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Effect of Iron and Cadmium on Some Biochemical Factor in Blood Smokers .

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Abstract

In this study including estimating the concentration values of some heavy metal (Iron and cadmium) as well as measuring some of the Biochemical factors in the blood smokers groups liver enzyme
Alanine aminotransferase (ALT),Asparatate aminotransferase (AST) , and alkaline phosphtase ALP) and Malondialdehyde antioxidant (MDA) and the peoples study groups contains (150) presence , divided into three groups , and the persons smokers divided into two groups each group consist of (50) of smokers according to the time smoking period , age and no. of cigarette per day , the first group from(1-10years) and the second groups more (than 10 years), the age was between (25-55years), the number cigarettes smokers per day 40 cigarettes , and the third group of 50 healthy negative smokers.
Estimated amount of cadmium and Iron elements have been found to be higher level concentration in blood smokers groups compared with negative-smokers groups) and also were measured some biochemical factor in blood of smokers groups , we found to be higher levels (liver enzymes ,ALT, AST. and ALP) and antioxidant MDA) were compared with blood of the healthy peoples groups negative smokers (control groups) .

The results indicated that there were significant differences ($p< 0.001$) in the levels of heavy metals cadmium and Iron and biochemical factor in blood of the smokers groups because exposure to high concentrations of pollutants of cigarette smokers , compared with negative -smokers groups (control).
Keywords : cadmium, Iron , smokers , negative-smoker, biochemical factor , MDA.

Introduction:

The use of tobacco is increasing and widely spreading throughout the world , and many major disorders are caused and enhanced by cigarette smoking , and different kind of diseases that lead to death appear all over the world every year [1]. The risk of the death among smokers depends on smoking duration , number of cigarettes smoked daily , and the degree of inhalation .In the smoke of tobacco there are many harmful compound with bad effect on the Human body , for example carcinogenic , cytotoxic compounds and different other compounds that work as an oxidants which including Oxygen free radicals and volatile aldehydes , this kind of oxidant substances may responsible of the bimolecular damage [2]. From cigarette smoke which are directly responsible of the bad effect on the human body,

Toxic heavy metal can cause dermatological diseases, skin cancer and internal cancers (liver, kidney, lung and bladder), cardiovascular disease, diabetes, and anemia, as well as reproductive, developmental, immunological and neurological affects in the human body [3].

who are exposed to tobacco smoke from the environment amount significant of these harmful substances .Heavy metals cause serious damage significantly on human health , in fact , explained some of the polls that the contents of some of the toxic heavy metals [4] .Body accumulate heavy metals from , their environment , they level in aquatic environment . The level of cadmium and Iron in blood can be taken as a representative of dose/ exposure.

The Iron metal :

It is known that members of the body need iron in order to functioning properly , however, our bodies secrete a sufficient amount of iron , so you do not deal with iron supplements if you were not experiencing anemia , because iron has a negative impact on the work of medications and supplements food , as it increases the case of patients with ulcers worse and lead to injury constipated [5] .

It is noteworthy that the ladies before the menopause who need 15 mg of iron per day , and the fact that most women receive less than 10mg . Approximately two thirds of the total iron in our bodies can be found in the oxygen –carrying protein of red blood cells known as hemoglobin , according to the National Institutes of health office of Dietary Supplements . Failure to consume enough iron to keep iron stores in the body high can cause iron –deficiency anemia, a condition characterized by a low number of red blood cells [6].

The Cadmium metal :

metallic chemical element fine ranging in color between silver and white . The cadmium in tobacco smoke either cigarettes or pipe studies have shown that cigarette smokers have higher rates of cadmium in smoker person or persons sitting with a smoker they take cadmium by inhaling smoke fumes [7] , poisoning cadmium due to high blood pressure and anemia and poisoning cadmium based on the weakening of the immune system , it causes reduced production of lymphocytes , which protects the white blood cells that protect the body by destroying objects west that attack the body and cancer cells , and because cadmium is being held in the kidney and liver , the increased exposure has kidney disease and serious destruction of the liver and the potential effects of exposure to cadmium intensive , emphysema and cancer[8] .

