

Evaluating The State Of Oxidative Stress And Some Biochemical Variables Among Barbers In The City Of Samarra

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Abstract

A study was conducted to determine the effect of dealing with hair dyes and hair straighteners and the gases they emit on the barbers who deal with them. The study revealed the following: High levels of oxidative stress in male and female barbers due to high levels of peroxynitrite radicals. Low levels of endogenous antioxidants such as SOD enzyme, total protein, and globulin in male and female barbers compared to control as a control sample. Lipid profile increased in male barbers compared to control as a control sample. Damage occurred to the barbers' liver cells, resulting in the release of enzymes into the bloodstream and an increase in the level of ALT, AST. It was also shown from the blood glucose level that barbers are most at risk of developing diabetes. From the above, it has been shown that the damage resulting from dealing with hair dyes and hair straighteners is higher for female barbers than for male barbers.

Keywords: - Peroxy Nitrate , SOD , hair dyes, hair straighteners, ALT, AST, pollution, barbers.

Introduction: - The use of chemicals has become associated with any human activity in all areas of life, and these materials have negative effects on the human body, whether directly or indirectly, especially if we know that the number of uses of these materials is constantly increasing and that these chemicals and pollutants are transmitted to living organisms, especially humans, through the accumulation of pollutants, one of the components of the environment in which they are present (air - water - soil), this leads to chronic poisoning that does not appear on the person until its concentration becomes very high in the body to the point of acute poisoning occurring as a result of regular interactions occurring within the living body due to the mutual influence between The chemical substance accumulated and in the living body that enters through breathing by inhaling airborne substances, which are gases, vapors, mist, fumes, and dust. Exposure to air polluted inside the workplace with particulate matter-PM less than 10 nm for three days leads to a decrease in the PCV rate and blood hemoglobin concentration ⁽¹⁾. PMs are characterized by their size and aerodynamic properties that are directly related to their biological effects. For example, only particles smaller than 10 micrometers in diameter can be inhaled deep into the lungs, while larger particles are usually trapped in the upper airways ⁽²⁾.

Given the widespread use of hair dye, it is critical to comprehend the dangers and poisons connected to chemical exposure from hair color formulations. In terms of their chemical makeup and constituent parts, hair dyes are divided into two categories: oxidizing and non-oxidizing. The safety of numerous chemicals used in hair dyes has been assessed for many years by the Expert Committee's Cosmetic Ingredient Review (CIR); nevertheless, a thorough analysis of hair dye ingredients and the danger of exposure to hair dye has not been recorded ⁽³⁾.

All sections of the respiratory tract, including the nose's mucous membranes and the skin, absorb these chemical pollutants. Moreover, a wide range of chemicals dissolved in lipids have the ability to pass through the fatty layer-covered epidermal cells and into the dermis. The skin is continually exposed to outside elements including ozone

and UV radiation. air contamination. When applied topically to open wounds, scrapes, or dry skin, some industrial chemicals, such solvents, can absorb into the skin and cause health problems. The skin has a vast network of non-enzymatic antioxidants like glutathione, vitamin E, vitamin C, and uric acid, as well as enzymatic antioxidant defense systems like catalase and superoxide dismutase (SOD), to defend against oxidative damage. which complements one another to balance oxidative stress ⁽⁴⁾.

As for pollution through digestion, occupational poisoning occurs in the digestive system by eating, drinking, or smoking with hands contaminated with chemicals during work. The chemicals contained in cigarette smoke contribute to changing the blood vessels, causing an increase in platelets, thus opening the way for the formation of a blood clot ⁽⁵⁾.

The degree of the toxic effect of a chemical is not the same for all organs as one or two organs are affected more than others, as they are called the (target organs) or systems for the toxicity of a particular substance such as, the central nervous system that is often targeted in the systemic effects of chemicals, followed by the blood circulation systems, liver, kidneys, , and skin. These substances enter the body and their effect on the body becomes apparent, leading to the emergence of various occupational diseases that increase respiratory diseases especially bronchial asthma, blood pressure diseases, atherosclerosis, and myocardial infarction, and increase the generation of free radicals that work to oxidize lipid, thus destroying the immune system. Cells in the body and abnormal protein production ⁽⁶⁻⁷⁾ There may be a considerable correlation between ambient air pollution and some neurological disorders, including stroke, Parkinson's disease, and Alzheimer's disease. ⁽⁸⁾. The toxic substance inside the living body passes through two basic stages:

1-The first stage: the kinetics of the toxic substance and its passage

A-Absorption , B- Spread , C-Metabolism , D- Extracting the toxic substance

2-The second stage: - Dynamics of the toxic substance

A- Local sabotage , B- Expansive destruction in which the toxic substance is transferred to destroy the entire organ in which it is present. The organism is exposed to different chemicals in multiple ways, which leads to a difference in the rate of absorption of these substances, and the absorption process depends on the duration of exposure, concentration, and number of times of exposure ⁽⁹⁾.

