Role of Laboratory Tests and Ultrasound in Detection of the Dangers of Total Dissolved Solids in Drinking-Water

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Abstract: One of the primary goals of WHO and its member states is that “all people, whatever their stage of development and their social and economic conditions, have the right to have access to an adequate supply of safe drinking water Total dissolved solids (TDS) is the term used to describe the inorganic salts and small amounts of organic matter present in solution in water. The principal constituents are usually calcium, magnesium, sodium, and potassium cations and carbonate, hydrogencarbonate, Chloride, sulfates, and nitrate anions The method of determining TDS in water supplies most commonly used is the measurement of specific conductivity with a conductivity probe that detects the presence of ions in water. Conductivity measurements are converted into TDS values by means of a factor that varies with the type of water (1,2). The practical quantitation limit for TDS in water by this method is 10 mg/litre (M. Forbes, personal communication, 1988). High TDS concentrations can also be measured gravimetrically, although volatile organic compounds are lost by this method (3). The constituents of TDS can also be measured individually. The main source of drinking water in Saudi Arabia (4). TDS in water supplies originates from natural sources, sewage, urban and agricultural run-off, and industrial wastewater. Salts used for road de-icing can also contribute to the TDS loading of water supplies. Concentrations of TDS from natural sources have been found to vary from less than 30 mg/litre to as much as 6000 mg/litre (5)

Keywords: Ultrasound, Physical analysis of TDS

1. Materials and Methods

In this study, we conducted several steps for both Radiological and mineral tests in Hail, Saudi Arabia. We examined more than 100 patients from 5 regions of Hail by Ultrasound (i.e. Project, Alkhuta, Ugda, Qnaa and Twaren). Similarly, 50 samples of tap water were obtained from all these 5 different areas of Hail.

Step 1

Two-ml. samples were taken from 5 randomly selected households for each 5 region of Hail. Samples were obtained after opening the faucet and allowing tap water to run for approximately 10 minutes. A total of 50 samples of tap water were taken from all 5 areas of Hail. All samples were stored placed in sterilized tubes prior to laboratory tests.

The measurements of TDS in water samples were carried out according to the standard methods of APHA and Sawyer et al. (1994) by the filtration process. Therefore, the accuracy and precision of following methods are well approved and cited in the scientific literature. The TDS of the water samples were determined by the gravimetric method. After filtration for TSS analysis, the filtrate was heated in oven at above 100°C until all the water was completely evaporated. The remaining mass of the residue represents the amount of TDS in a sample.

Step 2

Examine 20 patients for each 5 region of Hail in various ages from 10 to 60 years by ultrasonography and saved all images and reports by portable ultrasound machine.

Step 3

Analyze and conjugate all results each other.

2. Results

In early studies, inverse relationships were reported between TDS concentrations in drinking water and the incidence of cancer (6), coronary heart disease (7), arteriosclerotic heart disease (8), and cardiovascular disease (9,10). Total mortality rates were reported to be inversely correlated with TDS levels in drinking-water (11,12). It was reported in a summary of a study in Australia that mortality from all categories of ischaemic heart disease and acute myocardial infarction was increased in a community with high levels of soluble solids, calcium, magnesium, sulfate, chloride, fluoride, alkalinity, total hardness, and pH when compared with one in which levels were lower (13). No attempts were made to relate mortality from cardiovascular disease to other potential confounding factors. The results of a limited epidemiological study in the former Soviet Union indicated that the average number of "cases" of inflammation of the gallbladder and gallstones over a 5-year period increased with the mean level of dry residue in the groundwater (14). It should be noted, however, that the number of "cases" varied greatly from year to year in one district, as did the concentration of dry residue in each
district, and no attempt was made to take possible confounding factors into account.

By our examinations by ultrasound we detected 40% of cases renal stones and more gravels, 10% of renal cysts and 2% within renal, ass and 48% within normal tecture.

The Physical analysis reveals;

The total dissolved solids (mg/L) content of water samples:

<table>
<thead>
<tr>
<th>Sample</th>
<th>TDS (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Project</td>
<td>229</td>
</tr>
<tr>
<td>2 ALkhuta</td>
<td>724</td>
</tr>
<tr>
<td>3 Ugda</td>
<td>350</td>
</tr>
<tr>
<td>4 Qnaa</td>
<td>487</td>
</tr>
<tr>
<td>5 Twaran</td>
<td>254</td>
</tr>
</tbody>
</table>

The graph is satisfied

3. Discussion and Conclusions

The results of TDS of tested drinking water samples are presented in graph (1). The results revealed that ALkhuta and Qnaa had the highest values while the Project recorded the lowest value. According to WHO, nearly 80% of all the diseases in human beings are caused by water (Venkateswarlu et al., 2011).

The differences between the numbers of the total dissolved solids in different area focused their attentions on more detected Qnaa directly increase with increasing TDS, this study covers a 100 patients and 50 samples tap water. Those tested and analyzed (material and method)

References


