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Determination of the Microbial Contamination of Ground Waters in Iran

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ABSTRACT

The objective of the study is examining the microbial quality of drinking water in Rasht's villages. In Guilan province, a coastal plain and an area of low-lying land, with a low altitude at sea level and upper level of underground water supply, waste water leakage can be one of the contaminating factors of underground water supplies. Fertility of this province makes its rural population sporadic and it is costly and almost impossible to provide water supply pipe cover. The major source of water in rural areas is hand-dug well water, therefore considering the quality of this type of water is important in terms of healthcare and it will increase the provincial health indicators. during the 8 months of carrying out this research, from September 2011 until February 2012, quality of drinking water in terms of microbes were specified by sampling and bacteriology tests of 16 drinking water wells of rural areas around Rasht with thrice sampling and testing of each well.Total coliform contaminations were observed in the following villages: Atashgah, Kheshte Masjed, Dafchah, Rashtabaad, Falakdeh, Mishamandan and faecal coliform contamination specified in 4 villages of Atashgah, Siah Golvandan, Fakhab, and Balasbaneh.
KEYWORDS : The villages of Iran, Guilan province, contamination, Underground water supply, Coliform .

1-INTRODUCTION

Irregular increase in population growth, the extension of urbanization and industrialization regardless of the infrastructures have caused many problems among which water contamination is one of their major examples. Microbial contamination of major urban systems has the potential to cause large out breaks of water born disease. Ensuring quality in such systems is therefore a apriority. Nevertheless, the majority (around 80%) of the global population without access to improved drinking-water supplies resides in rural areas [9]. On the other hand, population growth has increased the amount of sewage and waste. There is a common misconception among people that groundwater is generally safe for human consumption. However, it is not correct to presume that ground water is generally safe owing to qualitative changes in ground water, especially in the high-density residential areas where sewage disposal practices are not proper [2, 9]. In regard with this point and assuming the fact that areas without healthy infrastructures such as places for waste disposal and also lack of collection, treatment and disposal systems of waste water traditionally release these waters into absorption wells which can be able to leak contaminations to underground bodies of water, contamination of underground water supplies is inevitable and irrecoverable [1, 3]. Significant changes include the mentioned parameters of table 1. .

Table 1.Main parameters in determination of water quality

Parameters	Main variables
Physical	Turbidity, taste, smell, color, temperature, etc.
Chemical	pH, Detergents, Saline, TOC-COD-BOD, Water hardness
Bacteriological	Microbial indicators including presence of coliforms

Microbial risky parameters which threaten drinking water supplies and human health include bacteria, viruses, protozoa, rickettsia, spirochetes, algae, and helminthes [7, 4]. Water analysis as an attendance of all hazardous and pathogenic factors is time consuming and costly, therefore a certain group of microbes has used as microbial indicators which are indicative of the presence of other pathogenic microbes, and special survey will be operated if only there would be a doubt about the presence of a certain bacteria. Most water related pathogenic factors will be present in water through faces, thus intestinal organisms are known as the indicator [9]. Head of these intestinal coliforms, *Escherichia coli*, is very important and it exclusively presents in the intestinal tract of warm blooded animals, and transmits to the

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environment in large amounts. Moreover, there are coliforms from outside of intestinal tract [8, 9]. These saprophyte organisms are mostly present in herbal and animal waste in moist soils. Among specific methods of evaluation and confirmation of coliforms, multiple tube method using the MPN table and membrane filtration method can be mentioned [2, 9, and 5]. This research was conducted with the purpose of considering microbial contamination of underground water supplies in rural areas of Rasht from September 2011 until February 2012. Other aims of this study include underground water supplies management based on scientific principles, determination of health frontage for water wells, and improvement of hygiene, development and health indicators.

