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The effect of sulfuric eyes on the blood and hormonal components of the people who live near them in the district of Heet

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Abstract

This study was conducted for the period between (September 11, 2018) to (October 31, 2018) in Heet District / Anbar Governorate, on sulfur springs located in the Al-Jabal region (Al-Khader neighborhood), and it included a study of the effects of sulfur eyes on the blood and hormonal study of people Who live near it. This study included (100) females and males , and it was divided randomly into five groups (males and females) separately, and each group included (10 females and 10 males) and their ages ranged from 18 to 50 years. It included the following groups:- the groups were divided into five groups, the first group:- (control group) people who are away from the sulfur springs between (100 - 200) meter, the second Group:- People who are 10 meters away from sulfur springs. the third group:- People who are 30 meters away from the sulfur springs, Fourth group:- People who are 50 meters away from sulfur springs and Fifth group:- People who are 70 meters away from sulfur springs The results of the effect of hydrogen sulfide H2S gas emitted from the sulfur eye showed significant increase ($P \leq 0.05$) in the number of red blood cells and hemoglobin in the second and third group compared to the control group, and also a significant increase in the number of blood platelets in the third and fifth group, a significant increase was also recorded in the number of white blood cells in fifth group only. The presence of significant differences in the concentration of malondialhyde for the specified distances compared to the control It was observed that there was a significant increase ($P \leq 0.05$) in the group located at a distance of (second, third, fourth and fifth) groups in the groups of females compared to the control group and the males group. There were no significant differences after (third and fifth) in the males group compared to the control group. There are significant differences in the concentration of glutathione for the specified distances compared to the control. It was observed that there was a significant decrease ($P \leq 0.05$) in the group located at third and fourth groups compared to the control group. there were no significant differences at (second and fifth) groups compared to the control group and other groups. The effect of sulfur eyes on hormonal changes in people living near sulfur eyes, it was found that there was a significant decrease in (second , third and fourth) groups for testosterone compared to the control group. The same applies to the hormone progesterone, a significant decrease in (second and fourth) groups. As for the results of the field research, the observations showed a significant increase($P \leq 0.05$) in the amount of hydrogen sulfide gas in the area near the sulfur spring, as it has a clear effect. Some people who live near it have been observed with genetic and pathological symptoms such as eye inflammation and redness, as well as there are respiratory problems and allergies in the trachea, and there are problems with the sense of smell and taste. It was noted that there are some genetic diseases on some children.

Keywords: H_2S; sulfuric eyes ; blood ; hormone ; malondialhyde

1. Introduction

The city of Heet and its surroundings are characterized by the abundance of sulfur springs and springs resulting from the city being located in what is known as the Abu al-Jir Fault. Which is located in the western part of Iraq west of the Euphrates in the Al-Anbar governorate is represented by the coordinates (Longitude 42o 15 '- 42o 57) (33o 15' - 33o 42 'Latitude) [1] , [2]

Sulfur springs have a temperature of 25 °C [3]. Sulfur is present in natural waters in many forms, more of which are the negative sulfate ion SO_4^{2-} combined with the positive ions present in that water, in varying concentrations ranging from a few milligrams to thousands of milligrams per liter of water, and there are other forms of sulfur such as sulfide S^{2-}, which is an intermediate and unstable radical that quickly turns into thiosulfate $S_2O_3^{1-}$ or quickly oxidizes to sulfate $SO_4^{2-}$when sufficient amount of oxygen is available [4]

As for the most dangerous forms of sulfur, it is sulfide, which in turn takes three forms: H_2S , S^{2-}, HS^{1-}

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These three forms when present in water depend on the pH value. Among the most prominent and harmful forms is hydrogen sulfide H_2S [5], [6]

The following picture shows the sulfur springs in the mountain area in the city of Heet:

The sulfur springs in the Heet region emit water and gases, accompanied by a group of chemicals and tar. The smell of gases emitted from these eyes can be inhaled from a short distance, and the water of the eyes is characterized by being rich in chloride, sulfate, sodium and calcium ions [3], [2]

Hydrogen sulfide is heavier than air and is a colorless, flammable, and extremely dangerous gas that smells like a "rotten egg". Some of the common names for gas include sewage gas, swamp gas. People can usually smell hydrogen sulfide at low concentrations in the air, ranging from 0.0005 to 0.3 parts hydrogen sulfide per million parts of air (ppm) and at high concentrations or low concentrations, but the exposure is continuously lost. A person's ability to smell this matters because a person may falsely believe that hydrogen sulfide is no longer present and this is called olfactory fatigue [7] (When the smell of rotten eggs is first noticeable to some) This is known as the odor threshold. The odor becomes more offensive at 3-5 part per million and there are certain limits to a person's exposure to hydrogen sulfide gas [8]