Martial and Methods: - Sampling:- Blood samples were collected from forty people 20 males and 20 females with ages ranging between (20-45) years, divided into four groups, two of which were control non-smokers and groups of barbers treated with hair dyes and hair straighteners over a treatment period of (3-7) years.

-The first group ♂ : barbers non-smoking males.

-The second group ♀ : barbers non-smoking females.

-The third group: non ♂- barbers smoking male barbers.

-The fourth group ♀: Barbers for non-smoking females.

Blood samples were collected from people with an amount of (5 ml) of blood. The blood was collected in single-use glass anticoagulant-free test tubes. Using a centrifuge, the serum was separated. at 2500 rpm for 15 minutes and the obtained serum was divided into four parts using an Eppendrove tube The serum was stored at -20°C until analysis . The following biochemical serum parameters were identified:

Peroxyinitrate as a marker determining the level of oxidative stress according to ⁽¹⁰⁾ , As for measuring the effect of dealing with hair dyes and hair straighteners on the level of antioxidants, the enzyme super oxidase dismutase was

estimated according to ⁽¹¹⁾, total protein was estimated according to ⁽¹²⁾, albumin was also estimated according to ⁽¹³⁾, and globulin was calculated By subtracting albumin from total protein. The total cholesterol level was estimated according to ⁽¹⁴⁾ and the triglycerides were estimated according to ⁽¹⁵⁾ and the value of triglycerides was divided by 5 to obtain VLDL according to ⁽¹⁶⁾. The liver damage caused by Barberies working with hair dyes and hair straightening materials was also known through measuring liver enzymes such as ALT and AST was measured according to ⁽¹⁷⁻¹⁸⁾ respectively Finally, blood sugar was estimated among the groups according to ⁽¹⁹⁾.

Statistical analysis :- To find the significant differences between the groups, the arithmetic means of the coefficients were checked using the Duncan multiple range test at a significance level ($P \geq 0.05$). The data were statistically analyzed using the SPSS program and in accordance with one-way analysis of variance. ⁽²⁰⁾.

Result and Discussion: - The level of peroxy nitrite has increased in the blood serums of male and female barbers who deal with hair dyes and hair straighteners. The reason for the increase in the level of the harmful peroxy nitrite radical is attributed to dealing with the vapors of the chemical substances that make up the dyes and hair straighteners and that contain ammonia. The reason for the higher level of peroxy nitrite in male barbers compared to female barbers may be due to the greater number of times male barbers work than female barbers.

