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تأثير التدخين على خلايا الدم و انزيمات الكبد في مناطق غرب ليبيا

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Effect of Smoking on Blood Cells and Liver Enzymes In Western Libya

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الملخص:

يعد التدخين من الاهتمامات الكبيرة على الصحة العامة، وتأثيره عليها ملحوظ، حيث يسبب العديد من الأمراض ويساهم في الوفيات المبكرة. في حين أن الآثار الضارة للتدخين على الجهاز التنفسي معروفة على نطاق واسع، إلا أنه تم إيلاء اهتمام أقل لتأثيره على مؤشرات الدم والكبد. الهدف: تهدف هذه الدراسة إلى تقييم تأثير تدخين السجائر على تعداد الدم الكامل وأنزيمات وظائف الكبد لدى المدخنين بين السكان في غرب ليبيا. **المنهجية:** أجريت هذه الدراسة على **148** شخصاً ليبياً في غرب ليبيا. ضمت المجموعة **88** مدخناً تتراوح أعمارهم بين 20 و70 عاماً، مع تفاوت مدة التدخين من أقل من **10** سنوات إلى أكثر من **10** سنوات. كما شملت **60** شخصًا من غير المدخنين الذين تم جمعهم في نفس الفئة العمرية للمقارنة الإحصائية. النتائج: كشفت الدراسة عن زيادات في معايير الدم بما في ذلك الهيموجلوبين (17 جم / ديسيلتر)، وحجم الخلية (97.0٪ فلوريدا)، وخلايا الدم الحمراء (6.7 * 10^6 ميكرولتر)، وخلايا الدم البيضاء (18.0 * 10^3 ميكرولتر). لتر) والصفائح الدموية (468 * 10^3 ميكرولتر)

كما لوحظت تأثيرات مماثلة في إنزيمات الكبد **AST**: (70 وحدة / لتر) و **ALT**(65.7 وحدة / لتر). ويزداد هذا التأثير خاصة مع زيادة مدة التدخين. **الاستنتاج:** كانت التغيرات في نشاط إنزيمات وظائف الكبد مؤشرا على تأثير تدخين السجائر. على وظائف الكبد، وارتبطت درجة التغير بمدة التدخين. قد تترافق التغييرات مع زيادة خطر الإصابة بكثرة الحمر الثانوية وتصلب الشرايين وأمراض القلب والأوعية الدموية.

الكلمات الدالة: تدخين السجائر، صورة الدم الكاملة***(CBC)*** ، إنزيمات الكبد.

Abstract

Background: Smoking is a major concern for public health, and its impact on it is noticeable, causing many diseases and contributing to premature deaths. While the harmful effects of smoking on the

respiratory system are widely recognized, less attention has been paid to its effect on blood and liver parameters.. **Objective:** This study was aimed study is to evaluate the effect of cigarettes smoking on complete blood count (CBC) and liver function enzymes in smokers among populations in Western Libya. **Methodology:** this study was conducted on 148 Libyan people in the cities of Al-Zahraa and Janzour.

The group included 88 smokers aged between 20 and 70 years, with varying duration of smoking from less than 10 years to more than 10 years. It also included 60 non-smokers who were gathered in the same age range for statistical comparison. **Results:** The study revealed increases in blood parameters including hemoglobin (17 g/dL), cell volume (97.0%fl), red blood cells ($6.7 * 10^6$ μ L), and white blood cells ($18.0 * 10^3$ μ L). liters) and platelets ($468 * 10^3$ μ L).

Similar effects were also observed in liver enzymes: AST (70U/L) and ALT (65.7U/L).these effect increase especially with increase duration of smoking **Conclusion** Changes in the activity of liver function enzymes were indicative of the impact of cigarette smoking on liver function, and the degree of change was correlated with the duration of smoking. Changes may be associated with an increased risk of secondary polycythemia, atherosclerosis, and cardiovascular disease.

Keywords: cigarette smoking complete blood count (CBC),liver enzymes

INTRODUCTION

One of the worst human habits and behaviors is smoking, which negatively affects all cultures equally. A number of ailments, including heart disease, lung cancer, vascular disorders, and others, are mostly brought on by smoking. Reports from the World Health Organization state that smoking causes one death worldwide every six minutes. Of the chemicals found in a single cigarette, 200 are harmful and 80 are carcinogenic [1].The human body is harmed and becomes disordered by these poisonous compounds, which include nicotine, carbon monoxide, hydrogen cyanide, nitrogen oxide, and free radicals. The burning of tobacco in cigarettes [2] affects Blood levels and the activity of liver enzymes.