The health effects of hydrogen sulfide gas can vary, depending on the concentration level of the gas and the duration of exposure. Because repeated exposure at low concentrations works on inflammation of the eyes and shortness of breath, these effects can be delayed for several hours, or sometimes several days, when working at low concentrations. A brief exposure to high concentrations of hydrogen sulfide (greater than 500 ppm) can cause Loss of consciousness and possibly death. For typical environmental concentrations of hydrogen sulfide (0.00011--0.00033 ppm) [4]. The smell is strong and strong at a concentration of 20-30 (mg/liter) and causes loss of consciousness and possibly death at a concentration higher than 400 mg / liter [6]

The research problem lies in trying to find appropriate solutions to reduce the harmful effects of hydrogen sulfide gas on people living near sulfur springs in the mountain area in the city of Heet, and on his respiratory system and on its blood and hormonal components. Since hydrogen sulfide gas is considered one of the harmful gases to human health in particular, and living organisms in general, it was necessary to focus on this topic to see more clearly in studying the risks of hydrogen sulfide gas on human health, especially for people who live near sulfur springs in the city of Heet, specifically the mountain area [9]

And due to the lack of studies on this subject, we deemed it necessary to study the effect of sulfur springs in the Heet area, in order to know the extent of the positive and negative impact on the people living near it.

2. Aim of the study

1. A field survey in the study area on a groups of certain people who live near the sulfur spring in the mountain area in the city of Heet. The duration of their presence in this area and their blood types, sexual hormone marital status, age and gender were identified, with an estimate of the distance between their area of residence and the sulfur spring.
2. The study of the effect of hydrogen sulfide gas on Hematological test such as packed cell volume involve (Total count of red blood corpuscles), Total count of white blood cells and (Blood Platelets count)
3. Measurement of some oxidative stress enzymes. glutathione and malondialhyde in blood

3. Materials and Methods

3.1. The experience of studying

3.1.1. Divide the study samples

In this study, 100 people, males and females, were used, into 5 groups, each group included 20 people (ten females and ten males) and their ages ranged from 19 to 55 years. And as follows: -

- The first group: (control group) people who more than 100 (100-200) meter away from the eye.
- The second group:- People who are 10 meter away from the sulfur spring.
- The third group:- People who are 30 meter away from the sulfur spring.
- Fourth group:- People who are 50 meter away from the sulfur spring.
- Fifth group:- People who are 70 meter away from the sulfur spring.
- Blood samples were collected and divided in two sections the first section was put in test tubes free of anticoagulant for the purpose of conducting biochemical tests later
- A second section was put in tubes containing anticoagulant EDTA for hematological tests.

3.1.2. hematological Tests

3.1.2.1. Determination of Packed cell volume (PCV)

Capillary tubes of 75 mm in length and 1 mm internal diameter were used. Two-thirds of the capillary tube was filled with blood by capillary action, after which one end of it was closed with a special paste, then the tube was placed in a Microcenterfuge at a rotation speed of 5000 rpm for 5 minutes. Then I put the volume on the hematocrit reader and read the percentage of the volume of PCV and record the results [10]

3.1.2.2. Hemoglobin Determination

The amount of haemoglobin was estimated by dividing the volume of compressed blood cells by 3 by describing that haemoglobin represents 1/3 the volume of the red blood cell (WHO, 1989).According to the following law:

Hb = pcv/3.3 g / l [1]

3.1.2.3. Red Blood Cells Count

R.B.Cs (106 / mm^3) = n Number of R.B.Cs x 50 x 200

= n x 10,000

50 = volume of diluted blood

200 = dilution ratio

3.1.2.4. Total White Blood Cell Count

The number of white cells was calculated as in the following equation: The number of white cells in 1mm3 = the sum of the number of white cells in the four peripheral squares multiplied by 50

3.1.2.5. Measuring of Platelet Rate

Platelet count was measured using (Platelet Solution). The number of platelets per mm^3 = n * 10,000) [11].

3.2. Determination of Serum Lipid Peroxides

was used. According to this method, the level of Malondialdehyde (MDA), which is one of the main products of the lipid peroxidation process, was measured[14].

