

Study the effect of barely drinks on some haematological variables on male rats

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Abstract

The purpose of the experiment was to determine how barley drink affected the physiological and biochemical changes in male white rats. The lab animals were divided into four groups of five male white rats apiece, in comparison to the control group, the Saudi and Iraqi drink groups, and the beer drink group, the results showed a significant increase ($P \leq 0.05$) in haemoglobin and a percentage of agglutinated cells in the beer drink group, respectively. Compared to the control group and the Iraqi barley drink group, the Saudi beer and barley drink group had a considerably greater concentration of red blood cells. The quantity of red blood cells in the control group significantly decreased ($P \leq 0.05$) in comparison to the other groups. The number of white blood cells was significantly higher in the Saudi barley group compared to the control group and the Iraqi beer and drink groups, however it was significantly lower in the Iraqi barley drink group compared to the control and other groups. Compared to the control group, the Saudi beer and syrup groups, the Iraqi barley group, and the control group, respectively, platelets significantly increased and significantly decreased. Compared to the Saudi barley group and the beer group, the levels of glucose in the blood of white rats in the Iraqi barley group was much lower ($P \leq 0.05$). In comparison to the healthy control group, there was a substantial drop in all Iraqi, Saudi, and Al-Bireh groups. When compared to the control group, the cholesterol levels in the blood serum of white male rats in the Iraqi, beer, and Saudi barley groups increased significantly ($P \leq 0.05$). When compared to the Saudi barley, Iraqi barley, and control groups, the beer group exhibited a substantial rise significant increase ($P \leq 0.05$) in triglyceride concentrations in white male rats.

Introduction

Barley is one of the few ancient grain crops that isn't found in nature. It is grown all around the globe. It's an annual plant that comes in summer and winter variations and thrives in dry, cold climates [1]. Because whole grain barley is low in calories and fat and high in antioxidants, bread or drinks produced from it are nutrient-dense and feed the body with a variety of nutrients [2,3]. Beer is the most popular alcoholic beverage in the world [4]. and the world's third most consumed liquid after water and tea.

Most forms of beer are seasoned after they've been brewed with hops, which give the drink a bitter flavor and serve as a preservative. Herbs or fruits can be substituted as flavorings. To finish the brewing process, the beer is fermented to produce natural carbonation [5]. Barley drink has been known to have great benefits for the human body since

ancient times, and when Barbican was created, the drink had a plethora of benefits, but excessive consumption of any food or drink, regardless of the benefits it provides to the human body, will cause it to have a plethora of problems [6].

Barley includes fructans, a kind of fermentable fiber that comprises short-chain carbs, and these fibers can cause gas generation and bloating in persons who have IBS or other digestive issues. Some drugs, including the following, can be affected by barley [7, 8]. Diabetic medications: Barley has been shown to lower blood sugar levels in diabetics. Diabetes drugs have the same action of inhibiting the absorption of sugar from food, thus taking them together may drastically lower the level of blood sugar, and it is suggested to monitor the blood sugar level continually when taking them together [9, 10].

The high fiber content of barley can be said to contribute to regulating the digestive processes in the body, as it promotes the feeling of satiety for longer periods, and while eating or drinking barley alone will not cause weight loss, its consumption in conjunction with a healthy diet and exercise will. Sports can help you lose weight [11,12].

Excessive use of barley water with added sugars, honey, or other sweeteners, on the other hand, may result in an increase in the number of calories taken each day, which may result in weight gain. Many people believe that brewing barley water for the kidneys and urinary tract is healthy, however there are no scientific studies to back this up. Drinking barley drink has a multitude of health advantages, the most notable of which are as follows:

It works to lower harmful cholesterol levels: This is because the fiber content in this drink is stabilized. It acts to lower cholesterol levels, therefore protecting the body from heart disease.

Aids in the regulation of blood sugar levels. It works by cooling the body, allowing it to hydrate and leaving the user feeling rejuvenated [13]. Because they include crucial nutrients for the body, many individuals have recently turned to non-alcoholic barley beverages.

Although non-alcoholic malt beverages have several health benefits, excessive use creates a slew of issues: Feeling sluggish and fatigued after ingesting significant amounts of barley beverages due to the presence of tastes and industrial components [14]. Gases are produced in the intestines as a result of helpful bacteria in the stomach. There is fungal contamination. You are hypersensitive to wheat and barley products. It might cause a dip in blood sugar levels. Some drugs, the most significant of which are diabetic treatments, may be affected by malt syrup [15].

Materials and Methods

Experimental Design

The experiment was designed in the laboratories of the Department of Life Sciences, College of Education for Girls. The laboratory animals prepared for the experiment were randomly divided and distributed into four groups in an equal manner. Each group included (5) rats, as the groups were as follows:

The first group (control): dosed 2 ml of distilled water daily.

The second group (Saudi barley drink): The gentlemen Saudi barley drink dosed 2 ml per day for 30 days.

The third group (Iraqi barley drink): The Iraqi gentlemen barley drink was dosed by 2 ml per day for 30 days.

The fourth group (beer drink): The gentle beer drink was dosed by 2 ml per day for 30 days

To determine the effective dose: The animals used in this experiment were divided into four groups, each group includes 3 rats of different weights, and they were treated as follows:

The first group, like the control group, drank distilled water only. As for the groups (2,3,4), they were given the aqueous extract.

After three hours of dosing, blood samples were taken from all the groups by pricking the heart, and then the serum was separated by a centrifuge at a speed of 3000 revolutions / minute for five minutes, then the level of cholesterol and sugar in the serum was measured [16].