Because smoking smoke produces carbon monoxide, which is more strongly linked to hemoglobin than oxygen, burning tobacco has a significant effect on blood parameters and physiological changes in the human body. Carbon monoxide is linked to a number of disorders, including anemia, blood viscosity, hypoxia, and liver cancer. etc. Cigarette smoking alters the blood system by raising the levels of macrophages, platelets, and white blood cells. Additionally, it raises the volume of red blood cells in the blood as well as hemoglobin. Because the liver plays a crucial role in the removal of toxins from the body, tar, which is a poisonous component of smoke, enters the liver through the blood. It is believed that smoking has an indirect impact on the liver. [3,4].

The liver is regarded as one of the most vital organs in the body, performing a variety of vital tasks include detoxifying the body and metabolizing drugs and alcohol. [5].

It is believed that smoking has an indirect impact on the liver. According to certain research, smoking may influence the onset of chronic liver disease and raise the risk of cirrhosis. The proteins the liver produces and uses in different metabolic processes are known as liver enzymes. It aids in the body's breakdown of poisons and medications. As a result, any abnormality in the liver causes an increase in the blood's production of these enzymes, which include ALT and AST. One of the first tests to identify potential alterations in blood physiology is the CBC test. One of the first tests to identify potential alterations in blood physiology is the Complete blood count(CBC) test. [5,6].

Assessing and forecasting potential liver disorders can also benefit from testing your liver's overall function and its enzyme levels in particular.

As a result, the current study focuses on how smoking affects blood and the activity of the aspartate transaminase (AST) and alanine aminotransferase (ALT) liver enzymes. It also focuses on examining the distinctions between people who smoke and those who do not. [7].

Effect of Smoking on The Blood

Prior research indicates that smoking's impact on red blood cells raises blood levels of carbon monoxide (CO). Because carbon dioxide binds to hemoglobin more readily than it does to oxygen, red blood cells are less able to carry oxygen, which lowers oxygen delivery and adds to the tissues' lack of oxygen. [8].

Bone marrow hyperplasia is caused by erythropoietin, which is generated in response to hypoxia. Because of this, secondary polycythemia is produced, which raises red cell mass and turnover rate. [9,10].

Furthermore, smoking cigarettes alters the circulatory system by raising the numbers of monocytes, lymphocytes, platelets, eosinophils, basophils, and macrophages. Red blood cells and hemoglobin levels in the blood are also raised by it. Nicotine increases the release of hormones that cause blood cells to aggregate, blood arteries to become more viscous, and platelets to clump together. Moreover, prior research has demonstrated that the quantity of white blood cells rises in direct proportion to the daily cigarette smoke intake. [11,12].

The liver is a vital organ with a multitude of functions. Among other functions, the liver is in charge of eliminating poisons, alcohol, and other medications from the body. Proteins called enzymes help the body's chemical reactions proceed more quickly. Bile is produced as a result of these chemical interactions, which also produce compounds that aid in blood clotting, break down food and pollutants, and combat infections. Enzymes are useful proteins found in the liver's bile ducts and liver cells. [13,14].

These proteins are released when liver cells sustain injury, which causes an increase in blood levels.

Among these many enzymes, the most common ones are examined

1.Alanine aminotransferase (ALT).

2. Aspartate aminotransferase (AST).

3.Alkaline phosphatase (ALP).

4. Gamma-glutamyl transferase (GGT).

If the liver is injured, it releases enzymes into the bloodstream, most commonly ALT and AST. [14,15].

Effect of Smoking on the Liver and Its Enzymes

Since the liver is one of the organs that smoking does not directly impact, smoking excessively produces toxins that raise the risk of liver lesions (fibrosis and activity levels) linked to hepatic viruses and drive necrotic inflammation. [16].Smoking has three main detrimental effects on the liver: immune system effects, tumor development effects, and direct or indirect adverse effects. Because smoking produces compounds that may be harmful to cells, it can have a direct hazardous effect. Smoking produces several compounds that cause oxidative damage. It promotes the development of fibrosis and the generation of stellar cells. TNF-alpha and other pro-inflammatory cytokines linked to liver cell fibrosis, such as IL1, IL6, and IL10, are also produced in part by cigarette smoke [5,17].

