Analytical and Biogeochemical Studies of Gall bladder Stones of Patients in Baghdad Hospitals

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Abstract
This study includes an investigation about biogeochemical composition of gall bladder stones in some patients who use groundwater (well water) in Baghdad city. Samples of stones collected from patients with surgery of gall bladder removing. 15 samples were collected from residents of Jissr Diyala area where there was water scarcity forcing people in these areas to dig wells for use of cooking and drinking.

Samples were collected from the gall stones of the injured in the Baghdad AL-Jadeda area who used filtered tap water for comparison. The highest ratio of stones was for pigment type with (80%) in areas where wells were used for domestic purposes while the percentage of cholesterol stones (Cholelithiasis) was 20% in the same area. Patients used tap water and cholesterol stones were the highest ration than pigment stones.

Keywords: Gall bladder, biochemical study, analytical study, pigment stones.

Introduction

Gall stone disease is a morbid problem. This occurs when the amount of bile and other liquid chemicals inside the gall bladder become unbalanced. In such a state, some of chemicals solidify and form gall stone (a sediment). They may begin as small particles and if the bill is abnormal, stones gradually forms around the bacteria that irritate the gall bladder.

The essential part of the gallstone pathogenicity is the study of the chemical composition of stone formed and collected[8]. This procedure is followed with any other type of stone that may be formed in the human body whether it is in gall bladder or kidney or other[2].

Knowing the actual composition of the stone provides a clear indication of appropriate treatment for the disease. If the stones remaining in the gallbladder, it may not cause any problem to the patient. However, some patients may have repeated episodes of infection and pain.

Bile contains water, cholesterol, fats, bill salts, proteins and bilirubin (waste product). yellowish-brown color of bile and stool came from the breakdown of fat and bilirubin by bile salts. If the liquid bile contains too much cholesterol, bile salts or bilirubin, it can be transformed into gall stones[6]. Three types of gallstones can be found: cholesterol (pure), pigment and mixed stones. Also pigment stones can be subdivided to brown and black stone. Cholesterol stone is made up of more than 70% of hard cholesterol, while pigment stones contain less than 20% of cholesterol in its contents, cholesterol stones are usually yellow – green and, they account 80% of gall stones. Pigment stones are small, dark stones made of various bilirubinate salts with less of cholesterol[10,20].

Gall stone are more common in female than in males with a ratio of 3:1. Many factors increase the risk of stone formation and recurrence including age, (where the risk increase with age), genetic gender, obesity, nature of food, climate and sources of water consume[22]. Gall stone can block the normal flow of bile if they move from the gallbladder and lodge in any of the ducts that carry bile from liver to the small intestine, such ducts include, hepatic ducts, cystic ducts and common bile ducts, bile trapped in these ducts can cause inflammation in the gallbladder or in the liver in some rare cases[7].

Low fiber and high fat in diet made peoples more susceptible to getting stones, also in obese one, who have inflammatory bowel disease and other digestive disorders it was observed that gallstones increased in patient with elevated levels of sugar serum lipids[5]. Water used for personal uses plays an important role in the formation or preventing of gall stone disease, it would make sense that the quality of water should be just as important as the quantity[1].

The study of the chemical structure of the gallstones of all types gives a sufficient evidence to find the appropriate and the best way to prevent recurrence in the patients. So, the aim of this study was to identify the main features of gall stones disease in some area in Baghdad city and analysis of the main composition of the stone collected according to the sources of water that patient consumed.

Material and Methods

Apparatus:

1. Flame Atomic Absorption spectrometer type (6200 AAS Shimadzu spectrophotometer) was used for elements analysis.
2. Centrifuge (speed 4000rpm) to separate the particles from the well water samples.
3. Many plastic tubes, Eppendorf, stick and stirrer sterilized before use with deionized water to avoid the contamination or pollution from the round space.