Collection of blood samples

The animals were anesthetized using the anesthetic (chloroform) by placing a cotton swab containing the anesthetic substance in a large box in which the rat was located to be anesthetized by breathing, then blood (5 ml) was drawn from the heart directly by stab the heart to get the largest amount of blood, The blood samples were placed in tubes containing anticoagulant (EDTA) as they were shaken lightly to prevent blood clotting for the purpose of conducting hematological physiological tests to measure the hemoglobin volume (PCV), hemoglobin concentration (HB), red blood cell count (RBC) and total white blood cell counts. (WBC and platelet measurement), while blood samples for hematological biochemical tests were placed in test tubes free of any anticoagulant and placed in a centrifuge to separate blood serum at 3000 rpm for 15 minutes and the sera were kept in a refrigerator at a temperature of (4°C) to complete the biochemical measurements [17].

Red blood cell count (RBC)

The Haemocytometer method was used to calculate the number of red blood cells per one cubic millimeter of blood [18].

Number of red blood corpuscles in mm⁶=N×4000|80× 200

Hemoglobin Estimation (Hb): [19]. was used

Packed Cell Volume Measurement: Heparinized tubes containing an anticoagulant substance (EDTA tubes) were used in its own centrifuge (Micro-Hematocrit centrifuge) for (5) minutes at a speed of 5000 rpm, after that the capillary tubes were read in the hematocrit reader [20].

The Blood Platelet Count

The number of platelets in the blood samples taken from the animals under study was calculated using the red bead pipette to count red blood cells. Blood was drawn to the mark (0.5) as the number of platelets per cubic millimeter was extracted according to the following equation: [21].

Total White Blood Cell count (W.B.C.): The numbers of white blood cells were calculated using the red blood cell count device and Turkey's solution, which works to break down the red blood cells and dye the white blood cells without others. Multiply the total result by 50 to calculate the number of blood cells in a milliliter of blood [20].

Measuring the level of glucose concentration in the blood serum: The blood glucose level in rats was measured using the ACCU-CHEK device of German origin, by following the steps [22].

Biochemical parameters

Estimation of Serum Total Cholesterol (TC): The concentration of cholesterol in the blood serum was determined by the enzymatic method, according to the method [23].

Concentrations Estimation of Triacylglycerol (TG) The concentration of triglycerides was determined by enzymatic method [23].

Concentration HDL-C Estimation of Cholesterol The concentration of HDL cholesterol was determined by enzymatic method [24].

Estimation of Low - density lipoprotein (LDL): The concentration of LDL-cholesterol was calculated mathematically using the Friedewald equation:
 $LDL = TC - (HDL + TAG/5)$ [24].

Estimation of Very low density lipoprotein (VLDL): The VLDL concentration was calculated based on the equation described by [24].
 $VLDL = TAG/5$

Measuring the level of glucose concentration in the blood serum: The blood glucose level in rats was measured using the ACCU-CHEK device of German origin, by following the steps [25].

Statistical Analysis:

The results were analyzed statistically by means of the statistical program SPSS, using the t-test (unpaired t-test) for unsymmetrical samples and one-way ANOVA, under a significant level ($P < 0.05$) [26].

Results and Discussion

The influence of barley and beer on physiological and hematological alterations is being investigated.

Effect of malt drinks on hemoglobin content and packed cell volume % in albino rats given a 30-day dosage.

Both the amount of hemoglobin and the percentage of packed cells in the beer drink group increased significantly when compared to the control group and the Saudi and Iraqi drink groups, respectively, as shown in Figures 1 and 2.

When compared to the control group, there were no significant variations in Iraqi and Saudi barley drinks. The reason may also be due to the fact that the active compounds present in the plant may lead to the activation of the enzyme Na-K.ATPase in the membranes of red blood cells, which in turn leads to maintaining the size of the cells and their osmotic pressure and reduces the lysis of blood cells [27]. or the reason is due to the role of the active substances present They contain antioxidants as well as contain stimulants that activate important enzymes that have a role in reducing oxidative damage within the organism's body [28].

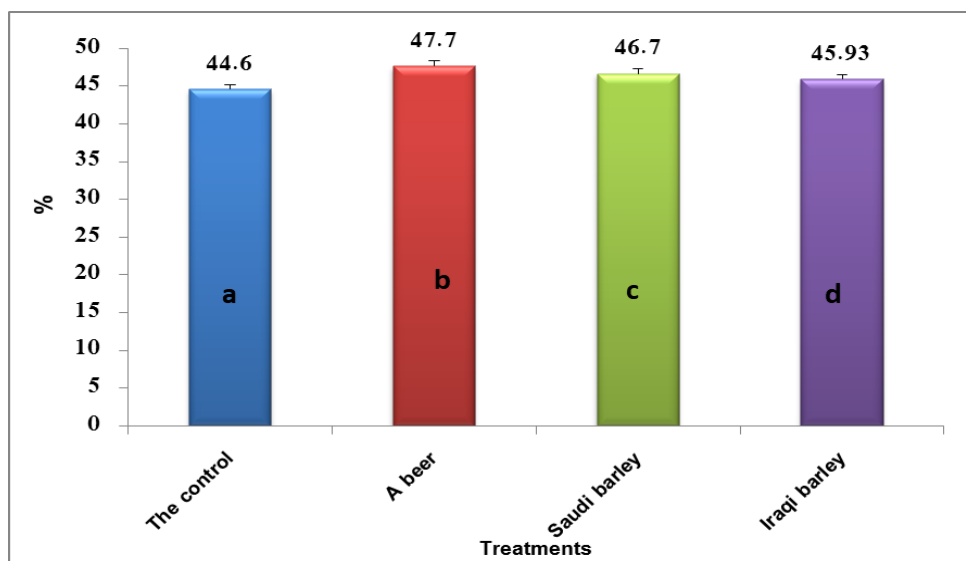


Fig. 1: Study of the effect of barley and beer drink on (P.C.V) in white rats dosed for 30 days