The liver and the enzymes AST (aspartate aminotransferase) and ALT (alanine aminotransferase) may be adversely affected by smoking. When there is injury or inflammation to the liver cells, the liver enzymes AST and ALT are released into the bloodstream. Increased blood levels of these enzymes may be a sign of liver damage or malfunction. According to

studies, smoking can raise blood levels of ALT and AST, which may indicate inflammation or injury to the liver [18].Toxic compounds in cigarette smoke and oxidative stress brought on by smoking can harm liver cells and enhance the release of these enzymes. [5].

Moreover, there is a correlation between smoking and a higher chance of liver disorders such liver cancer, alcoholic liver disease, and non-alcoholic fattymliver disease (NAFLD). These illnesses may cause the blood's ALT and AST levels to rise even further[19]. It is noteworthy that smoking is not the exclusive cause of liver illnesses; rather, it can play a role in addition to other lifestyle decisions and inherited tendencies. [19].

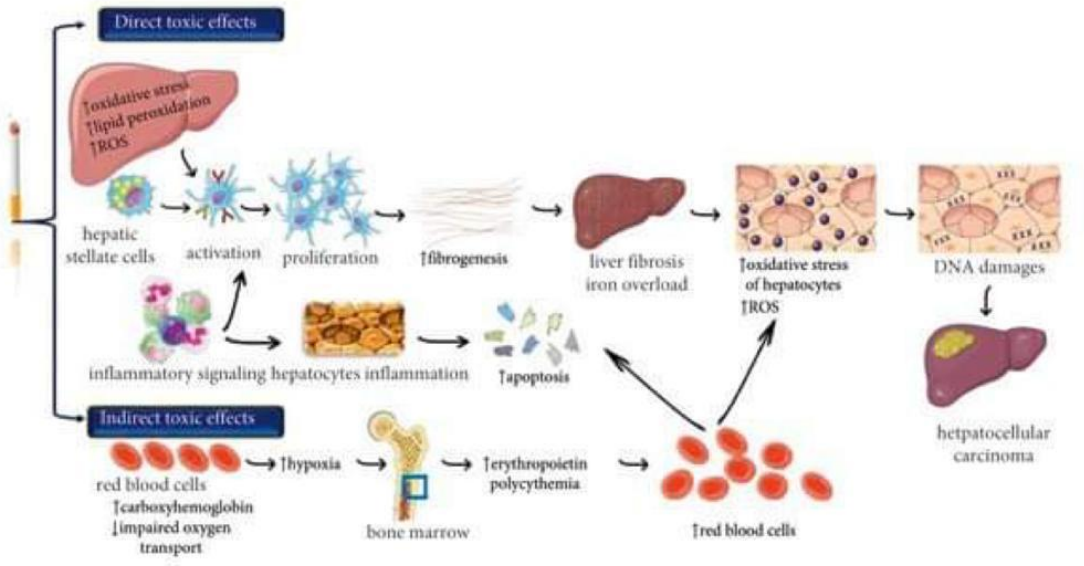

Figure (1): Diagram with potential molecular mechanisms by which tobacco smoking can induce liver carcinogenesis.

AIM OFTHIS STUDY

This study aims to explore the differences between smokers and non-smokers in various blood variables and serum biochemical markers of liver function in the human body.

This study was created to evaluate the relationship between cigarette smoking and its effects on the liver and blood.

In this study, we planned to compare blood parameters and liver enzyme activity (AST & ALT) in smokers with non-smokers.

SUBJECTS AND METHODS

(148) Libyan males in the city of Janzour ,AlZahra and Tripoli areas, were divided into two groups: (88) smokers and (60) non-smokers, and their ages ranged between 20-70 years. . All participants did not suffer from any chronic diseases and did not take any medications.. Each person in this study was asked how long they had smoked. A blood sample was collected from a vein, a small amount of each sample was separated into a test tube containing the anticoagulant with gentle mixing for use in the CBC test, and the remainder was left to clot in serum separation gel tubes.

Sample collected over a period of eight months from the beginning of August 2022 to the end of March 2023.