Sampling: Fifteen samples have been collected from residents of Jissr Diyala bridge area where lack of water is forcing people to dig wells in their homes to compensate for the shortage of water which is sometimes used in cooking. Also, water samples are collected from wells drilled in the homes of the injured after the investigation of their addresses.5 gallbladder stones samples of patients from the area of Baghdad AL-Jadeda were also collected (who use well water), two samples of gallbladder stones of patients who use water train were collected for comparison. All the water samples were saved in a sterilized plastic container and acidized it using strong acid (Concentrated HCL) to increase the solubility of elements in water.

Analysis:

A. Water: The waste water samples and gallbladder stones samples (after digestion with concentrated nitric acid and diluted with deionized water) were analyzed to detect their containing from the elements under study. Calcium (Ca), Copper (Cu), Lead (Pb), Nickel (Ni) and Magnesium (Mg) standard solutions covering the concentration range (0.5, 1.0, 1.5 and 2.5) µg\ml were prepared by the dilution of the standard solution (1000 µg\ml) for each element with metal free water (deionized water) and stored in tightly closed polyethylene bottle. Using the range of concentrations (0.5-2.5 µg\ml) for the elements and waste water, samples were analyzed under the standard curves which appear in figure 1.

B. Stones: The types of stones were determined by the observation by the naked eye., depending on color and texture. Yellow or white were cholesterol stone, yellow to brown or black were considered as pigment stone.

Results and Discussion

Using Shimadzu Atomic Absorption Spectrometer, the concentrations of the elements under study were analyzed and the results are presented in table 1.

According to table 1, the well water of Jissr Diyala region was more polluted from the others, wells number 1, 4, 10 and 14 showed higher calcium, copper, nickel, lead and magnesium concentrations (when compared with the normal value of all these elements[21]. Also, magnesium levels are increasing in all wells of Jissr Diyala region. In general, all the wells which are dig in Jissr diyala region had higher levels in all the elements under study. In the Baghdad AL-Jadeda region, it was shown that the results of the elements in the wells water are less than in the Jissr Diyala region, all elements levels appeared in moderate higher than the normal value, Under our study elements results in the tap water of Baghdad AL-Jadeda region showed a normal values of all the elements: calcium, copper, nickel, lead and magnesium.

Samples of gall bladder stones of population who used the wells water are also analyzed, after digesting by strong acids. All the results appeared in table 2. In previous study, it was shown that the sludge is a common term that is applied to an abnormality of bile that is seen with ultrasonography of the gall bladder. Specifically, the bile within the gall bladder is seen to be of two different densities with the denser bile on the bottom. The bile is denser because it contains microscopic particles, usually cholesterol or pigment. The colors of gall bladder stones reflex the containing of them from the elements under our study, the highest ratio of stones was for pigment type with (80%) in areas where wells were used for domestic purposes while the percentage of cholesterol stones (Cholelithiasis) was (20%) in the same area.

Patients using tap water cholesterol stones were the highest ration than pigment stones with 90%. The patients who used Jissr Diyala region wells water appeared as dark especially the kinds for the patients who used the polluted well water, when the polluted wells water are compared containing stones; it appears as dark that deals with it consisting them from the elements which take a higher concentrations. Samples number 1,4,10 and 14 appeared as a dark color as in figure 4b. The elements concentrations appeared as higher than the other stones samples in the same region (Jissr Diyala region).

In Baghdad AL-Jadeda region the stone samples number [1,2] take moderate high levels of the elements under our study than the other stones of patients who used the other wells water in the same region, the colors are light dark and brownish. The last stones samples collected from the gall bladder of the patients who used the tap water, appeared as yellowish color consisting of cholesterol.

Gall stone disease is one of the most common and expensive in treatment in western countries especially in the United State[24], where the disease usually spread between women suffering from overweight and obesity as well as the nature of nutrition often depends on fast food[17,18]. In the middle east this disease is widely found in many countries, especially in Iraq and in areas where water is scarce, The residents have to resort to digging wells to get it and therefore may be infected by many diseases including gall stones, kidneys and bladder problems as a result of the quality of water rich in contaminated metals.