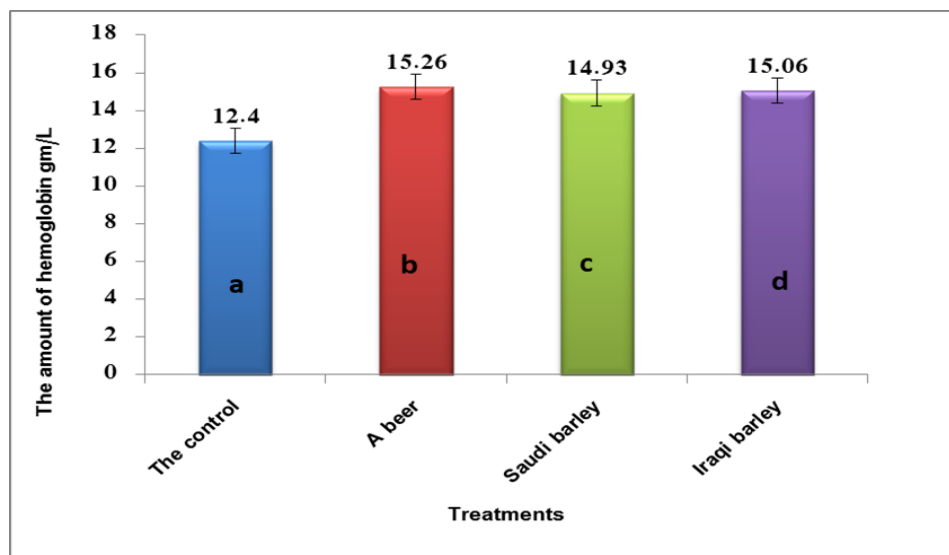


Fig. 2: Study of the effect of barley and beer drink on (the amount of hemoglobin) in white rats dosed for 30 days

* Values are expressed as the mean \pm standard deviation.

* The number of rats (6) in each group.

* Different letters mean that there are significant differences at ($P \leq 0.05$)

Effect of barley drinks on the number of red blood cells

Figure 3 shows that the Saudi beer and barley drink group had a significantly higher number of red blood cells than the control group and the Iraqi barley drink group. Similarly, as compared to the other groups, the control group had a substantial drop in the amount of red blood cells.

This increase may be due to a disturbance in the movement of ions through the membrane, as well as a change in the properties of the molecules that make up the membrane, thus changing the internal interactions with neighboring cells and reducing the effectiveness of metabolic processes [29].

This is due to the fact that the extract showed antioxidant activity by scavenging free radicals, enhancing antioxidant enzymes such as catalase and glutathione peroxidase, and increasing glutathione in the cell, and these enzymes work to prevent toxic effects.

Vitamin C also works to protect the membranes of red blood cells by increasing the unsaturated fatty acids in the phospholipids that make up the membranes of red blood cells [30].

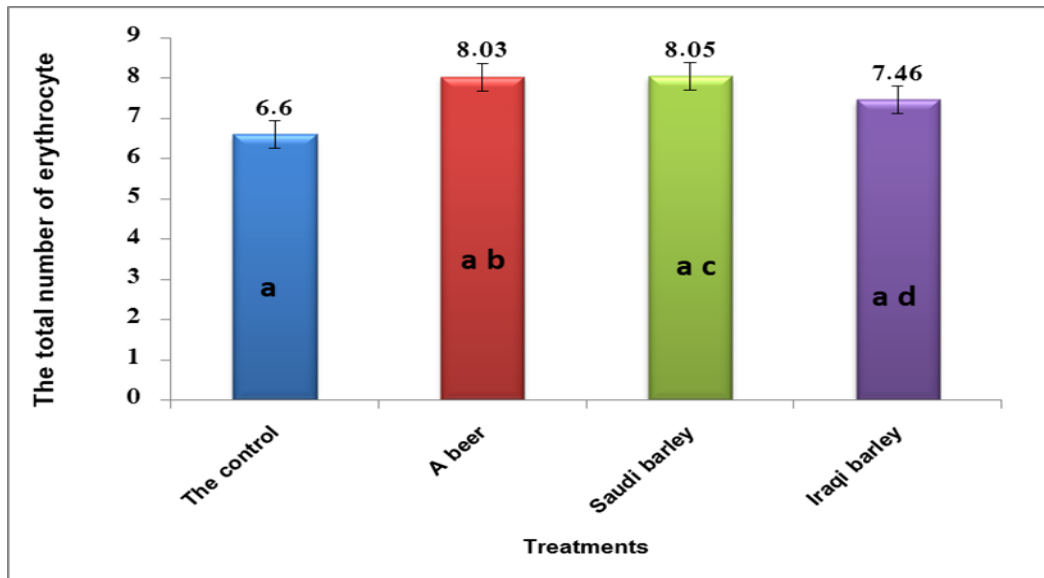


Fig. 3: Study of the effect of barley and beer drink on (red blood cell count) in white rats dosed for 30 days
 * Values are expressed as the mean \pm standard deviation.
 * The number of rats (6) in each group.
 *The total number of erythrocytes $\times 10^6$
 * Different letters mean that there are significant differences at ($P \leq 0.05$).

Effect of barley drinks on the number of white blood cells

The number of white blood cells in the Saudi barley group increased significantly when compared to the control group and the Iraqi beer and drink group, as seen in figure 4. While the number of white blood cells in the Iraqi barley drink group was much lower than in the control and other groups, the results demonstrated a substantial drop in the number of white blood cells in the Iraqi barley drink group. In comparison to the other groups, the control group showed a considerable drop [31].