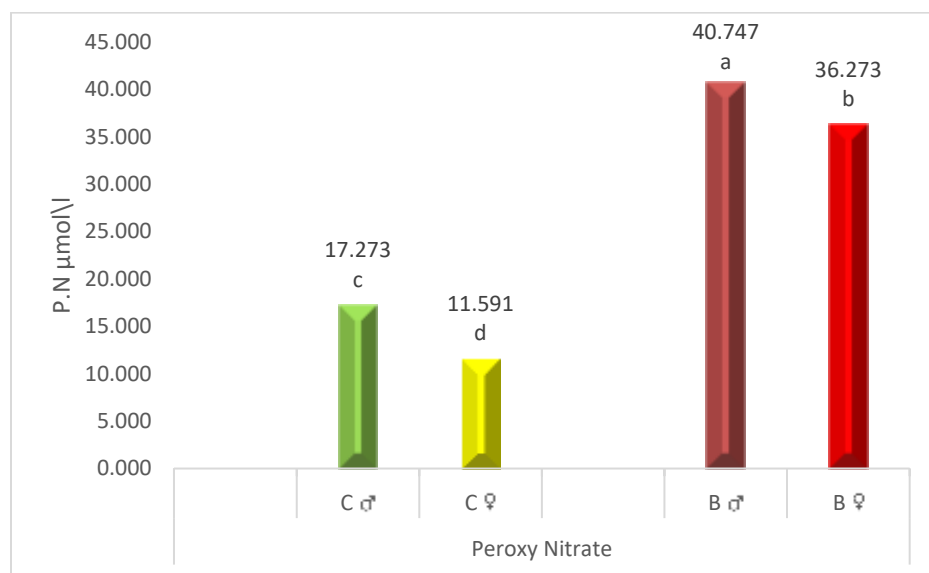


Fig.(1) level of Peroxy nitrate in control and barbers

Hair products, such as hair dyes and straighteners, may contain dangerous chemicals with carcinogenic and endocrine-disrupting properties. The use of hair products is associated with an increased risk of hormone-sensitive cancers including breast and ovarian cancer ⁽²¹⁻²³⁾ As the researcher indicated Al-Bayate also proved that there was an increase in peroxy nitrite radicals for women with breast cancer, High oxidative stress, represented by high peroxy nitrite, may lead to an increased risk of breast cancer ⁽²⁴⁾ Dyes may also contain heavy elements, as the results of the study ⁽²⁵⁾ showed that these elements have toxic effects on the human body. The presence of these elements may alter the redox balance and tip the balance toward lower antioxidant components and the capacity of vitamins and antioxidants in a recent study conducted on spices exposed to fumes contaminated with heavy metals ⁽²⁶⁾.

The level of activity of the enzyme superoxide dismutase in the blood serum of barbers decreased significantly below the level of probability ($P \geq 0.05$) compared to control.as showed fig.2

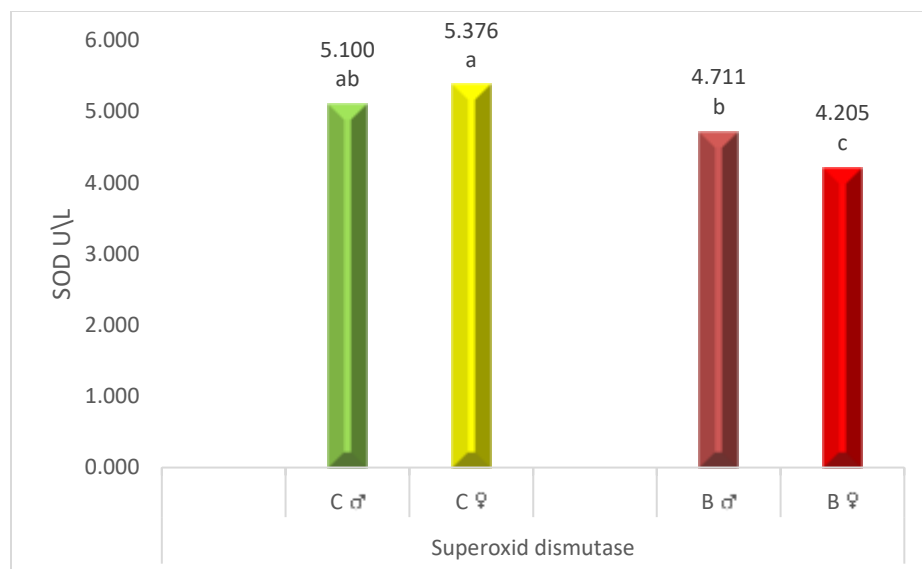


Fig.(2) level of SOD in control and barbers

The results of our study agree with researcher Nazik, who showed that there was a significant decrease for SOD in treatments with hair dye and oxidizing hair cream compared to a group that used henna ⁽²⁷⁾. Enzymes known as superoxide dismutases (SOD) are responsible for converting superoxide radicals (O₂⁻) into molecular oxygen (O₂) and hydrogen peroxide (H₂O₂). Hydrogen peroxide is eliminated from tissues by GPX. SOD and GPX stop lipid peroxidation from starting and from building up free radicals. The term "oxidative stress" describes a change in the pro-oxidant antioxidant balance that damages cells. ⁽²⁸⁾.

It is worth noting that the decrease was greater in females than in males, and the results of our study agree with the findings of Al-Helaly ⁽²⁹⁾, where he showed a significant decrease in the level of the enzyme superoxide dismutase at oil station workers and cement factory workers who are exposed to inhaling harmful chemicals. One epidemiological study also found that air pollution is associated with an increase in the incidence of cancer, especially lung cancer ⁽³⁰⁾. One theory regarding the documented detrimental effects on health is that oxidative damage brought on by inflammation and polluted particles may release reactive oxygen species (ROS) through the Fenton reaction in transition metals or the redox cycle in quinones within the particles ⁽³¹⁾. Thus, it depletes endogenous antioxidants, including the enzyme superoxide dismutase

The total protein level decreased significantly at the probability ($P \geq 0.05$) level in male and female barbers compared to Group C. We also notice a decrease in the total protein percentage at the same level in males and females without any differences between the two groups, as is showed in the fig (3).



Fig.(3) level of Total Protein in control and barbers

The findings of our investigation align with the findings of the researcher⁽³²⁾ concerning the elevated concentration of Total Protein in workers at oil refineries who breathe in chemical fumes.