However, studies in these areas have been based on an epidemiological study of the disease, but they have neglected the main cause, which is to examine the quality and viability of human use of water[9,12,16,23]. Pigment stones were the most abundant type of gallstone among Iraqi patients of the current study. These finding agree with other studies in Libya, Sudan, India. Region. It was upper than the normal value in the home- used water[13].

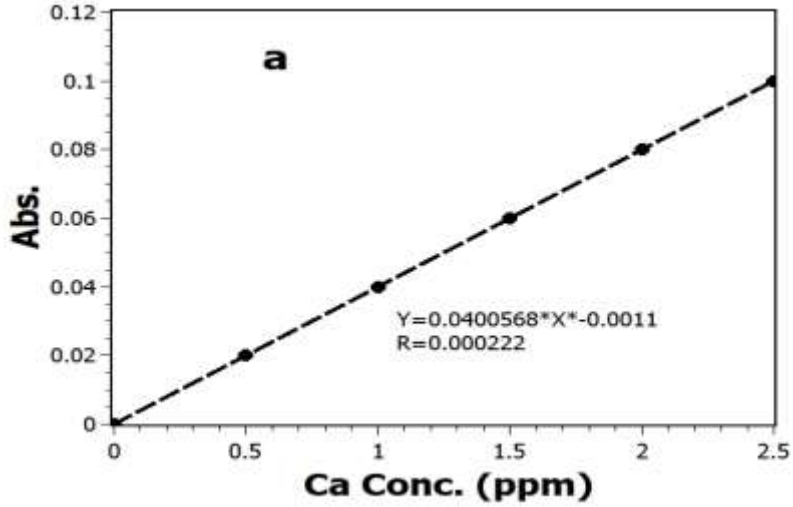
The color of most of the stones collected from patient in Baghdad AL-Jadeda which is yellow to white reflects the effect of diet not the water. From the analysis of wells water, it was found that the increase in the elements in some regions especially in Jissr Diyala, in which water was more polluted with many elements such as Nickel, Lead, Cooper and others

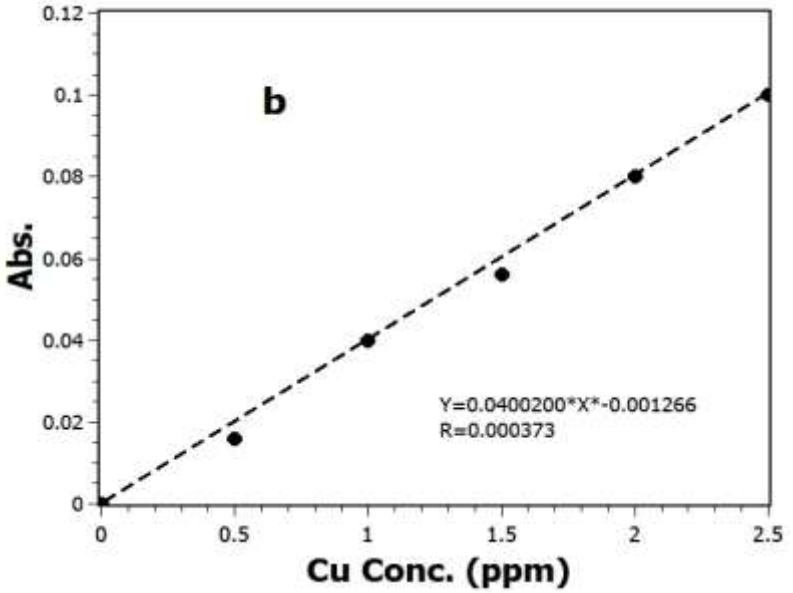
elements with levels was higher than their normal values. Many researchers showed the importance of water to prevent the gall bladder from containing a stone, the water supply safety depending to it contains[13,14,19]. In U.S.A most tap water is not safe for dinging due to heavy industrial and environmental pollution, toxic bacteria, chemicals and heavy metals routinely penetrated and polluted the natural source of water making people sick while exposing them to long term health consequences such as liver damage, cancer and other serious conditions[11].