It is believed that the rise in the total number of white blood cells could be a reason for increasing the speed of these cells being newly attracted from the bone marrow to the peripheral blood, or to the effect of the extract on the bone marrow and then increasing the production of these cells in the bone marrow, or it might stimulate the responsible lymph nodes. It indicates the maturity of lymphocytes and their specialization in anti-disease immunity, and then an increase in their numbers in the peripheral blood, and that the reason for the rise can also be due to the effect of the extract at these concentrations on immune cells in peripheral lymphoid tissues such as the spleen and its stimulation to release a number of cellular mediators such as TNF- And IL-1, and it is likely that it is caused by the stimulation of some cells such as helper T lymphocytes, some of which stimulate an increase in the number of eosinophil cells in the bloodstream, and others work to increase the permeability of blood vessels for the purpose of migration of these cells to the site of inflammation [32].

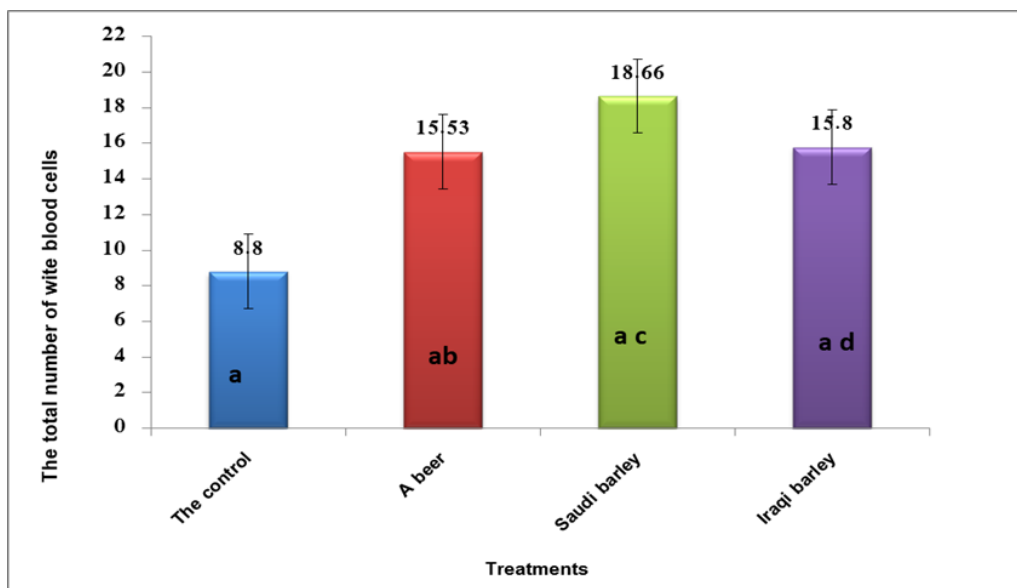


Fig. 4: Study of the effect of barley and beer drink on (white blood cell count) in white rats dosed for 30 days
 * Values are expressed as the mean \pm standard deviation.
 * The number of rats (6) in each group.
 *Total white blood cell count x $10^3/\mu\text{l}^3$

Effect of barley drinks on platelet count

Figure 5 shows that the number of platelets in the Iraqi barley group increased significantly when compared to the control group and the Saudi beer and syrup group, respectively.

While the control group had a much lower number of platelets than the other groups, the results demonstrated a substantial increase in the number of platelets in the other groups. It is believed that the reason for a significant increase in the number of platelets compared to the control group is due to the effect of the factor controlling platelet production, called thrombopoietin, or fibrinogen (Thrombopoietin), which works to increase giant cells in the bone marrow, which in turn produce platelets that They are considered cytoplasmic segments of these cells, as the effect on fibrinogen may lead to an increase in the effectiveness of this factor, and then an increase in giant cells, which in turn increases the production of normal platelets at the expense of abnormal blood platelets, and then these platelets have all the necessary functions that depend on They contain a factor called Von Wille Brand, which is part of clotting factor VIII) [33].

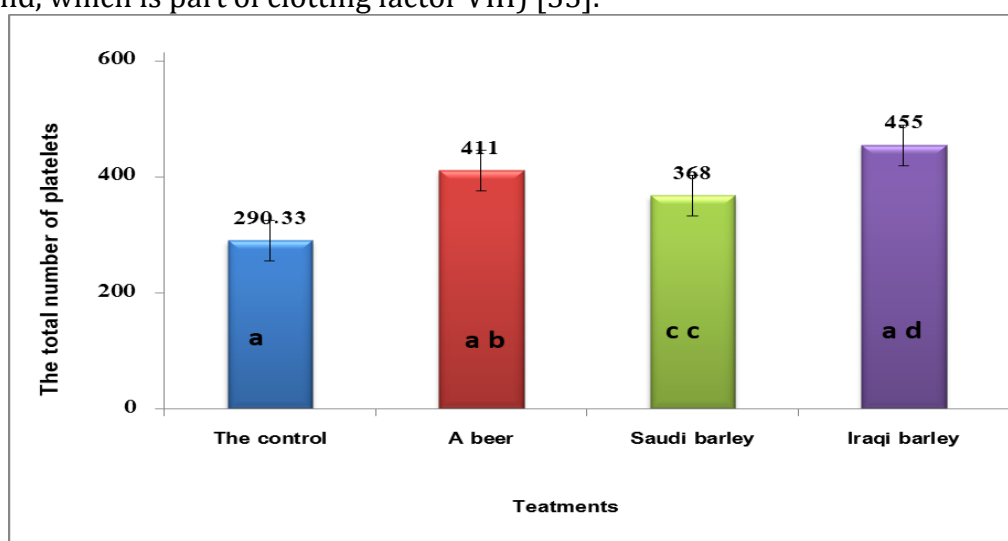


Fig.5: Study of the effect of barley and beer drink on (platelet count) in white rats dosed for 30 days
 * Values are expressed as the mean \pm standard deviation.
 * The number of rats (6) in each group.
 *The total number of platelets x $10^3/\mu\text{l}^3$

Study of the effect of barley and beer drink on the biochemical changes of lipid profile in white rats dosed for 30 days

Level of glucose in the blood serum

The glucose content in the blood of white rats in the Iraqi barley group was significantly lower than the Saudi barley group and the beer group, as shown in figure 6. In comparison to the healthy control group, there was a substantial drop in all Iraqi, Saudi, and Al-Bireh groups.