The Questionnaire

No.	Question	Answer
1	Do you smoke?	• Yes • No
2	The Age	
3	Smoking period?	• > 10 years • < 10 years
4	Do you suffer from any chronic diseases?	• Yes • No

Statistical analysis

Spss. v. 26 software was used to analyse the data of this study

Results

Table (1): Distribution of frequencies among smokers and non-smokers

smoking	Frequency	Percent	Mean	Std. Deviation
smoker	88	59.5%	2.3636	1.39936
non-smoker	60	40.%	3.1333	1.39936

This study targeted (88) smokers and (60) non-smokers males.

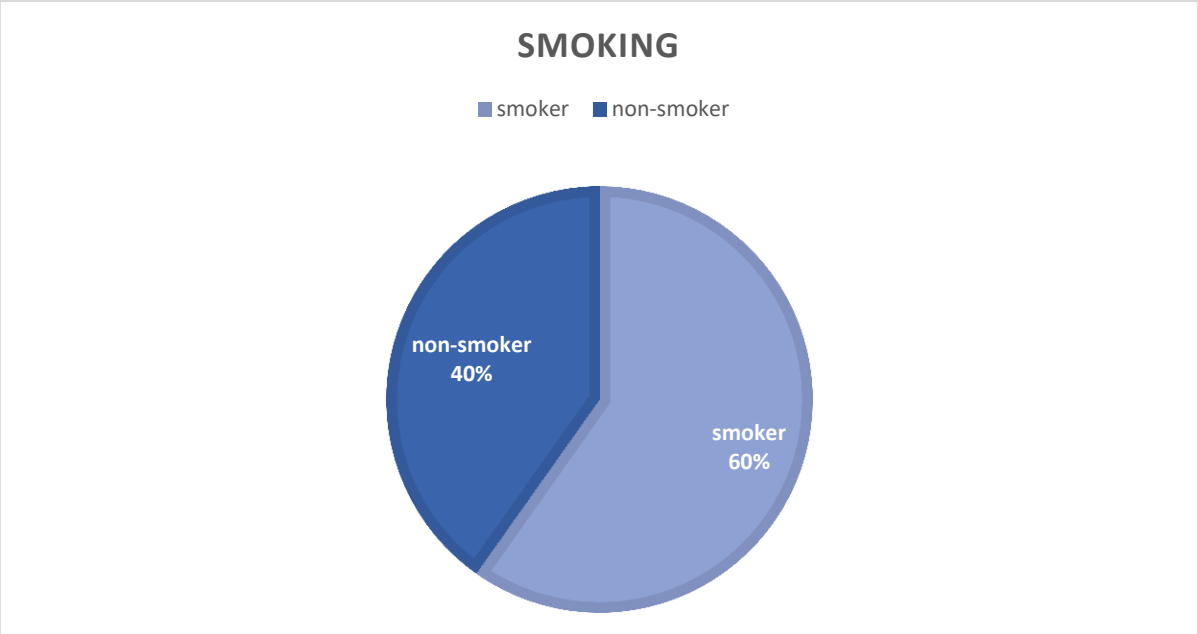

Figure 1: Distribution of frequencies among smokers and non-smokers

Table (2): shows the period of smoking among the smokers participating in the study

smoking period	Frequency	Percent
more than 10 years	54	36%
less than 10 years	34	23%

Most study participants had been smoking for more than 10 years.

Table (3): Ages of study participants

Age	Frequency	Percent
20-30	50	33.8%
31-40	22	14.9%
41-50	27	18.2%
51-60	24	16.2%
61-70	25	16.9%
T0tal	148	100%