The majority of relaxers and straighteners used on afro-colored hair have a pH greater than 11. International rules for occupational health and safety state that this pH is corrosive to skin. In addition, using straighteners increases the risk of alopecia by three to six times. When using these hair straightening products, the skin comes into contact with them as well, causing skin irritation.⁽³³⁾ The decrease in total protein in the blood serum of barbers may be due to its depletion as an antioxidant

While albumin recorded a decrease at the probability level ($p \leq 0.05$) for male barbers compared to control sample, while a significant increase was observed for the group of female barbers compared to Group C, as is showed in the fig.(4).

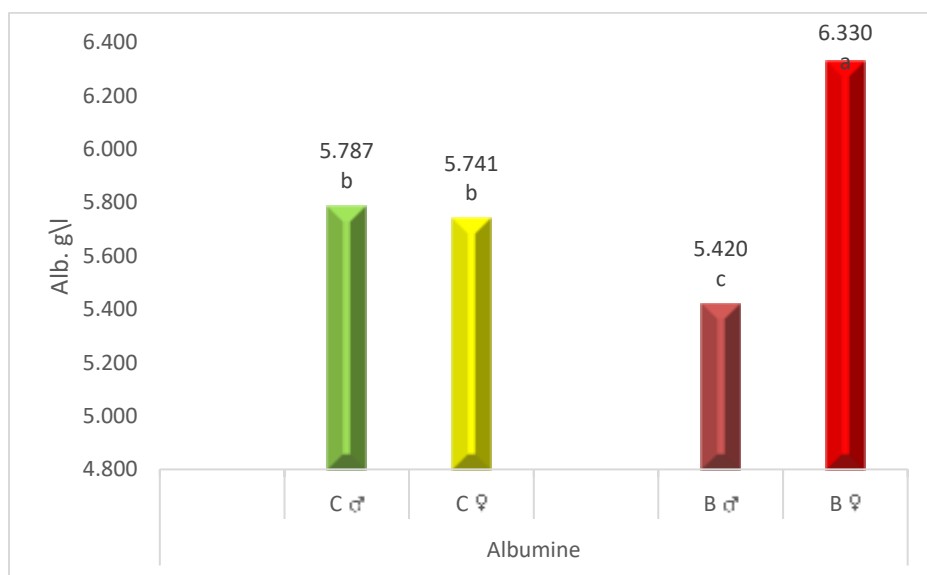


Fig.(4) level of Albumin in control and barbers

Researcher's results ⁽³³⁾ showed a significant decrease ($p \leq 0.05$) in cell index and ATP production after treating keratinocytes with less than a tenth of the acceptable concentrations of hair straighteners.

When calculating globulin, we notice a decrease at the probability level ($p \leq 0.05$) for male and female barbers compared to healthy males and females as a control sample. as is showed in the fig.(5).

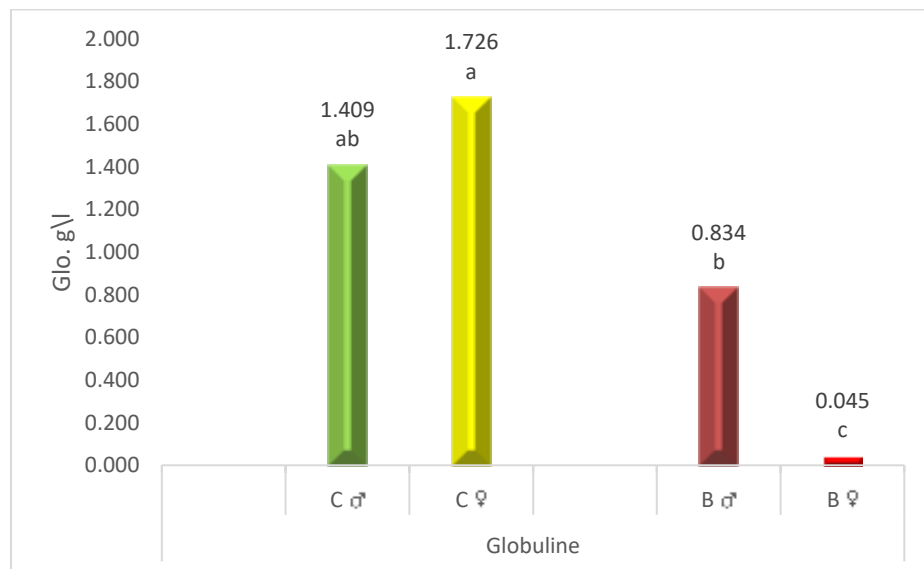


Fig.(5) level of Globulin in control and barbers

The aforementioned result indicates that female barbers had lower immune globulins than male counterparts, likely due to the high occupational dangers that hairdressers face, which include asthma and rhinitis, which they encounter on a regular basis. Persolipid and hair dyes are examples of allergens and irritants that can lower the body's resistance, according to a Norwegian study. Because hairdressers are exposed to hair color components for a longer period of time at work than controls, they are more likely than controls to experience respiratory allergies, allergies, and other disorders. ⁽³⁴⁻³⁵⁾.