The alpha-iso acids found in non-alcoholic beer are equally beneficial to the body, according to the experts. These acids are produced during the fermentation of beer and are responsible for its bitter flavor. It also helps to prevent liver damage by influencing fat and sugar metabolism [34]. Diabetics will benefit from malt syrup since it helps to keep blood sugar levels in check. Barley's beta-glucan (a kind of soluble fiber) delays glucose absorption after meals and reduces glucose and insulin spikes. Obesity, a key risk factor for type 2 diabetes, is also reduced by beta-glucagon, 4-hydroxyphenyl acetic acid, vanillic acid, caffeic acid, syringic acid, p-coumaric acid, ferulic acid, and sinabic acid are among the phenolic acids found in beer [35].

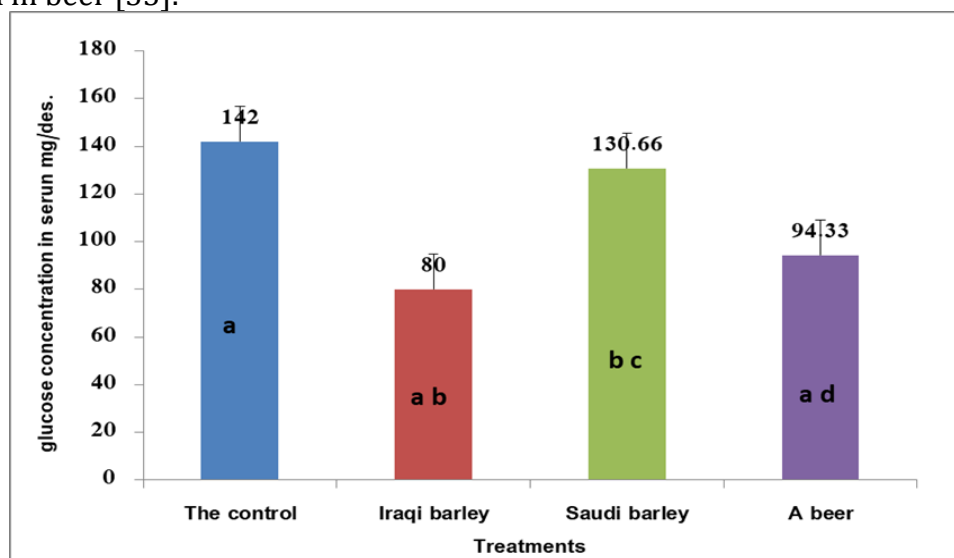


Fig. 6: Study of the effect of barley and beer drink on (glucose concentration) in white rats dosed for 30 days

* Values are expressed as the mean \pm standard deviation.

* The number of rats (6) in each group.

* Different letters mean that there are significant differences at ($P \leq 0.05$).

Cholesterol concentration in blood serum

The results in figure 7 showed a significant increase in cholesterol concentration in the blood serum of white male rats in the Iraqi, beer and Saudi barley group, respectively, compared to the control group. A significant decrease was also observed in the Iraqi barley group compared to the Al-Bireh and Saudi group.

When compared to the control group, the cholesterol levels in the blood serum of white male rats in the Iraqi, beer, and Saudi barley groups increased significantly.

In comparison to the Al-Bireh and Saudi groups, the Iraqi barley group showed a considerable drop. One of the benefits of boiled barley or barley water in general is that it helps lower cholesterol levels in the blood by linking the beta-glucan in barley to the bile and excreting it outside the body with the stool. Bile is made in the liver from cholesterol, so the body consumes more cholesterol in order to produce more of it, lowering cholesterol levels in the blood [36].

Insoluble fiber is abundant in barley syrup, making it a useful source for lowering cholesterol and lowering the risk of heart disease. Dietary fiber aids in the prevention of cholesterol absorption from meals in the stomach and intestines [37].