Most participants are between 20 -30 years' old

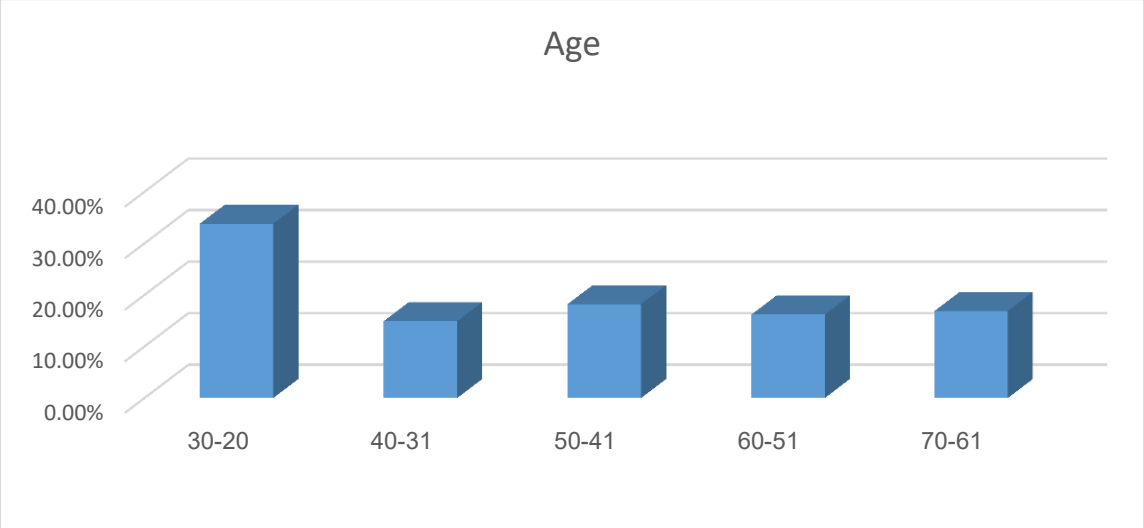

Figure 2: Ages of study participants

Table (4) : Chronic diseases percentage

chronic diseases	Frequency	Percent
yes	0	0%
no	148	100%

All participants do not suffer from chronic diseases

Table (5) Liver function test in male smoker and non-smoker

	smoker		non-smoker	
	Mean	Std. Deviation	Mean	Std. Deviation
AST	22.5341	12.43184	23.2667	12.44087
ALT	26.5682	13.33718	24.5000	12.25367

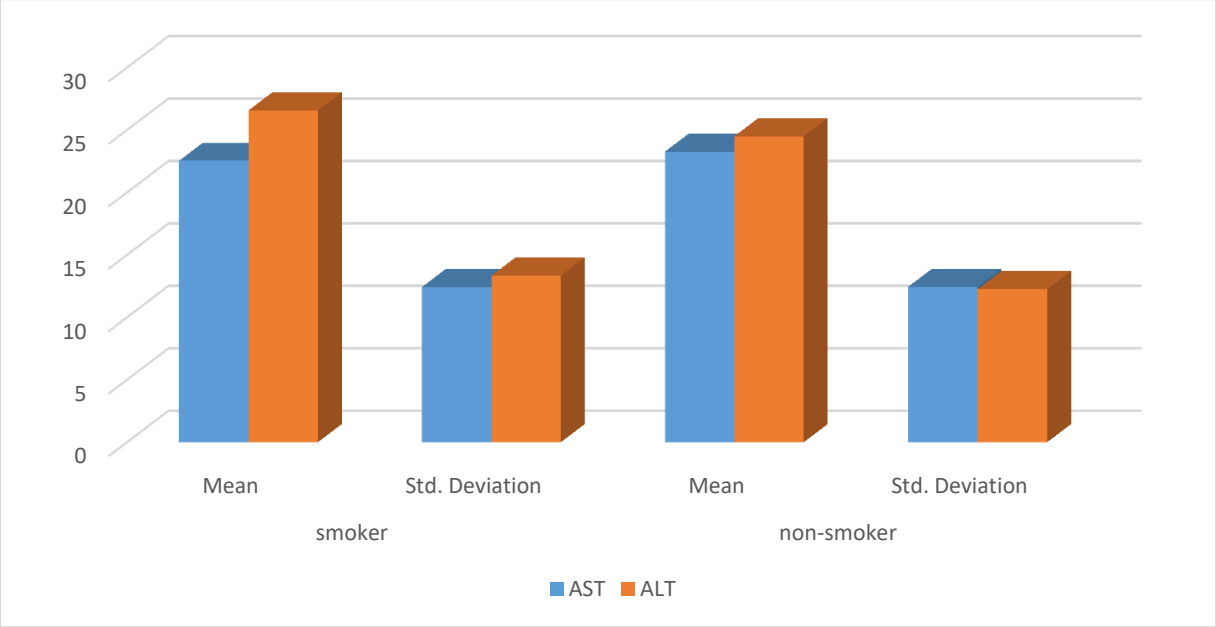

Figure 3: Liver function test in male smoker and non-smoker

Liver function test measures liver enzymes with an automated human analyzer for all smokers and non-smokers. AST concentration increased significantly ($P < 0.05$) in smokers. In addition, ALT level increased significantly ($P < 0.05$).

