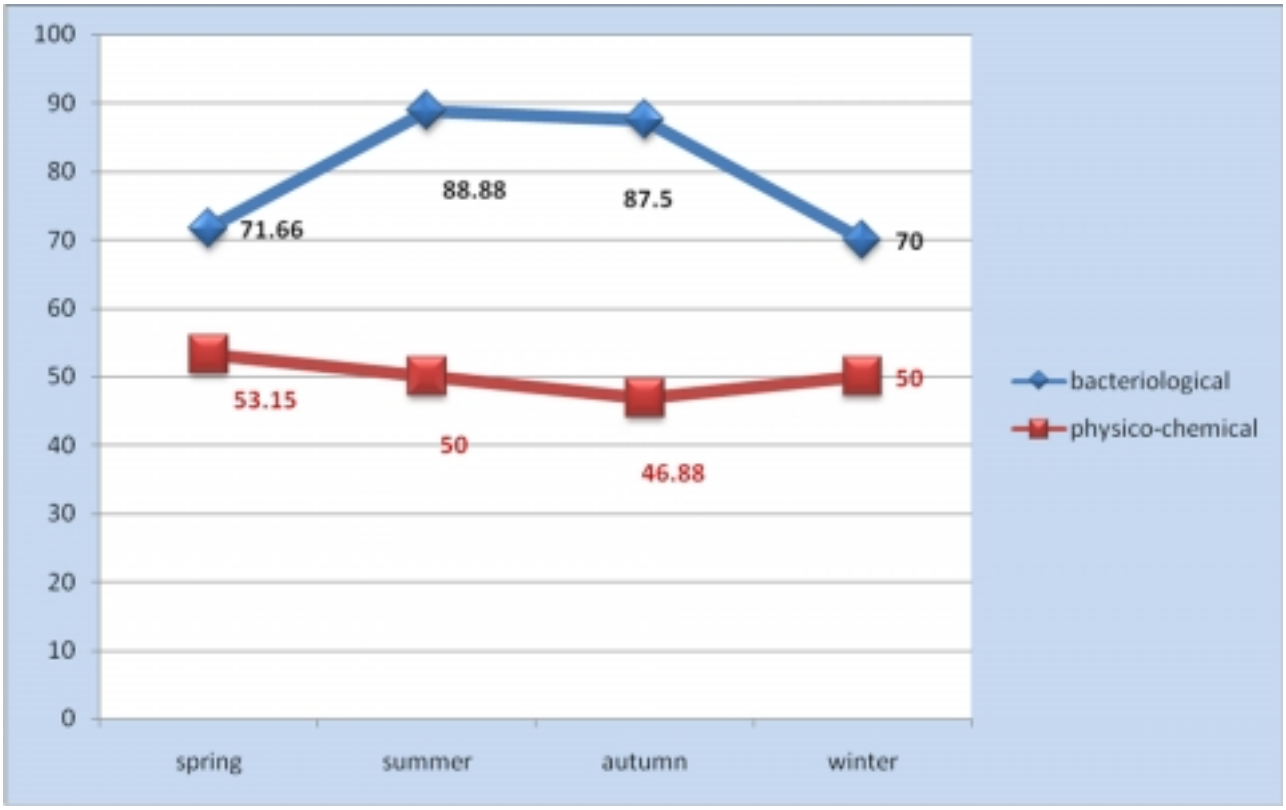
Table number 1: Number and % of samples of drinking water during the years

years	physic- chemical				bacteriological			
	Responded		Not responded		Responded		Not responded	
	N	%	N	%	N	%	N	%
2006	20	42.55	27	57.45	11	23.4	36	76.6
2007	15	48.39	16	51.61	2	6.45	29	93.55
2008	23	52.27	21	47.73	12	27.27	32	72.73
2009	21	52.5	19	47.5	4	10	36	90
2010	23	65.71	12	34.29	5	14.29	30	85.71
2011	23	58.97	16	41.03	10	25.64	29	74.36
2012	23	58.97	16	41.03	8	20.51	31	79.49
Total	148	51.64	127	48.36	52	18.91	223	81.09