2-MATERIALS AND METHODS

Microbial sampling of well waters in rural areas of Rasht was performed in 3 periods of September, October and November considering the importance of the frequency of microbial analyses in order to reach higher certainty in the results. Because of the multiplicity of water wells in respected villages, 16 wells in residential parts of rural areas were specified as samples of this cross sectional research. The specifications of several wells have been provided in table 2. Sampling and transportation of samples were done based on Iran standard number 2348, and recommended tests were administered based on scientific standards of water test methods of M.P.N/100ml and membrane filtration [2, 3, and 6].Results ,Studying on the microbial test results of sample wells specified that 6 areas had a major contamination of total coliform, the villages of Atashgah, Kheshte Masjed, Dafchah, Rasht Abad, Falakdeh, Mishamandan had total coliform contamination(Table No.3) and the villages of Jobaneh, Mishamandan, Atashgah, and Pirbazar had thermo tolerant coliforms (faecal). The results of these faecal or thermo tolerant coliform tests are present in table 4.

Table2. The specifications of sample-collected wells

NO.	Name of village	Discharge of the well	Depth of the well	Morphology of district
1	Atshgah	6	6	Abyssal plain
2	Mobarak Abad	6	6	Abyssal plain
3	Polkouh	12	18	Abyssal plain
4	Balasbaneh	6	6	Abyssal plain
5	Taaleshaan	10	12	Abyssal plain
6	Pishevar	6	6	Abyssal plain
7	Khesht Masjed	6	6	Abyssal plain
8	Dafchaah	6	6	Abyssal plain
9	Rashtabaad	6	6	Abyssal plain
10	Siagolvandan	6	18	Abyssal plain
11	Gourabjir	8	12	Abyssal plain
12	Marz Dasht	12	24	Abyssal plain
13	Jobaneh	6	8	Abyssal plain
14	Falakdeh	6	6	Abyssal plain
15	Mishamandaan	8	12	Abyssal plain
16	Fakhab	6	8	Abyssal plain

Table3. Level of Total Coliforms (TC / 100 ML)

Name of village	Sep 2011	Oct 2011	Nov 2011
Atshgah	23	20	18
Mobarak Abad	0	0	0
Polkouh	0	0	0
Balasbaneh	0	0	0
Taaleshaan	0	0	0
Pishevar	0	0	0
Khesht Masjed	48	48	42
Dafchaah	52	50	52
Rashtabaad	23	17	18
Siagolvandan	0	0	0
Gourabjir	0	0	0
Marz Dasht	0	0	0
Jobaneh	0	0	0
Falakdeh	5	0	0
Mishamandaan	107	123	124
Fakhab	0	0	0

Table4. Level of Fecal Coliforms (FC / 100ML)

Name of village	Sep 2011	Oct 2011	Nov 2011
Atshgah	9	8	9
Mobarak Abad	0	0	0
Polkouh	0	0	0
Balasbaneh	7	11	9
Taaleshaan	0	0	0
Pishevar	0	0	0
Khesht Masjed	0	0	0
Dafchaah	0	0	0
Rashtabaad	0	0	0
Siagolvandan	23	19	21
Gourabjir	0	0	0
Marz Dasht	0	0	0
Jobaneh	0	0	0
Falakdeh	0	0	0
Mishamandaan	0	0	0
Fakhab	3	3	1

3- CONCLUSION AND DISCUSSION

It was specified in the studies that most of the villages with positive results in regard to coliform presence, in the second and third repetitions were positive. It shows minimum error rate in sampling, transporting and performing the tests. Villages of Miahamandan, Jobaneh, Atashgah and Pirbazar had faecal coliform contamination. This study confirmed that several factors such as the proximity of well to waste water wells (8meters) and low height of well casing above ground level and lack of well cap, mainly cause to contamination leakage to these wells.Given the geographical conditions of this area and microscopic findings of the tests and also according to the fact that the only source of drinking water supply in rural areas of Rasht is well water, it is necessary to examine the quality of this area's drinking water by related experts and teach them special instructions including chlorination and waste disposal in order to prevent leakage of pollutants to water supplies. Considering the geographical condition of this low land and plain area, an adequate proximity of wells related to health threatening factors such as waste water wells must be observed. In this case many types of microbial contamination could be eliminated by a simple chlorination and there could be no health problem for the locals. Therefore it seems necessary that Guilan province water and Sewage Corporation, by help of involved people and media and related specialists, in the first stage must consider health education of villagers and then with several scheduled controls and sampling of suspicious contaminated wells and performing favorable tests improve health and hygiene indicators in this area.

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