Table (6): Blood indicators in male smoker and non-smoker

	smoker		**non-smoker**	
	Mean	Std. Deviation	Mean	Std. Deviation
WBC	38.5000	20.18307	27.9000	17.88731
Lymph	29.8977	15.58738	27.4333	16.67370
Gran	32.1023	16.57518	32.1667	17.97943
HGB	21.2955	10.79289	20.2667	10.73544
RBC	27.1591	21.32124	40.1333	9.19371
MCV	32.2273	15.99046	24.5000	13.27097
MCH	28.3295	15.17993	23.0333	11.53472
HCT	30.0000	15.17484	27.9000	14.61912
PLT	27.3068	20.57135	40.5333	8.42809

WBC, RBC HB, HCT, and MCV for Smokers and Nonsmokers WBC, RBC HB, HCT, and MCV were measured by a fully automatic counting instrument for all volunteer smokers and nonsmokers Cigarette smoking caused a significant ($P < 0.05$) increase in RBCs in males

There was also A statistically significant increase ($P = 0.000$). The MCV showed a statistically significant change ($P < 0.05$) between male smokers and male non-smokers. The analysis also showed that the number of white blood cells changed between all groups, but it did not reach statistical significance ($P > 0.05$).

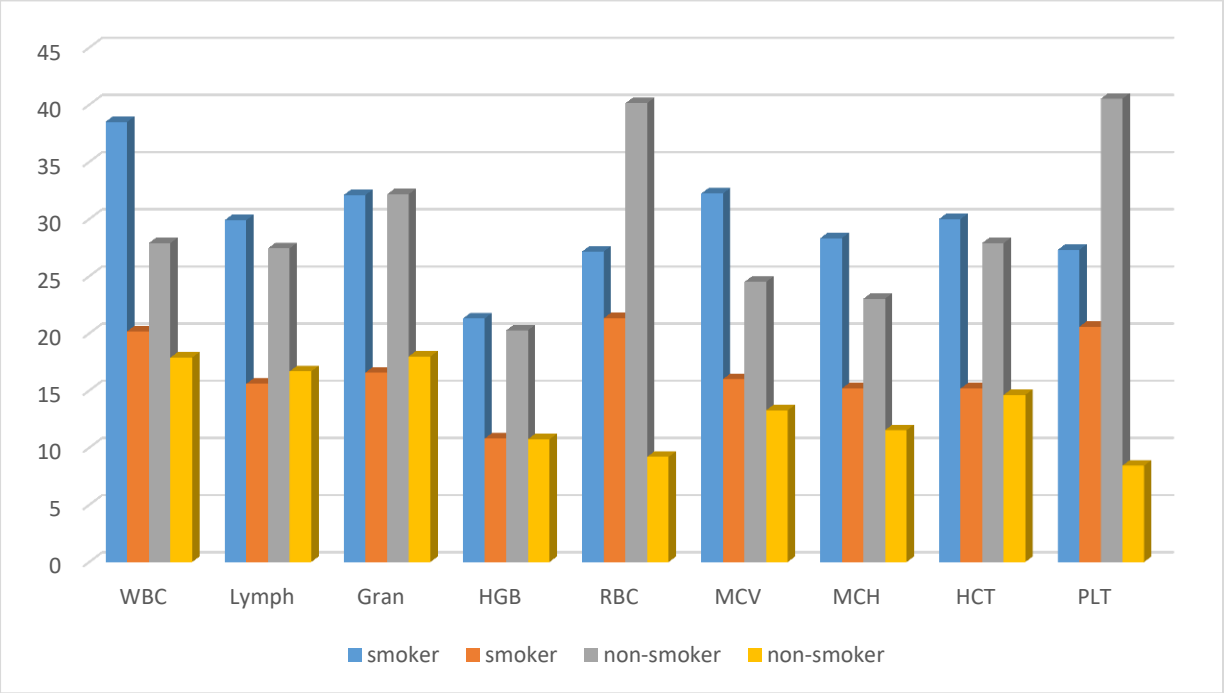

Figure 4: Blood indicators in male smoker and non-smoker

Table (7): Correlations with selected parameters in the smokers group

parameters	Pearson Correlation	Sig. (2-tailed)
Age	.253**	.002
AST	.029	.725
ALT	-.079-	.340
WBC	-.262-**	.001
Lymph	-.076-	.360
Gran	.002	.982
HGB	-.047-	.569
RBC	.345**	.002
MCV	-.248-**	.002
MCH	-.186-*	.024
HCT	-.069-	.403
PLT	.363**	.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