The measurement of the morality risk and the death risk in the smoking individuals are depending on how long the persons are exposing to the tobacco smoke and how many cigarettes they are smoking every day [9] .

There are many organ in human body which are not direct contact with cigarette smoking but they are affected greatly , one of these organs is the liver which is very important for the metabolism , storing the glycogen and it is also important for the process of eliminating the harmful compounds , toxic compounds , and drugs from the human body as it is the case of liver [10].

Our project is devoted to determine how the liver and its enzyme secretion is affected by the cigarette smoke by checking the levels of the enzyme (ALT) Alanine aminotransferase , Asparatate aminotransferase (AST) and The increase in the effectiveness of liver enzymes can occur as a result of increased cell processing processes or as a response to cell growth processes . Including alkaline phosphates' (ALP) , which is used to measure the liver's extractive . So, our project is devoted for the evaluation of relationship between the smoke of tobacco and the physiological function of liver and the smoke effect on its secretion of enzymes and their levels in blood serum [11].

The effect of smoking cigarettes on the liver is caused by many harmful chemicals and toxic compounds which present in cigarette smoke that cause liver damage represented by liver cell injury , and that increase the probability of chronic inflammation , liver diseases such as hepatitis B, and C, and also high probability of the liver cancer and many other liver disorders like liver fibrosis[12].

On the other hand , the smoking can increase the effectiveness of MDA as a result of the oxidation of the polyunsaturated fatty acid . this will lead to shift the double bonds to peroxide and begin the formation of free radical such as $Roo^{\cdot}$, $Ro^{\cdot}$, $Ho^{\cdot}$, through the formation of peroxide from the unsaturated fatty acid .

The final products of the mechanical oxidation of unsaturated fatty acids and multi- double bond which lead to malondialdehyde (MDA).This has a high toxicity and inhibitor action on antioxidants enzymes, by working as a contributing factor for cancer [13].

The objective of this study is to determine the effect of smoking cigarettes on accumulate heavy metals Cd and Fe also liver is caused by many harmful chemical and toxic compounds which present in cigarette smoking that cause liver damage by measuring the efficacy of the enzymes of AST, ALT,ALP, and MDA in the blood of people smoking cigarettes represented by liver cell injury , liver diseases such as hepatitis and also high probability of liver cancer .

Materials and methods :-

Collected samples of blood solution :

Collected samples of blood to persons are healthy not infected with any disease and each group containing (50) people and the age between 25-55 year , and smoking (40) cigarette per /day , were with drawn (10) ml of blood from each donor and placed in tubes , clean and dry then the tube that contained blood sample transferred to centrifuge with a speed of 3000 rpm for 15 minutes .

Measure the amount of elements (cadmium and Iron) in the blood serum :

The serum is separated from all samples , serum were diluted using micro pipette , measuring sample was done by flame atomic absorption spectrophotometer was the best and the simplest one used to measure the concentrations of the some heavy metals in the samples [14].

Was the work of models of different tube spray devices atomic through which can be found absorption to the amount of iron and cadmium in each concentration where absorption they can read the absorbance of the amount of iron and cadmium in serum.

Enzymatic Assays :

Determination the level and efficiency of enzymes (AST,ALT,) :

The determination of the level of enzyme activity in the serum of laboratory smoker was studied . As follows by instructions according to the method mentioned by the company supplied Randox, U.K.[15].

Determination of the level and effectiveness of the enzyme (Alkaline phosphatase) (ALP) :

To determine the efficiency of alkaline phosphates (ALP) in the serum by measuring the optical density of the solutions along wavelength (510nm) using the optical spectrometer[16].

Method of determination of the level (MDA)

The measurement of the dialdyhide material in the chromatic manner used on wavelength absorption is (532nm) and method [17] .

statistical analysis:

The data of this study was used to analyze the variance . T. test , mean , standard error and standard deviation to test the significance of mean difference . Data has been analyzed by using statistical analysis system [18] .