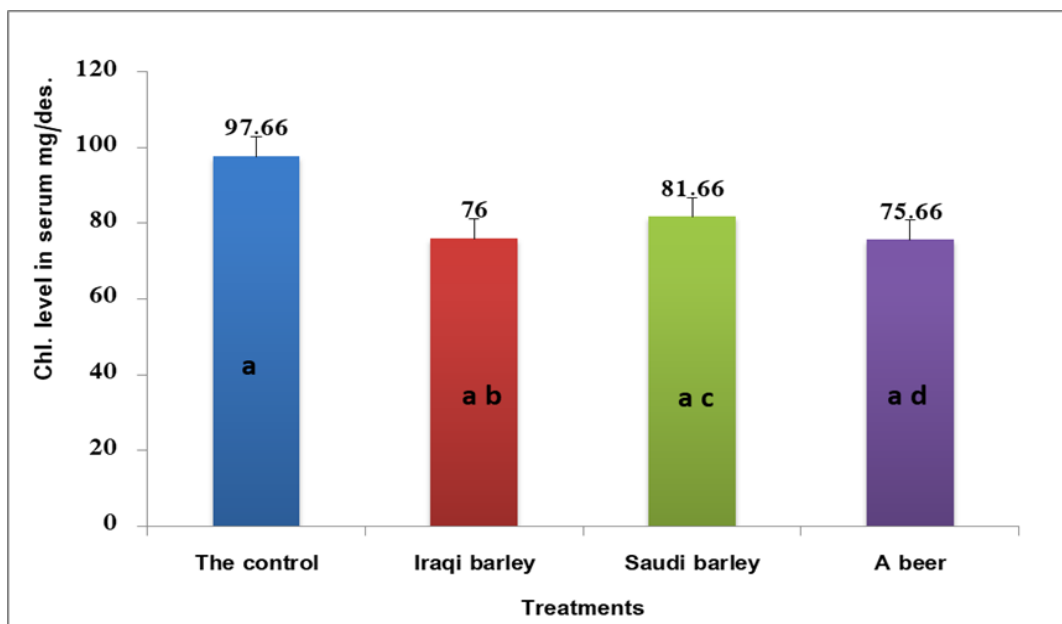


Fig. 7 Study of the effect of barley and beer drink on (cholesterol level) in white rats dosed for 30 days.
 * Values are expressed as the mean \pm standard deviation.
 * The number of rats (6) in each group.
 * Different letters mean that there are significant differences at ($P \leq 0.05$).

Triglyceride concentration

Concentrations Estimation of Triacylglycerol (TG)

The results in figure 8 reveal a substantial rise in triglyceride concentrations in white male rats in the beer group as compared to the Saudi barley, Iraqi barley, and control groups.

While the concentration of triglycerides in Iraqi barley was significantly lower than in the other groups, the results demonstrated a considerable drop in the concentration of triglycerides in Iraqi barley. The reason for the decrease in the concentration of triglycerides in these cases may be attributed to several reasons, including the fact that the extract contains alkaloids, flavonoids and glycosides that remove free radicals (OH $O^2\cdot$ from the body and thus reduce the oxidation of LDL-C and reduce the concentration of TG, or it may be due to the activation of the enzyme Lipase in fat cells and thus a decrease in the amount of triglycerides entering the blood [38].

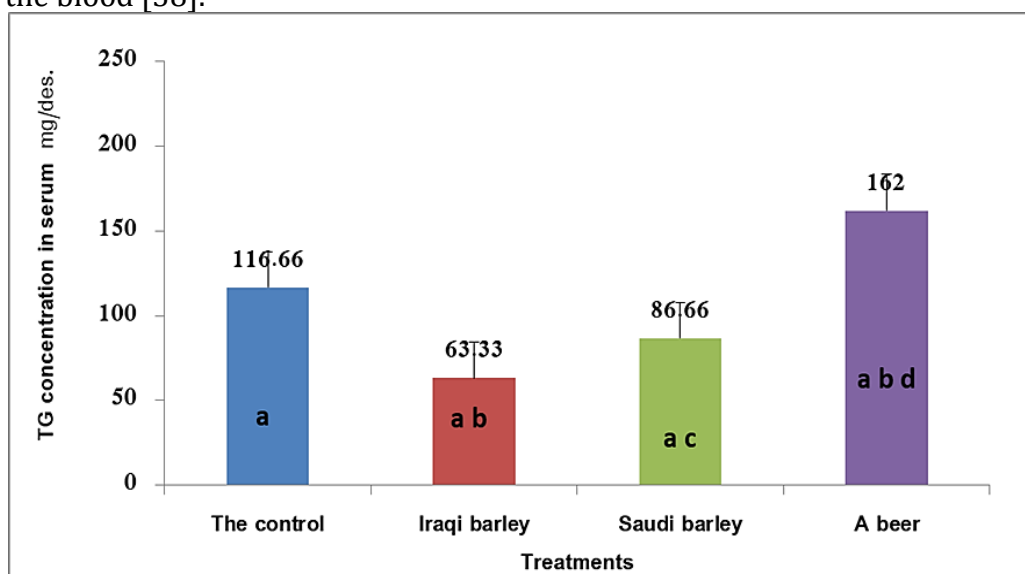


Fig. 8: Study of the effect of barley and beer on (triglyceride concentration) in white rats dosed for 30 day

* Values are expressed as the mean \pm standard deviation.

* The number of rats (6) in each group.

Concentration HDL-C Estimation of Cholesterol

Figure 9 shows that the Iraqi barley group had a significantly higher concentration of healthy HDL cholesterol than the Saudi barley and beer group and the control group.

While the beer group had a lower HDL level than the other groups, the results demonstrated a substantial drop in HDL in the beer group. This is due to the fact that the compounds present in the aqueous extract stimulate liver and intestinal cells to form high-density lipoprotein particles [39]. Also, a section of the chemical compounds works to reduce the level of cholesterol in the blood, and this is reflected positively on increasing the level of high-density lipoproteins for cholesterol [40].

Perhaps the reason for the high concentration of HDL-C is due to the effectiveness of some of the compounds present in the aqueous extract and their ability to stimulate liver and intestine cells to build high-density lipoprotein particles. Sambubioside, Delphinidin-3-Sambubioside, also it contains many organic acids such as citric, malic, and tartaric acid, as well as a high percentage of ascorbic acid, which plays an important role as an antioxidant as it reduces the damage of free radicals resulting from the effectiveness or Other sources, thus inhibiting lipid oxidation and raising the concentration of HDL-C [41].