When studying the lipid profile of the samples under study, it is clear from the previous results that there was a significant increase at the probability level ($p \leq 0.05$) in the percentage of total cholesterol for female barbers compared to healthy females as a control sample, as seen in the fig.(6)

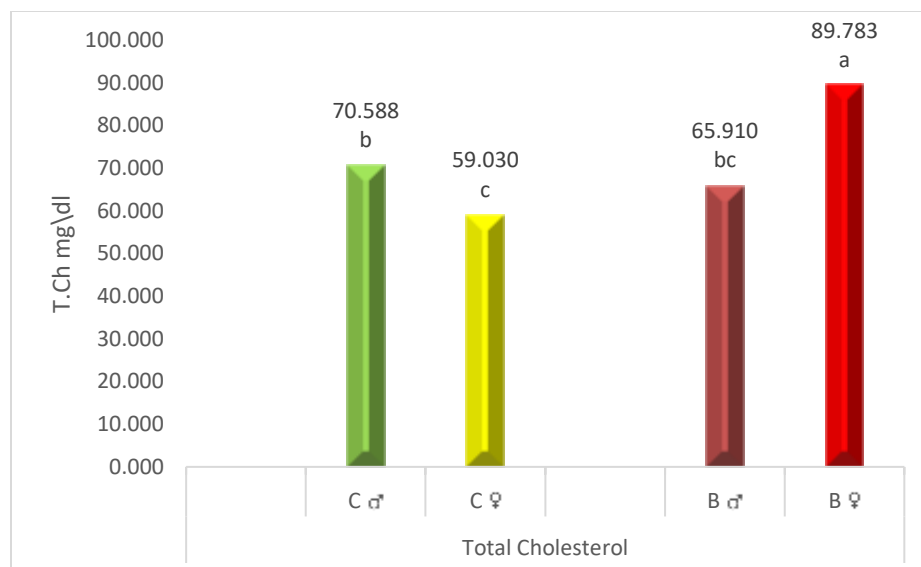


Fig.(6) level of Total Cholesterol in control and barbers.

Our research's findings support those of researcher Adegoke, who found that petroleum fumes can alter lipid profiles and increase the risk of cardiovascular illnesses in albino rabbits ⁽³⁶⁾.

The outcomes of our investigation align with the conclusions made by Al-Helaly ⁽³⁷⁾ concerning the notable rise in total cholesterol levels among workers exposed to chemical vapors in cement and oil refineries.

When we talk about cholesterol, we're talking about the entire amount of cholesterol in the blood, which includes: List every kind or class of cholesterol that is present ⁽³⁸⁾.

According to the study, the large abnormal rise in the level of cholesterol in the blood in groups of male and female barbers compared to healthy people indicates the negative effect of chemical vapors on lipid metabolism. As a result of liver damage, lipid metabolism is affected, and a violation of the integrity of the cell membrane leads to the excitement of some membrane lipids in the blood circulation. On the other hand, chemical vapors reduce the ability of tissues to regulate lipid metabolism. Therefore, there is a possibility that inhaling the vapors may lead to atherosclerosis, as was observed in previous studies on laboratory animals as well ⁽³⁹⁾. The presence of cholesterol in cell membranes gives them proper permeability. Cholesterol is a structural component of mammalian cell membranes. In addition, cholesterol is involved in nerve conduction, cell signaling, and intracellular transport. Although it is produced in a variety of tissues, the intestinal walls of vertebrates and the liver are the main sites. The health of the circulatory system can also be inferred by measuring cholesterol levels, lipid and lipoprotein disorders, and the risk of atherosclerosis. ⁽⁴⁰⁾

We note a significant increase in Triglycerides at the probability level at ($p \leq 0.05$) for male and female barbers compared to healthy males and females as a control sample. as showed in fig.(7)