Result and Dissection :

Efficacy level of Cd metal :

Table No.(1)and Fig. No.(1) show the result of the cadmium was significantly higher in smoker compared with non- smokers(p< 0.001) compatible with the presence of these metal in cigarette tobacco and inhaling them could contribute to disease connected with their accumulation in the human organism, [19]. Cadmium is a metal highly toxic . It also has a link and comes with some types of cancers in humans, as it causes in the incidence of anemia and cardiac hypertrophy . It is necessary to stop smoking . While increasing the absorption of cadmium content of food when at least calcium[20].

The study focused on estimating the concentration of heavy metal cadmium in the blood of smokers. The cigarette smoke that important sources of cadmium to enter the body should quit smoking and avoid the impact of passive smoking .At the height of cadmium in the body cause a significant increase in blood pressure and anemia in an iron in the blood and liver disease and damage to the nerves and the brain and the body gets rid of cadmium usually slowly. And cadmium , toxic effect which metal is highly toxic to all living organisms [21] ,

Table 1 determines the rate of the standard deviation and rate the level of significance cadmium(cd) metal when the control group and groups smokers .

Group	No.	g / dL)Cd Mean (µ ± S.D.	T .Test
Control	**50**	**0.007± 0.03**	**----------**
A	**50**	**0.0165± 1.4**	**P< 0.05**
B	**50**	**0.0227± 2.06**	**P< 0.001**

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

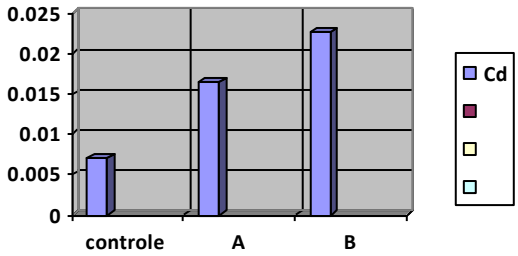

Fig .1 shows the efficacy of cadmium Cd metal between control group and smoker

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

Efficacy level of Iron (Fe) metal :

Table no. (2) and Figure No. (2)show the result of the Iron (Fe) leveling smoker though higher was not significantly different (p> 0.001).

The increase the level of Iron through time range well be increase the reaction Fenton and also increase of production of hydroxyl group (OH^-)[22] , free root danger has risk in the body because there no mechanical method to remove hydroxyl group from the body blood . And enters in the composition of the Iron hemoglobin therefore, the level of Iron in blood was high among smokers .It was also known that iron toxic to the liver if the increased levels in the tissues[23] . Iron helps to transport oxygen to the cells , particularly brain cells . When the level drops iron cells are in need of oxygen , and it leads to a sense of fatigue , memory loss, poor concentration , lack of enthusiasm and attention deficit and low level of achievement in the work[24].

Assembling_iron resulting from the death of cells and transferred again to the bone marrow for the works it hemoglobin and new cells.

Iron present in the human organism in ferrous state reacts with oxidizing reagents (e.g. with hydrogen dioxide) producing free radicals. Under normal conditions the radicals formed are controlled and removed by natural antioxidants but if the iron concentration systematically increases they are accumulated. Thus, iron overload may be a result of a high free radicals production, leading to heptatoxicity via lipid per oxidation and the destruction of the hepatic mitochondria.

Table 2 determines the rate of the standard deviation and rate the level of significance (Fe) iron metal when the control group and groups smokers .

Group	No.	g / dL)Fe Mean (µ ± S.D.	T .Test
Control	**50**	**123.9 ± 12.7**	**----------**
A	**50**	**1153.3 ± 4.25**	**P< 0.05**
B	**50**	**221.5 ± 5.212**	**P< 0.001**

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smoker groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more than 10 years .