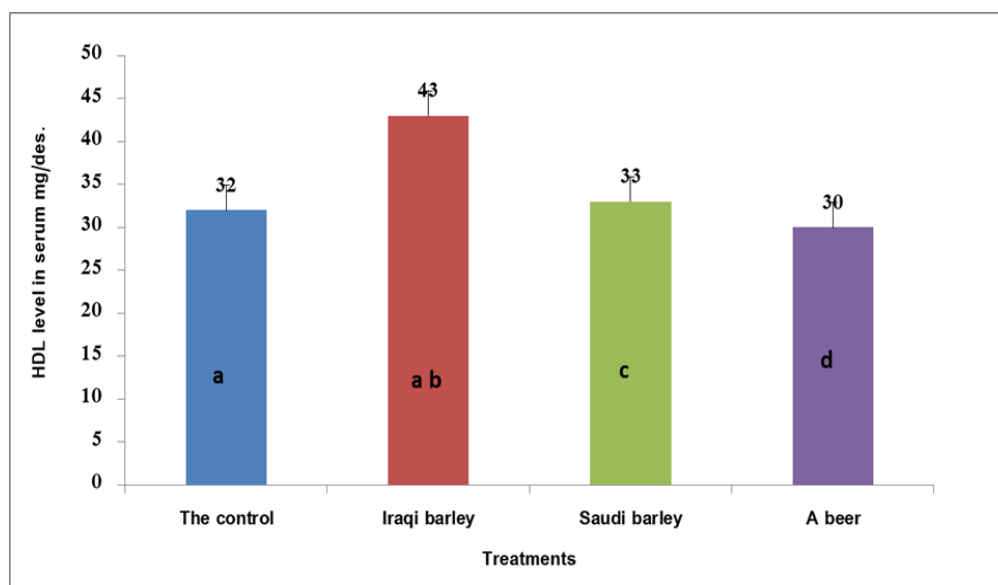


Fig. 9: Study of the effect of barley and beer on (HDL level) in white rats dosed for 30 days

* Values are expressed as the mean \pm standard deviation.

* The number of rats (6) in each group.

cholesterol concentration in low-density lipoprotein (LDL)

In comparison to the groups of Iraqi barley, Saudi barley, and beer, the results revealed a considerable rise in the concentration of LDL "bad" cholesterol in the control group as shown in figure 10. When compared to the other groups, it indicated a considerable drop in the beer group. Similarly, as compared to the Saudi barley and beer groups, there is a considerable rise in LDL content. The role of LDL is known as a major transporter of cholesterol from the liver to the tissues, which contains a high percentage of cholesterol, where it is noted that its concentration is high in LDL and that this rise leads to arteriosclerosis [42]. The increase in the level of LDL and VLDL can be explained by the increase in Malondialdehyde (MDA) level. In addition to the contribution of cholesterol in the manufacture of protein substances in the liver, and this has a role in raising the level of low- and very low-density lipoproteins for cholesterol [43].

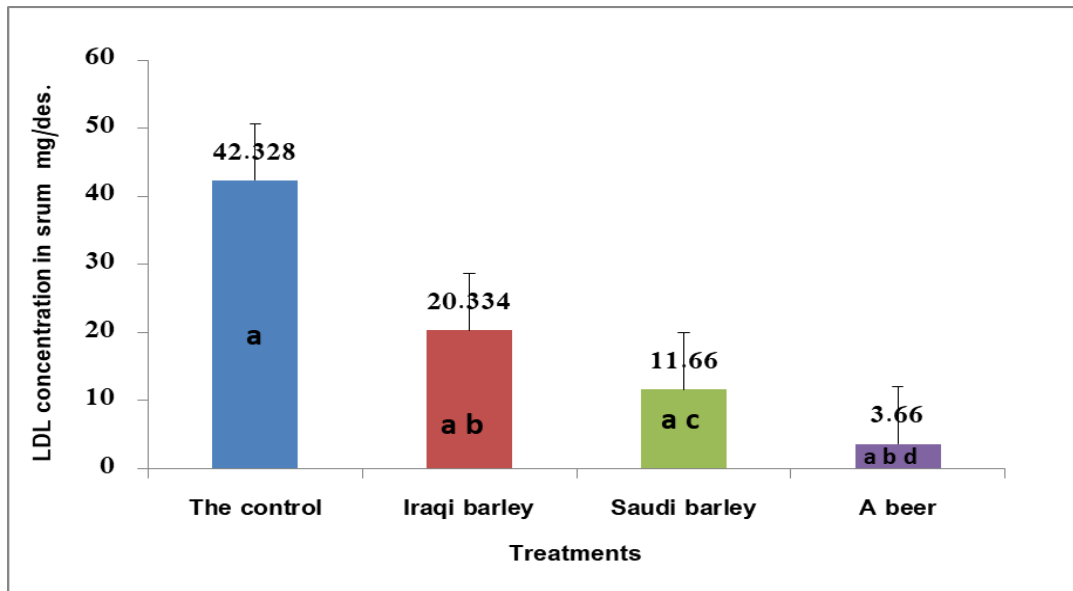


Fig. 10: Study of the effect of barley and beer on (LDL concentration) in white rats dosed for 30 days
 * Values are expressed as the mean \pm standard deviation.
 * The number of rats (6) in each group.
 * Different letters mean that there are significant differences at ($P \leq 0.05$).

cholesterol concentration in very low-density lipoprotein (VLDL -c)

Figure 11 shows that when comparing the beer group to the control group, Saudi barley, and Iraqi barley, the concentration of cholesterol in the very low density lipoprotein (vLDL) increased significantly in the beer group.

While the Iraqi barley group showed a large drop in comparison to the other groups, the results revealed a considerable increase in the other groups. The reason for its high concentration may be attributed to the increase in the concentration of free radicals in the body as a result of treatment. These radicals break down adipose tissue cells and thus increase the release of free fatty acids, of which the liver uses large quantities in the production of VLDL-C [44].