These two parameters are closely related to the RBC count, since HB is the hemoglobin concentration in grams, while HCT is the total RBC volume in percentage (31). Thus, if the number of red cells increases, the level of HB and HCT will increase as they change proportionally to the RBCs. However, red blood cell volume increased in the current study due to significant increases ($P < 0.05$) in MCV for the male smokers group. We believe that cigarettes can affect blood cell physiology by various mechanisms, including physical and chemical reaction mechanisms. Furthermore, cigarette smoking caused a change in liver enzymes, but it was more pronounced in the male smokers group; Many of these fluctuations are associated with elevated blood parameters (32)(33)(34). In conclusion, the dangers of cigarettes lead to changes in blood cells and fluctuations in liver enzymatic activity in males.

Discussion

The study, based on the samples collected and analyzed graphically, showed that there are harmful effects on blood parameters.

The values of hemoglobin, number of red blood cells, hematocrit, and red cell size were compared between smokers and non-smokers.

The results were a significant increase in the levels of HGB, HCT, and MCV, While the level of RBC decreased in smokers compared to non-smokers. The explanation for this is that cigarette smoke contains 4000 compounds, including carbon monoxide, which is quickly distributed through the alveolar capillaries, where it combines strongly with hemoglobin (With a binding capacity greater than that of O2) forming carboxyhemoglobin (HbCo).

Such a reaction leads to tissue hypoxia, which leads to an increase in the values of red blood cells, hemoglobin, and red cell size.

Some studies indicate that the high level of hemoglobin in the blood of smokers may be a compensatory mechanism. (El-Zayadi,2006)

The cause of decreased red blood cells in men who smoke may be to lack of oxygen, anemia, or destruction of RBC due to chemicals present in smoke.

The cause of decreased red blood cells in men who smoke may be to lack of oxygen, anemia, or destruction of RBC due to chemicals present in smoke.

Total white blood cells also increased in smokers, with an increase in lymphocytes. This can be due to many factors, as inflammatory stimulation of the respiratory system leads to an increase in signs of inflammation in the circulatory system, which affects white blood cells.

Many studies have proven that a high number of white blood cells represents an independent indicator of atherosclerosis and cardiovascular disease.

Platelet values were lower in smokers compared to non-smokers.

It has been shown, according to previous studies, toxins found in smoking affect the process of platelet formation in the body. (Farsolinos ,et al, 2013)

The results of this study also showed, according to the statistical table of liver enzymes, that there is a significant increase in the serum level of ALT, While the level of AST decreased in smokers compared to non-smokers.

The increase in ALT levels is likely due to the harmful effects of chemical compounds found in tobacco smoke on liver cells. Which leads to increased secretion of these enzymes through inflammatory pathways, or due to exacerbation of the disease-causing actions of other compounds on the liver.

While AST enzyme deficiency does not indicate a liver problem .

These enzymes, in addition to other enzymes, can be used to diagnose liver disorders.

The results of this study were consistent in terms of the increase in levels of HGB, HCT, WBC, and lymph with the results of previous studies.

As for MCV, it increased in our study, while The percentage of AlT also decreased in the current study, the percentage of RBC and PLT decreased, and this result contradicts the study of [Husen ...et al(2015)], agreed with [Noor (2020)]and [.Rafiye (2019)..etc)].

CONCLUSION FUTURE STUIES

Smoking is one of the most problem affect people in the world. Our study done in western Libya (Zahra, Tripoli.Janzour)). Our findings demonstrated Blood markers such HGB, WBC, lymph, MCV, and HCT are severely harmed by smoking. Secondary polycythemia, atherosclerosis, and cardiovascular disease may become more likely as a result of these alterations. Smoking can raise liver enzyme activity, and an excessive rise in this can put the liver at risk for harm. Compared to non-smokers, smokers have more health risks. the correlation coefficient between age and vital values for ALT, WBC, MCV, lymph, HBG, MCH, and HCT shows a negative association. While the correlation coefficients show a direct association between age and vital data. Age and vital values in AST

have a direct association in the correlation coefficients. Recommend quitting smoking quickly until the body returns to its normal state.

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