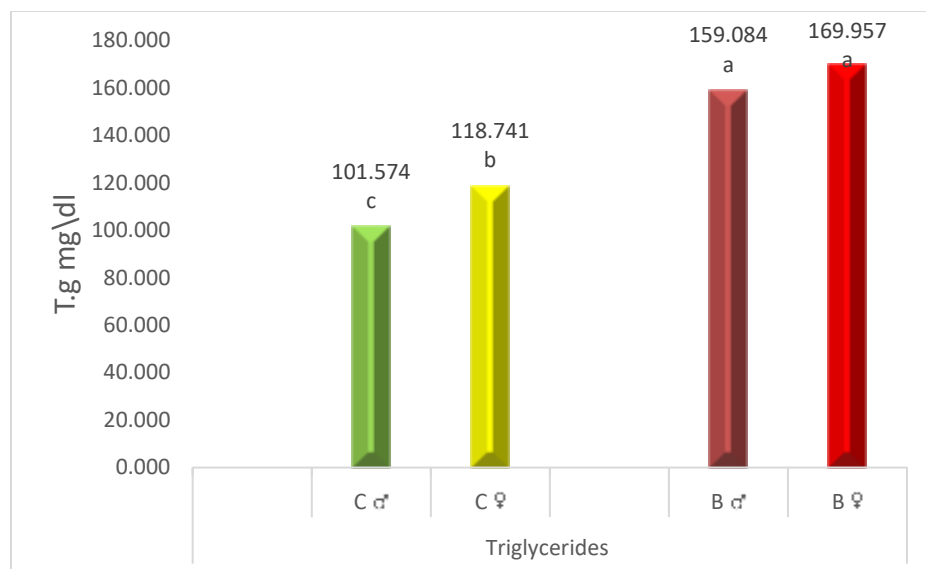


Fig.(7) level of Triglycerides in control and barbers

The results of our study are consistent with what the researcher ALJUBOURI ⁽³²⁾ reported regarding the high level of triglycerides in oil refinery workers who inhale chemical vapors.

Low-density lipoprotein (VLDL) particles released by the liver and chylomicrons secreted by the small intestine are significant sources of blood fat. Because food-based TG and cholesterol are unstable, fasting is frequently necessary in order to measure liver-derived lipids in blood ⁽⁴¹⁾. In the form of VLDL particles, the liver releases TGs as well as endogenous and exogenous cholesterol into the bloodstream. Then, the VLDL1-VLDL2-IDL-LDL lipodation cascade is carried out by the triglyceride- and cholesterol-rich VLDL, producing intermediate-density lipoprotein (IDL) and low-density lipoprotein (LDL) particles ⁽⁴¹⁾. Through LDL receptors (LDLR), tissue cells are able to absorb LDL particles. High-density lipoprotein (HDL) particles are formed when excess cholesterol is either passively or actively transferred to the liver, gut, or pancreas to make apolipoprotein A-I (ApoA-I). To create steroid hormones, HDL carries cholesterol to steroidogenic organs. It then returns the cholesterol to the liver for recycling or filtration ⁽⁴²⁾.

Because VLDL is a carrier of triglyceride molecules, the ratio between them is constant, and thus there was a significant increase at the probability level at ($p \leq 0.05$) for male and female barbers compared to healthy males and females as a control sample. as attend in fig.(8)

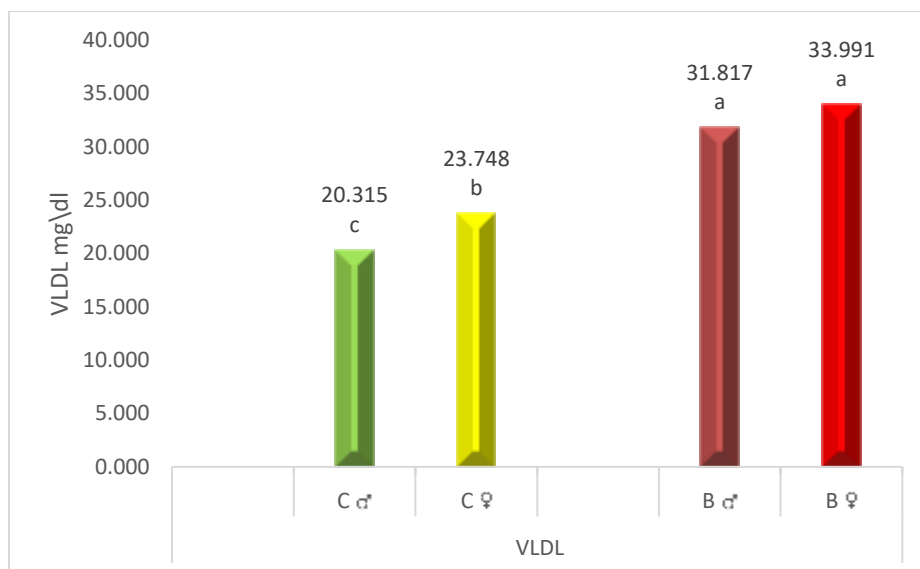


Fig.(8) level of VLDL in control and barbers

One of the main contributing factors to the onset of atherosclerosis and eventual cardiovascular disease is Hyperlipidemia. The link between abnormal blood lipids and air pollution is well-established. The majority of epidemiological studies support the detrimental effects of air pollution on blood lipids, despite the fact that the results are inconsistent due to varying research techniques and settings. Research on the mechanisms by which air pollution affects blood lipids has shown that it can do so through changes in insulin resistance, oxidative stress, inflammation, mitochondrial dysfunction, hypothalamus hormone, and epigenetics. Additionally, there is a chance that air pollution will cause metabolic disorders such fatty liver disease, diabetes, and obesity, all of which are linked to dyslipidemia. Thus, the biological possibility that air pollution influences blood lipids exists ⁽⁴³⁾.