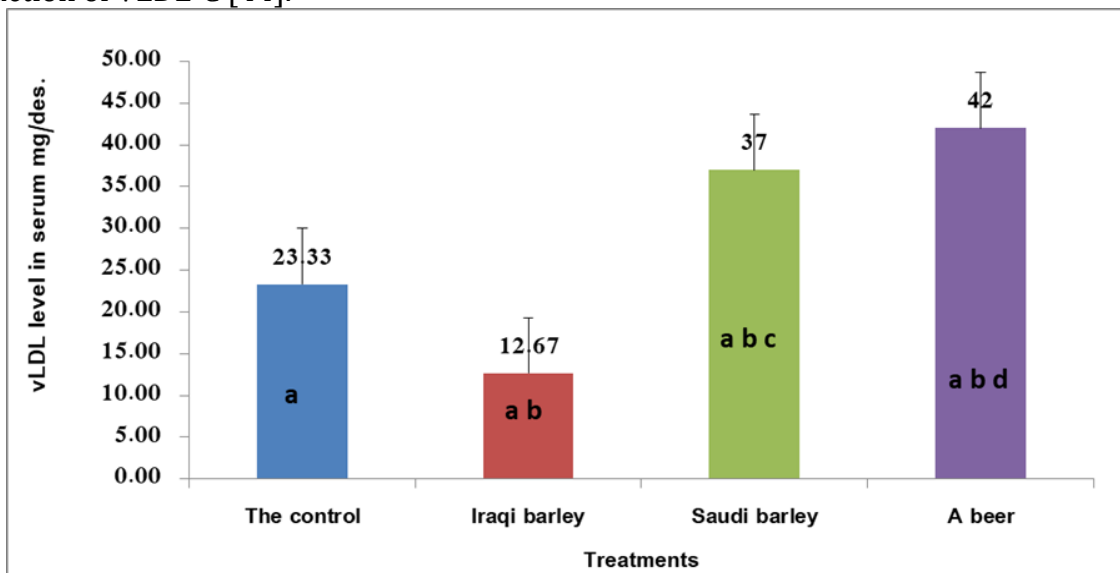


Fig. 11: Study of the effect of barley and beer drink on (vLDL level) in white rats dosed for 30 days
 * Values are expressed as the mean \pm standard deviation.
 * The number of rats (6) in each group.
 * Different letters mean that there are significant differences at ($P \leq 0.05$).

Conclusions

Beer drinkers' hemoglobin levels significantly increased ($P \leq 0.05$) as did their proportion of agglutinated cells. The Saudi beer and barley drink group had a much higher concentration of red blood cells than the control group and the Iraqi barley drink group. In compared to the other groups, the control group's red blood cell count considerably dropped ($P \leq 0.05$) In the Saudi barley group, compared to the control group and the Iraqi beer and drink groups, there were substantially more white blood cells, significantly more platelets, and significantly less red blood cells.

All Iraqi, Saudi, groups showed a significant decrease when compared to the healthy control group. The cholesterol levels in the blood serum of white male rats in the Iraqi, beer, and Saudi barley groups rose considerably ($P \leq 0.05$) as compared to the control group. When compared to the Saudi barley, Iraqi barley, and control groups, the beer group had a significant ($P \leq 0.05$) increase in triglyceride contents in white male rats.

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دراسة تأثير مشروبات الشعير على بعض المتغيرات الدموية لذكور الجرذان

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الخلاصة:

صممت التجربة لغرض دراسة تأثير مشروب الشعير على التغيرات الفسلجية والكيموحيوية في ذكور الجرذان البيض وقد تم تقسيم وتوزيع الحيوانات المختبرية عشوائيا الى اربعة مجموعات وبصورة متساوية حيث ضمت كل مجموعة (5) من ذكور جرذان البيض. اظهرت النتائج زيادة معنوية في كل من كمية الهيموجلوبين والنسبة المئوية لحجم الخلايا المرصوصة للمجموعة العائدة لشراب البيرة مقارنة مع مجموعة السيطرة ومقارنة بمجموعة الشراب السعودي والعراقي على التوالي. اظهرت النتائج زيادة معنوية في عدد كريات الدم الحمر لدى مجموعة شراب البيرة والشعير السعودي مقارنة بمجموعة السيطرة ومجموعة شراب الشعير العراقي كذلك الحال اظهرت مجموعة السيطرة انخفاض معنوي في عدد كريات الدم الحمر مقارنة بالمجاميع الأخرى على حدٍ سواء. اظهرت النتائج زيادة معنوية في عدد خلايا الدم البيض في مجموعة الشعير السعودي مقارنة مع مجموعة السيطرة ومجموعة البيرة والشراب العراقي على التوالي، بينما اظهرت النتائج انخفاض معنوي ملحوظ في عدد خلايا الدم البيض في مجموعة شراب الشعير العراقي مقارنة مع السيطرة والمجموعات الأخرى. اظهرت النتائج زيادة معنوية في عدد الصفائح الدموية في مجموعة الشعير العراقي مقارنة مع مجموعة السيطرة ومجموعة البيرة والشراب السعودي على التوالي، بينما اظهرت النتائج انخفاض معنوي ملحوظ في عدد الصفائح الدموية في مجموعة السيطرة مقارنة بالمجموعات الأخرى، كما اظهرت النتائج في انخفاض معنوي في تركيز الكلوكوز في الدم الجرذان البيض في مجموعة الشعير العراقي مقارنة بمجموعة الشعير السعودي ومجموعة البيرة مقارنة بمجموعة السيطرة السليمة. اظهرت النتائج في ارتفاع معنوي في تركيز الكوليسترول في مصل دم ذكور الجرذان البيض لدى مجموعة الشعير العراقي والبيرة والسعودي على التوالي مقارنة بمجموعة السيطرة