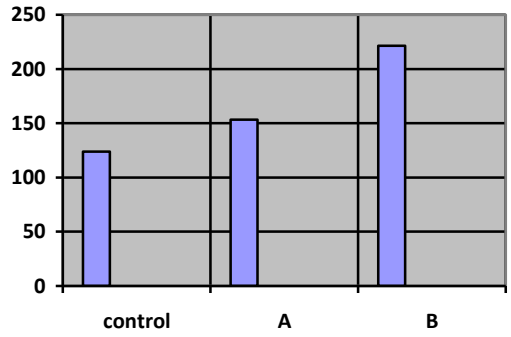

Fig. 2 shows the efficacy of Iron Fe metal between control group and smoker groups

C = control group

A = smoker groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smoker groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

The level of effectiveness of MDA antioxidant in the blood smoker groups

Table No. (3) and Figure (3) Shows that there are a significant difference in the level of MDA between smoker groups and control group.

The result explained the mechanical increasing of the MDA because of the high level of free radical (ROS) as a result of smoking; this will damage the body cells and speeds up the electron transferring in the super structure of biological organisms in the cell [25]. Also the previous studies showed that the Malondialdehyde(MDA)may increase as a result of strong exercise with smoking and the changes of antioxidant level in serum .While the action of antioxidant enzymes during the exercise can decrease the oxidation of peroxide . The result agreed with the recent research which included that the high oxidant increase the free radical formation and this increasing leads to the damage of cell membranes and nerve inflammation in the brain [26].

Table 3 the mean rate of (MDA) between smokers groups and control group .

Groups	No.	(MDA) (nmol/ml) Mean ± S.D.	T.Test
Control	**50**	**5.3± 0.03**	**------**
A	**50**	**12.5±2.5**	**P<0.05**
B	**50**	**20.8± 4.8**	**P<0.001**

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

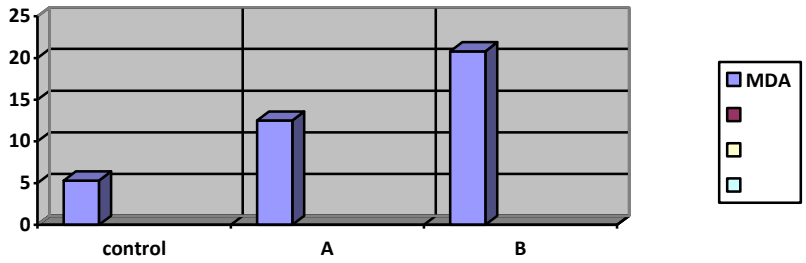

Fig. 3 show the mean rate of (MDA) between smokers groups and control group .

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

The level of effectiveness of enzymes (ALT, AST) in the blood smoker groups:

Tables (4,5) and also Figs. (4,5) show the result of this study showed a significant rise ($P<0.001$) in serum ALT and AST activity in cigarette smoker when compared to control group.

This may occur due to intransitive stress which is a condition that occurs when the production of highly reactive nitrogen containing chemical , such nitrous oxide , and nicotine , exceed the ability of the human body to neutralized and eliminate them. Nitrosamine stress can lead to reactions that alter protein structure thus interfering with normal body functions.[27].

we observe an increase in the level of activity of the serum ALT, AST,

enzyme compared with the control group. The reason for this is the effect of the thee effect of smoking cigarettes on the liver is caused by many harmful chemicals and toxic compounds which present in cigarette smoke that cause liver damage [28]represented by liver cell injury and also Cigarette smoke contains a large number of harmful chemical and toxic substances with hepatotoxic potential including nicotine

From the result of the present study , one can conclude that there is a dose response relationship between the number of cigarettes / day smoked and serum ALT, AST.

There for the damage of liver cells reduce the various enzymes due to their activity which stimulates the speed of occurrence of a large number of chemical reaction in the body or outside[29]. Therefore enzymes are the real engines of all biological processes. Antioxidants are the first line of defense of the body against free radical ,

Table 4 the mean rate of (ALT Enzymes) between smoker groups and control group .