***3.3. Measurement* of serum glutathione (GSH)**

Level: serum (GSH) was determined by the modified method of [15], GSH product the colored which read the absorbance at 412 nm.

3.4. Hormonal tests

The test was performed for the hormones testosterone and progesterone:

3.4.1. Progesterone

The absorbance was read by an ELISA device at a wavelength of 450 nm and the results were calculated.

3.4.2. Testosterone

The absorbance was read by an ELISA device at a wavelength of 450 nm, then we recorded the results. The kit used in the analysis of the testosterone hormone, the test used in the analysis of the hormone

3.4.3. FSH, LH and Prolactin

The ELISA device used to check hormones

3.5. Statistical analysis

The data were statistically analyzed according to the analysis of variance (ANOVA) test using the statistical program and the arithmetic means were compared using Duncun Multiple Range Test [12]and below the level of significance (P≤0.05).

4. Result and Dissociation

4.1. Hematological Tests

4.1.1. Determination of Packed cell volume (PCV)

4.1.1.1. Hemoglobin Determination

Fig. (1) (2) shows a significant increase(P≤0.05) in the percentage of agglutinated blood cells and the amount of hemoglobin at second and third groups in groups of men and women compared to the control and two groups (70,50 meters), respectively. This is due to the effect of hydrogen sulfide gas when it binds with the protein hemoglobin and prevents it from binding with oxygen and thus when the amount of oxygen

decreases due to this link, stimulates the body to produce large quantities of hemoglobin even at low concentrations, it works to weaken the cellular respiration that occurs inside The body of the animal cell, specifically in the mitochondria, as it works to inactivate the protein receptor that is found in the inner membrane of mitochondria called (Cytochrome C). [17] The negative effect of hydrogen sulfide is not limited to the body as it easily interacts with iron ions in hemoglobin molecules in the blood. As a result, iron sulfide is formed, and the blood thus loses the ability to transport oxygen. [18].

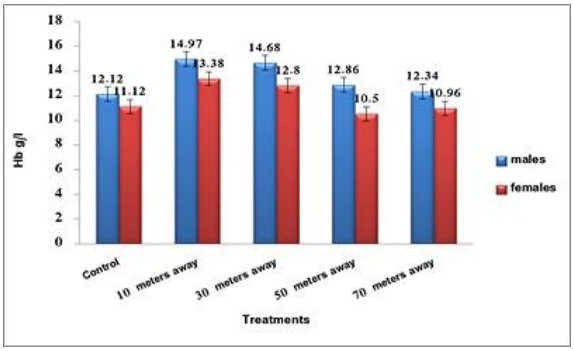


Figure (1) The effect of the distance from the sulfur eyes on the amount of hemoglobin in the blood of people who live close to them.

The number of male and females is ten for each group. Values are expressed as the mean ± the standard deviation.

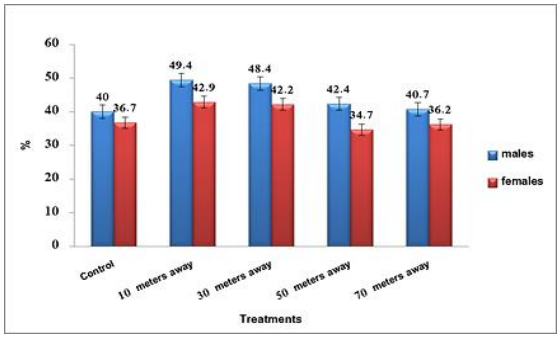


Figure (2) The effect of the different distance from the sulfur eyes on the average volume of compressed blood cells for people who live close to them.
The number of male and females is ten for each group.
Values are expressed as the mean ± the standard deviation.

4.1.1.2. Red Blood Corpuscles Count

Fig.(3) shows a significant increase in the number of red blood cells at a (second ,third ,fourth and fifth) groups for all groups compared to the control group. This indicates that there is a clear effect on the number of red blood cells, as hydrogen sulfide gas works Cytochrome C, which works to inhibit it, which is one of the important enzymes in the mitochondria that works to transfer electrons from one protein complex to another protein complex for the purpose of completing the process. Cellular respiration that occurs in the mitochondria, and thus the body responds to such a change by increasing red blood cells as well as an increase in the amount of hemoglobin as a result of a lack of oxygen in the blood [19].