The results of our study agreed with several studies conducted in different cities of Iraq, which have specialized in finding the most important causes of gallstones in Iraq[3,4,15]. We concluded that the contains and chemical composition of water consumed by patient under study has a significant impact on the formation of gall stone and also determines the type of stone that is formed depending on the quality of the elements and the accumulated components under the effect of water source whether tap or well water.

Table 1
Elements Concentrations in the Well water

Type of samples	No. of samples	Elements Concentrations (µg/l)				
		Ca	Cu	Ni	Pb	Mg
Well water of Jissr Diyala area	1	350	0.22	0.152	0.266	11.43
	2	106	0.19	0.042	0.077	8.61
	3	232	0.20	0.032	0.085	8.09
	4	333	0.21	0.101	0.186	9.33
	5	164	0.10	0.093	0.093	7.12
	6	156	0.076	0.066	0.107	8.02
	7	177	0.055	0.054	0.099	7.05
	8	213	0.17	0.083	0.087	8.43
	9	255	0.13	0.034	0.100	8.02
	10	310	0.23	0.110	0.096	7.00
	11	268	0.19	0.051	0.067	6.77
	12	221	0.20	0.032	0.073	5.94
	13	208	0.16	0.045	0.120	6.00
	14	322	0.24	0.121	0.152	9.44
	15	244	0.19	0.062	0.096	7.09
Well water of Baghdad AL-Jadeda area	1	102	0.07	0.0052	0.096	5.40
	2	113	0.08	0.0041	0.088	4.97
	3	91	0.02	0.0032	0.047	4.82
	4	95	0.03	0.0019	0.055	3.98
	5	87	0.02	0.0017	0.031	4.91
Tap water of Baghdad AL-Jadeda area	1	33	0.03	0.0012	0.0013	3.64
	2	23	0.01	0.0009	0.0010	4.02


a
Abs.
Y=0.0400568*X*-0.0011
R=0.000222
Ca Conc. (ppm)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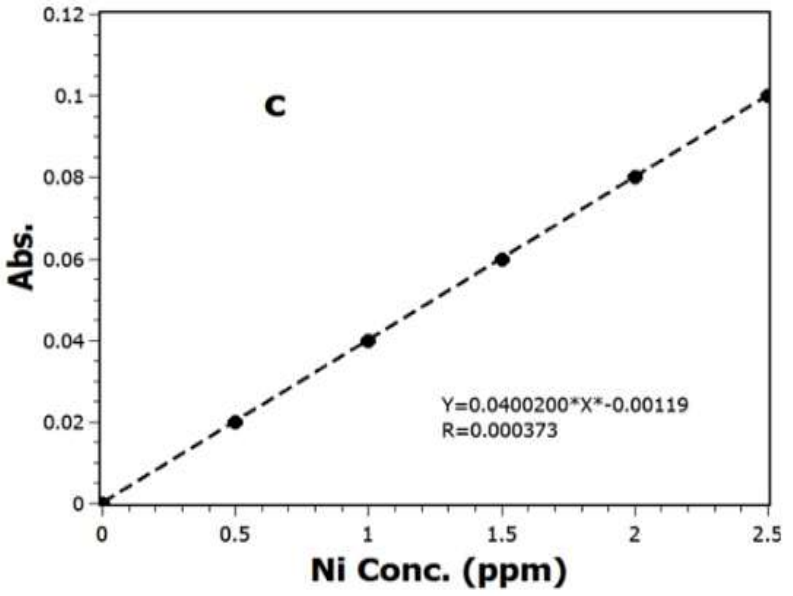
Cu Conc. (ppm)


c
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R=0.000373
Ni Conc. (ppm)