Groups	No.	ALT(U/L) Mean ± S.D	T.Test
Control	50	27.8 ±0.05	------
A	50	33.02 ±0.04	P<0.05
B	50	39.82 ±4.6	P<0.001

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

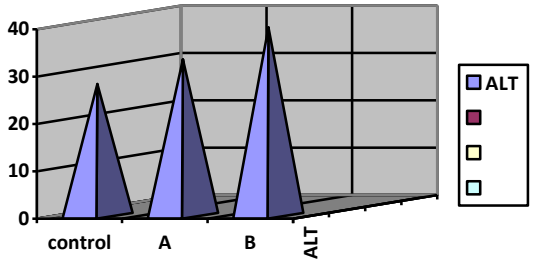

Fig.4 show the mean rate of (ALT enzyme) between smokers groups and control group .

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

Table 5 the mean rate of (AST Enzyme) between smoker groups and control group .

Groups	No.	AST(u/L) Mean ± S.D	T.Test
Control	50	57.15±0.05	------
A	50	64.15±0.12	P<0.05
B	50	74.23±0.13	P<0.001

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

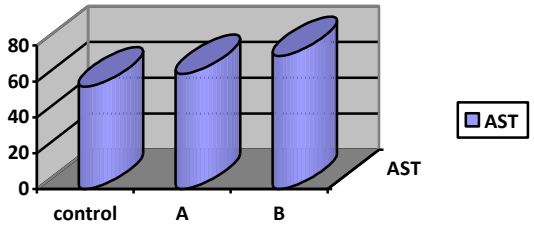

Fig.5 show the mean rate of (AST enzyme) between smokers groups and control group .

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

The level of effectiveness of enzyme (ALP) in the blood smoker groups

From Table (6) and Fig.(6) shows an increase in the level of efficacy of alkaline phosphatase enzyme (ALP) with control group [30]. The reason for this is explained by The effect of cigarettes smoking on the liver is caused by many harmful chemicals which is indicated by nicotine and some poising gases like (CO2 , CO ,CH4) of cigarette smoking and that cause liver damage represented by liver cell injury , the effect cigarette smoking the effectiveness of the enzymes especially in the liver [31], which are important in diagnosing liver damage , because they are present in a large quantity in the liver , this enzyme is high in the liver and this enzyme that determine the extent of damage which occurs in hepatic cells that the enzymes ALP is widespread in different areas of the body such as the intestines, bone marrow , liver and kidney, but with different concentrations and a few compared with other enzymes .

Table 6 the mean rate of (ALP enzymes) between smokers groups and control group .

Groups	No.	ALP (U/L) Mean ± S.D	T.Test
Control	**50**	**165.24±6.01**	**------**
A	**50**	**172.3±4.6**	**P<0.05**
B	**50**	**1913±4.6**	**P<0.001**

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

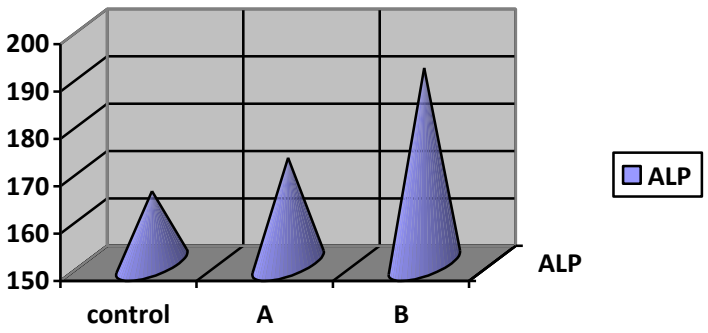

Fig 6 show the mean rate of (ALP enzymes) between smokers groups and control group .

C = control group

A = smokers groups (age from 25-55 years and 40 cigarette/day), (smoking duration) 1-10years.

B = smokers groups(age from 25-55 years and 40 cigarette/day) (smoking duration) more 10 years .

Conclusion

The results obtained for the blood cadmium (Cd) and Iron (Fe) for smoker groups were higher than control groups the study that are significant differences (P< 0.001), of high concentration of heavy metals and of some liver Biochemical blood serum including (ALP, ALT ,AST) and MDA among smokers groups for different time periods as a result of exposure to cigarettes smoke groups, compared with the control groups.

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