The main route of exposure is inhalation and the gas is absorbed by the lungs. During the inhalation of hydrogen sulfide gas and its entry into the alveoli, it irritates the mucous membranes of the respiratory system, causing the pulmonary fluid to collect inside the lung and thus reduces the capacity of the lung to absorb oxygen and reduce the efficiency of its work, which makes the person feel shortness of breath and discomfort [20]

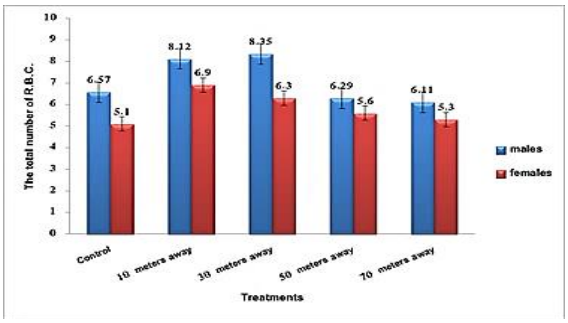


Figure (3) Effect of the distance from the sulfur springs on the total number of red blood cells for the people living close to them.
The number of male and females is ten for each group
Values are expressed as the mean ± the standard deviation

4.1.1.3. Total White Blood Cell Count

Fig.(4) shows the relationship between the number of white blood cells and the distance from the sulfur eyes. It was observed that there was a significant increase ($P \leq 0.05$) in the blood of men and women living at (second ,third ,fourth) groups compared to the control group and the fifth group. This indicates that there is an effect on the number of white blood cells at this distance, which may be due to the high concentration of exposure and the long period of exposure to the gas, or it may be attributed to genetic and immune factors.

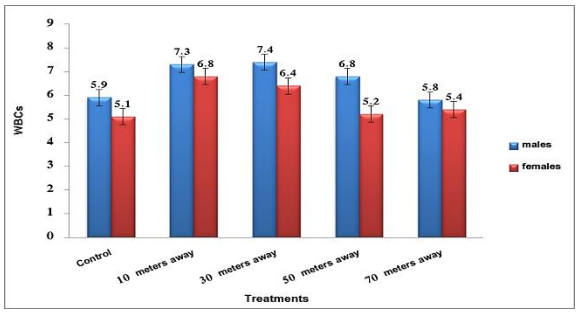


Figure (4) The effect of the distance from the sulfur springs on the total number of white blood cells of people who live close to them.
The number of male and females is ten for each group.
Values are expressed as the mean ± the standard deviation.

4.1.1.4. Count Platelet Rate

Fig. (5) shows that there is a significant increase in the total number of platelets ($P \leq 0.05$) at thirty,fourth and fifth group compared to the control group, and there were no significant differences ($p<0.05$) at the second group compared to the control group, which is attributed Increase in the number of platelets to Pollution with harmful chemicals causes free radicals that make vital systems in a state of confusion and damage represented by serious disease disorders[15].

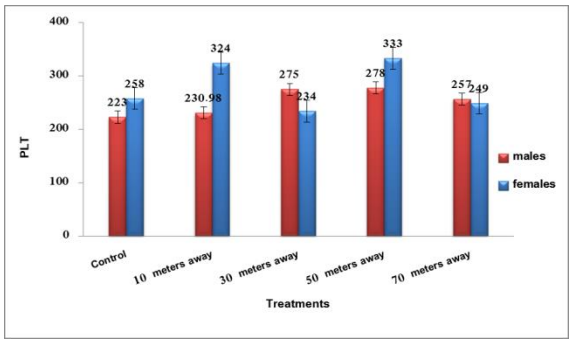


Figure (5) The effect of the distance from the sulfur eyes on the number of pressurized platelets for the people who live close to them.
The number of male and females is ten for each group.
Values are expressed as the mean ± the standard deviation.

4.2. Biochemical tests

4.2.1. Measurement of serum glutathione level

Fig.(6) shows that there are significant differences in the concentration of glutathione for the specified distances compared to the control. It was observed that there was a significant decrease (P≤0.05) in the group located at third and fourth groups compared to the control group.

There were no significant differences at (second and fifth) groups compared to the control group and other groups.

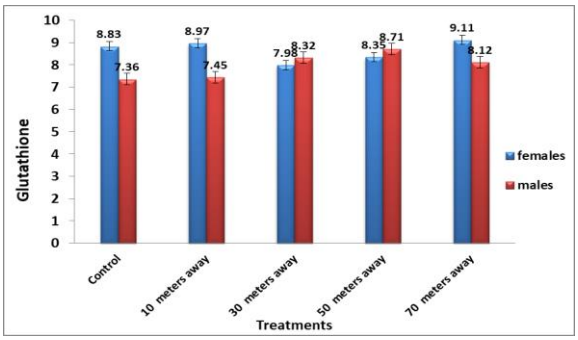


Figure (6) the effect of the distance from sulfur eyes on the concentration of glutathione for people who live close to them.
The number of male and females is ten for each group.
Values are expressed as the mean ± the standard deviation.