To know the damage caused to the liver as a result of dealing with hair dyes and hair straighteners, liver enzymes must be measured and compared between the groups, as the results of measuring enzyme activity showed a significant increase at the probability level ($p \leq 0.05$) for male and female barbers compared to healthy males and females as a control sample, and the increase was also for female barbers. Significantly higher compared to males which indicates the occurrence of necrosis of some liver cells and the release of their contents into the bloodstream as a result of dealing with these substances, as shown in the fig.(9)

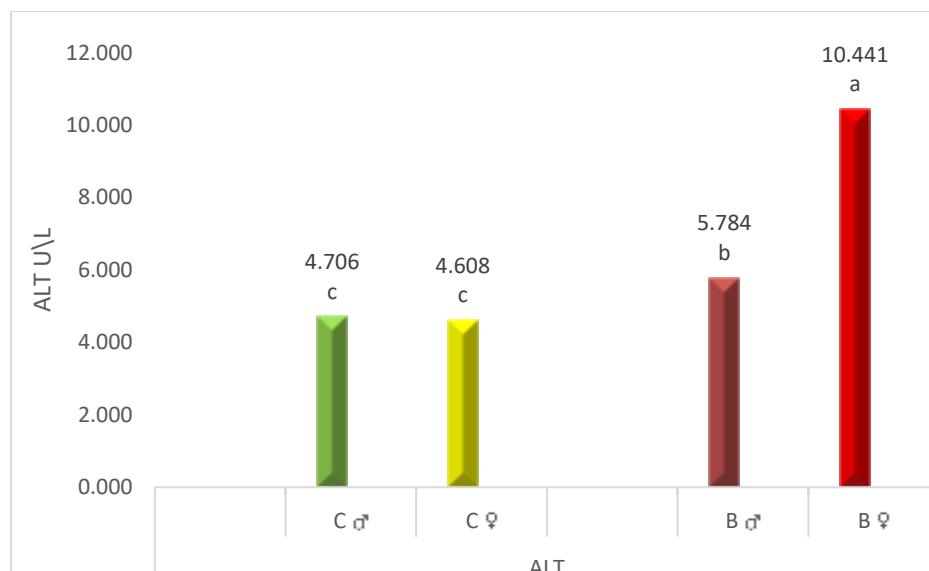


Fig.(9) level of ALT in control and barbers

The results of our study agree with researcher Nazik, who showed that there was a significant increase in ALT level treatments with hair dye and oxidizing hair cream compared to a group that used henna ⁽²⁷⁾ .

Hair straightening creams containing high concentrations of formaldehyde have been shown to exhibit a more serious reaction than has been previously documented for formaldehyde alone. This suggests that formaldehyde may act in concert with any other unidentified compounds in the creams or that these ingredients may be non-specific and have a high potential for toxicity on their own. We draw attention to the widespread use of cosmetic formulations by non-specialists, such as hair straightening treatments, because they may contain carcinogenic substances that increase the risk of tumors occurring and developing in primitive users. ⁽⁴⁴⁾.

In order to know the damage caused to the liver as a result of dealing with hair dyes and hair straighteners, another enzyme must also be measured through which liver and cardiac safety is AST confirmed, which is where a significant increase was observed at the probability level ($p \leq 0.05$) for male and female barbers compared to healthy males and females as a control sample.as disport at fig.(10)