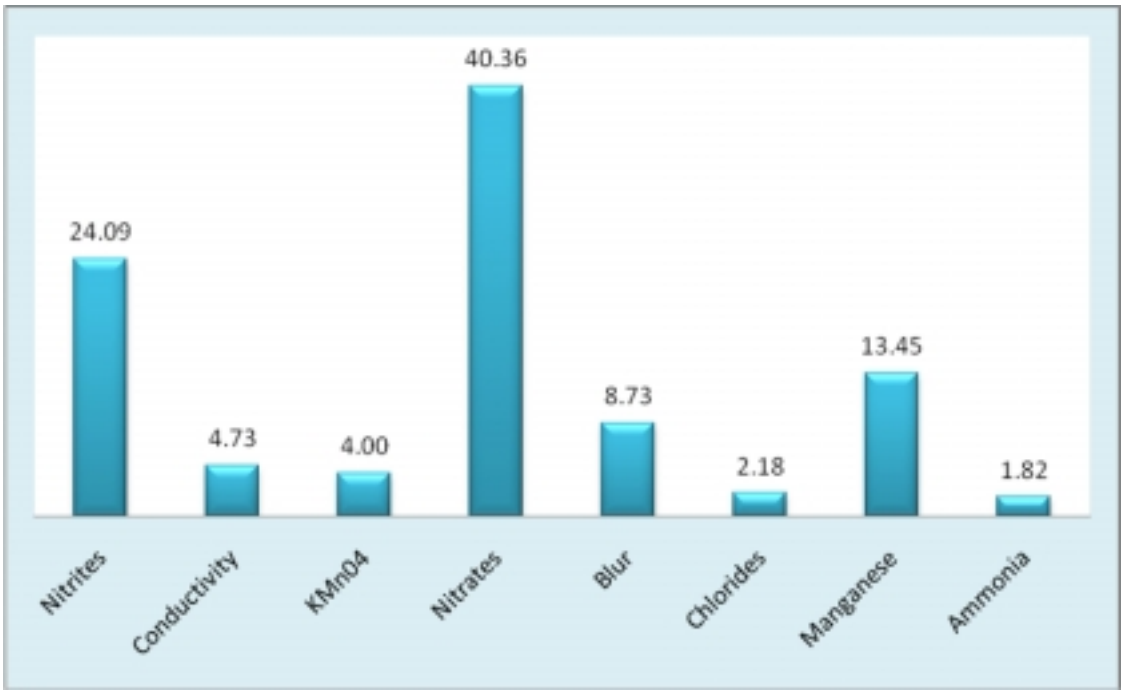
Graph number 2: The proportion of microbiological and physic-chemical contaminations.



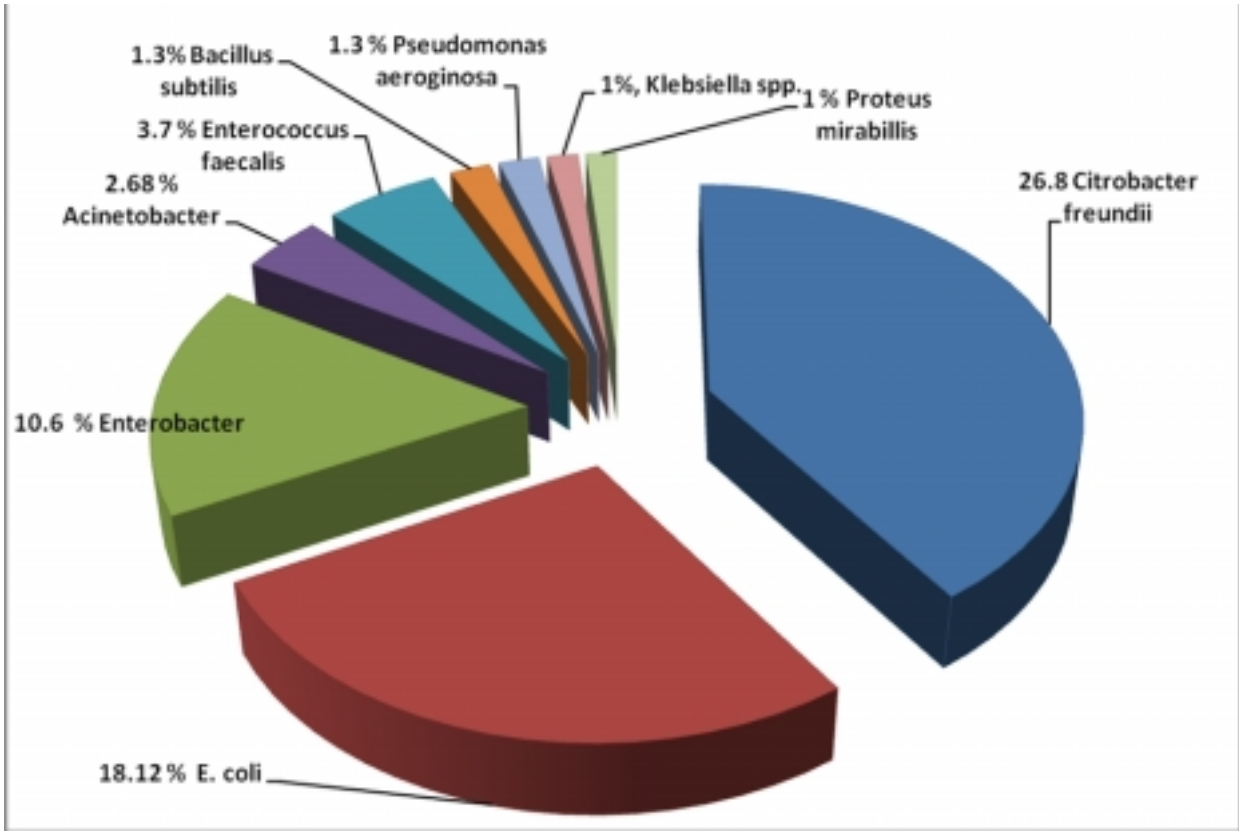
Graph number 3: Percentage of physic-chemical and bacteriological contaminations according to the seasons



Graph number 4: Percentage of physic-chemical samples



Graph number 5: Most isolated bacteria in the samples of drinking water.



Conclusions: The results of the survey indicate a relatively high degree of bacterial and chemical contamination of drinking water in rural schools of the municipality of Gjilan with direct risk to the health of school children. Results indicate the necessity of taking immediate precautionary measures and to improve the quality of drinking water.

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