4.2.2. Measurement of the level of malondialhyde in the serum

Fig.(7) shows the presence of significant differences in the concentration of malondialhyde for the specified distances compared to the control. It was observed that there was a significant increase (P≤0.05) in the group located at a distance of (second ,third ,fourth and fifth) groups in the groups of females compared to the control group and the males group. There were no significant differences after (third and fifth) in the men group compared to the control group. Chemicals that have a direct effect on the body metabolism and on the cells of the body generate free radicals that create more damage and oxidative stress, which works to change the standard concentration of hormones, nervous system and others. [15], [16].

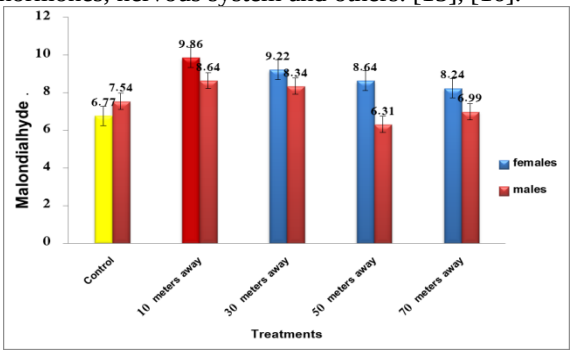


Figure (7) Effect of distance from sulfur springs on the concentration of malondialhyde for people living close to it.
The number of male and females is ten for each group.
Values are expressed as the mean ± the standard deviation.

4.2.3. Sexual Hormones

4.2.3.1. Estrogen

Fig.(8) shows significant differences in estrogen concentration for the specified distances compared to the control. It was observed that there was a significant increase (P≤0.05)in the group located at second , third and fifth groups compared to the control group. There were no significant differences at a distance of fourth group compared to the control group.

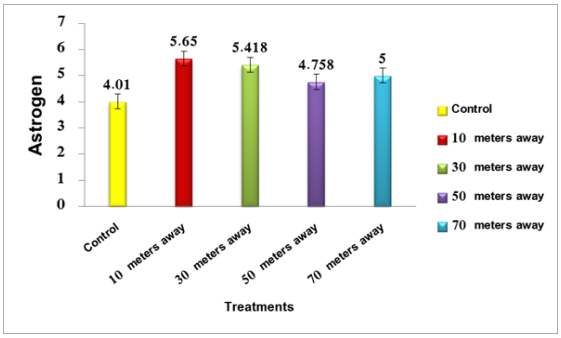


Figure (8): The effect of the distance from the sulfur springs on the concentration of the estrogen hormones living close to them.
The number of male and females is ten for each group.
Values are expressed as the mean ± the standard deviation.

4.2.4. Testosterone level measurement

4.2.4.1. Testosterone

Fig.(9) shows the presence of significant differences in testosterone concentration for the specified distances compared to the control. It was observed that there was a significant decrease (P≤0.05)in the group located at a distance of second ,third and fourth groups compared to the control group. There were no significant differences at fifth group compared to the control group.

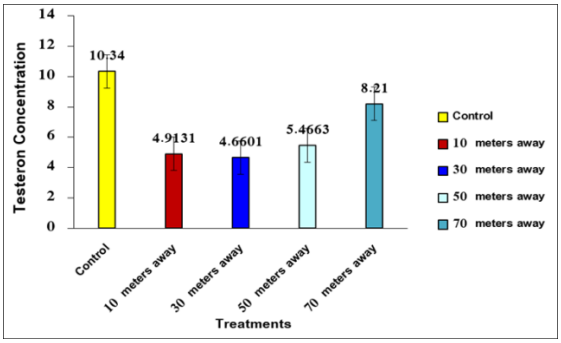
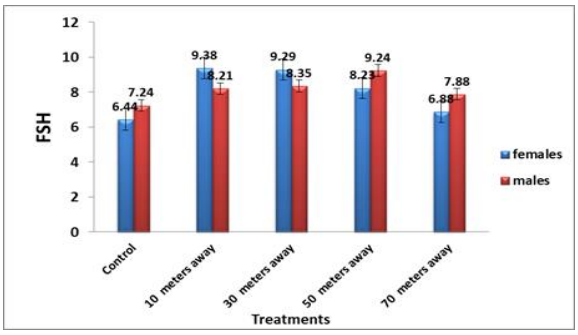


Figure (9) the effect of the distance from the sulfur eyes on the concentration of the static testosterone near them.
The number of male and females is ten for each group.
Values are expressed as the mean ± the standard deviation.