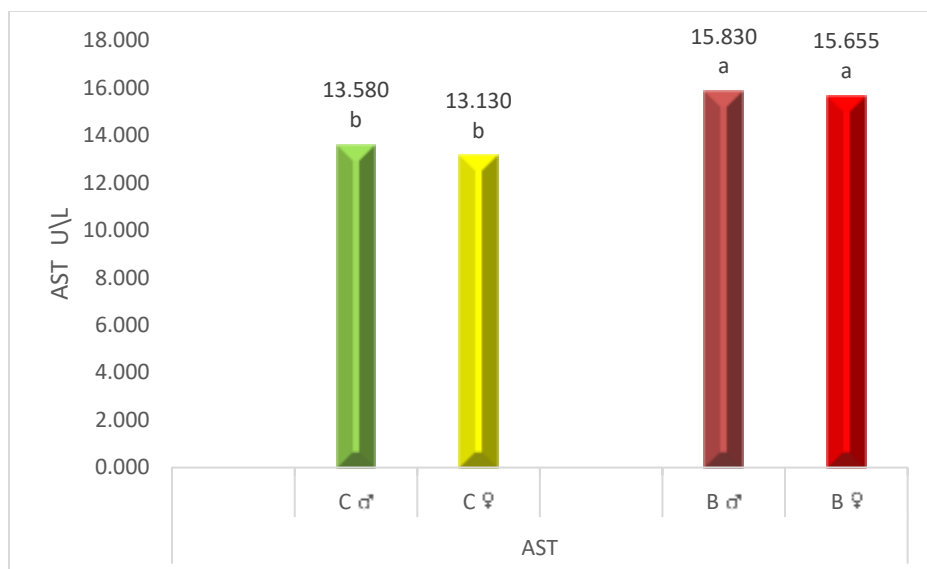


Fig.(10) level of AST in control and barbers

The results of one study, which discovered statistically significant positive associations between AST and ALT levels and liver oxidative stress, are in line with the results of our investigation. Hepatotoxic and oxidative effects of oxidizing creams and hair dyes have been reported. Comparing the oxidative and hepatotoxic effects of henna and oxidizing cream, it was not expected to find similarities. Compared to hair dye, the oxidizing cream was more harmful to the liver and had higher oxidative stress than hair dye and henna. ⁽²⁷⁾ The results of our study also agreed with a study conducted in 2018 between hookah smokers and healthy people, where an increase in levels of liver enzymes was observed ⁽⁴⁵⁾. Increased ALT and AST enzyme activity are linked to hookah smoke due to lipid peroxidation that destroys the biological cell membrane of the liver as a result of hookah smoke, where transporter enzymes work. Aminoenzymes are sensitive indicators of liver cell damage ⁽⁴⁶⁾.

When measuring the blood glucose level, it was observed that there was a significant increase at the probability level ($p \leq 0.05$) for male and female barbers compared to healthy males and females as a control sample, as shown in fig.(11).

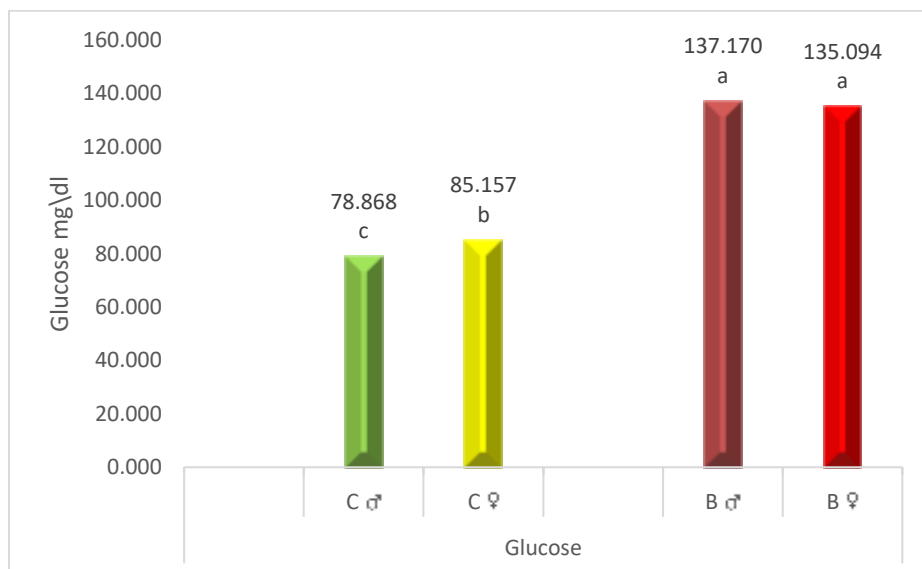


Fig.(11) level of Blood Glucose in control and barbers

The results of our investigation support those of Al-Hilali ⁽³⁷⁾ who found that smoking industrial workers had significantly higher blood sugar levels than non-smoking manufacturing workers. Both male and female barbers may have high blood sugar levels as a result of a sedentary lifestyle or a fast food addiction. In the world, air pollution is another significant risk factor. Our research strengthens the body of data linking chronic air pollution exposure to diabetes. PM10 seems to be a helpful indicator of the components of air pollution linked to diabetes. At concentrations below recommended limits for air quality, this correlation can be seen. ⁽⁴⁷⁾.

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