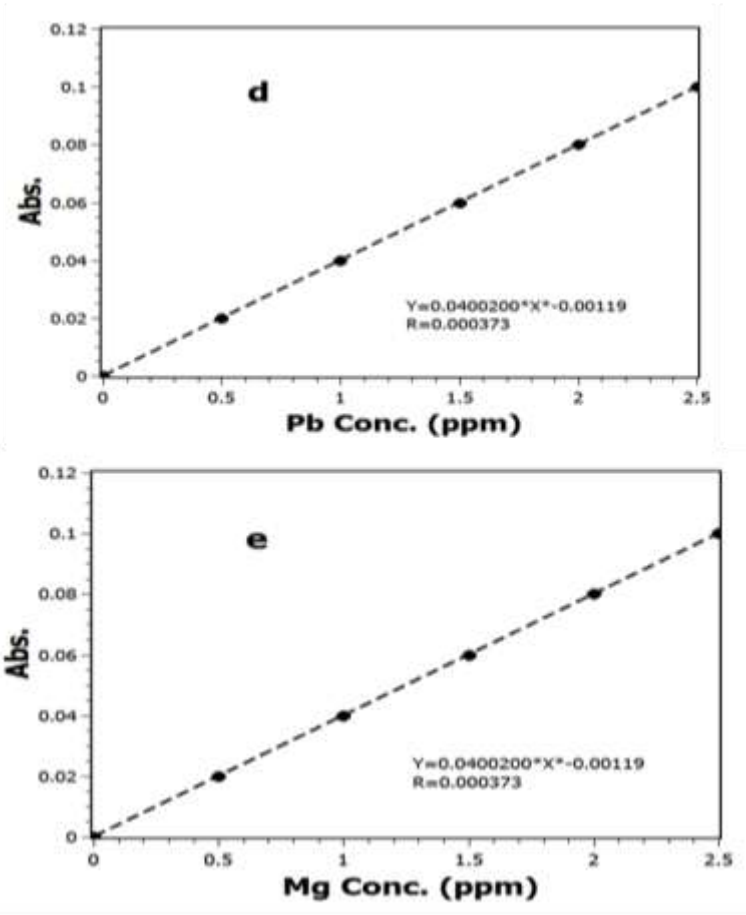

Figure 1: Calibration curve for the (AAS) determination of (a-) calcium, (b)-Copper, (c)-Nickel, (d)-Lead, (e)- Magnesium in samples

Table 2
Elements concentration in the Gall bladder stones

Type of samples	No. of samples	Appearance of gall bladder stones		Elements Concentrations(µg/ml)			
			Ca	Cu	Ni	Pb	Mg
Patients who used Well water of Diyala Bridge area	1	Dark	2.09	0.024	0.021	0.002	2.10
	2	Yellowish	0.76	0.006	0.002	0.001	0.27
	3	Light dark	0.94	0.003	0.001	Nil	0.41
	4	Dark	1.21	0.001	0.005	Nil	1.32
	5	Yellowish	0.34	0.001	Nil	Nil	0.25
	6	White to dark	0.55	0.002	0.001	Nil	0.89
	7	Yellowish	0.22	0.005	Nil	Nil	0.51
	8	Yellowish to dark	0.89	0.003	0.001	Nil	0.56
	9	Yellowish	0.21	0.004	Nil	Nil	0.31
	10	Dark	1.32	0.012	0.021	Nil	1.02
	11	Yellowish	0.74	0.001	0.001	Nil	0.51
	12	Yellow to brown	0.42	0.003	Nil	Nil	0.72
	13	Brownish	0.71	0.002	Nil	Nil	0.44
	14	Dark	0.99	0.010	0.001	0.001	1.04
	15	Light dark	1.00	0.001	0.001	Nil	0.61
Patients who used Well water of Baghdad AL-Jadeda area	1	Light dark	1.03	0.005	0.001	Nil	0.98
	2	Brownish	0.64	0.002	Nil	Nil	0.46
	3	White to dark	1.02	0.003	Nil	Nil	1.00
	4	Brownish	0.77	0.004	Nil	Nil	0.72
	5	Brownish	0.62	0.006	Nil	Nil	0.66
Patients used Tap water 0f Baghdad AL-Jadeda area	1	Yellowish	0.52	0.002	Nil	Nil	0.12
	2	Yellowish	0.19	0.003	Nil	Nil	0.31

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