4.2.4.2. Follicle stimulated hormone (FSH)

Fig.(10) shows that there are significant differences in FSH concentration for the specified distances compared to the control. It was observed that there was a significant increase (P≤0.05)in the group located at a second ,third and fourth groups in the two

groups of men and women compared to the control group. There were no significant differences at the fifth group in in each sex compared to the control group.



Figure(10) Effect of distance from sulfur springs on the concentration of Aaron FSH for those living close to it.
•The number of male and females is ten for each group.
•Values are expressed as the mean ± the standard deviation.

4.2.5. Latinizing hormone (LH)

Fig.(11) shows the existence of significant differences in LH concentration for the specified distances compared to the control. It was observed that there was a significant increase (P≤0.05) in the group located at second, third and fourth groups in the groups of for each sex compared to the control group.

There were no significant differences at fifth group compared to the control group.

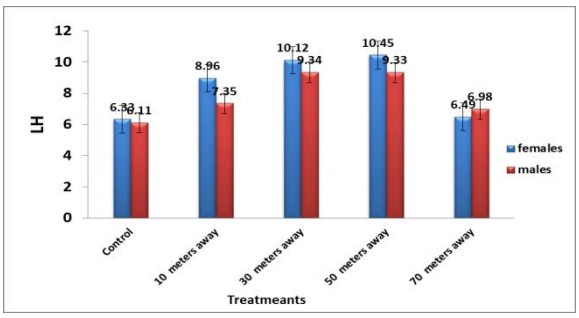


Figure (11) Effect of distance from sulfur springs on the concentration of Aaron LH for those living close to it.
•The number of male and females is ten for each group.
•Values are expressed as the mean ± the standard deviation.

5. Prolactin hormone

Fig.(12) shows the presence of significant differences in the concentration of the hormone prolactin for the specified distances compared to the control. It was observed that there was a significant increase (P≤0.05) in the group located at a distance of (10, 30 meters) compared to the control group.

There were no significant differences fourth and fifth groups compared to the control group.

The effect of radiation and chemicals on the cells of the body may be attributed to the free radicals that work to break down cells and generate more damage and harmful oxidative stress [16].

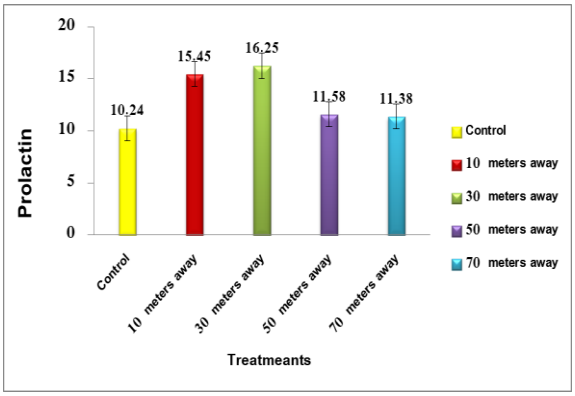


Figure (12) The effect of the distance from sulfuric eyes on the residents' prolactin hormone close to them.
The number of male and females is ten for each group.
Values are expressed as the mean ± the standard deviation.

5.1. Field research results and observations:

It was found through field research and our visit to the area that there is a significant increase in the smell of hydrogen sulfide gas within the area near sulfur eye. It was also noted on a group of people who live near the sulfur eye in the mountain region, "This sulfur eye has a clear effect on the eye in its inflammation and redness, as well as some skin infections, allergies in the trachea, breathing problems and a disturbance in the sense of smell and taste." It was noted that there are some genetic diseases on some children.

6. Recommendations

Burning the gases emitted from the sulfur springs in the district of Heet from time to time in order to reduce the hydrogen sulfide gas. This is done by enveloping the sulfur spring and making at its upper end a nozzle through which the emitted gases are burned in order to reduce and limit their spread in the air as well as from In order to protect people from the harmful effect of hydrogen sulfide gas on the blood components and also to protect copper materials from corrosion due to this gas.

We recommend carrying out genetic studies on the population located near the sulfur spring.

Conducting environmental and biochemical studies and knowing the chemical components and the quality of the gases emitted from time to time.

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