

# Determination of Serum Iron Level in Sudanese Cigarette Smokers

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**Abstract: Background:** One of the biggest public health problems throughout the world is smoking. Serious consequences cause by mineral disturbances that occur in cigarette smoking. **Objective:** The aim of this study was to assess serum iron level among Sudanese cigarette smoker. **Materials and methods:** In this cross-sectional study Fifty males smokers as cases and fifty male non smokers as controls (age matched between two groups). Serum iron was measured by spectrophotometer. The data was then analyzed by using SPSS version 16. **Results:** The results showed insignificant different in the level of serum iron in smokers compared to non smokers, ( $P$ .Value=0.301). There was insignificant different in serum iron among different ages group ( $P$ .Value=0.766). There was insignificant difference between the mean of serum iron in smokers who smoked < 5 cigarette per day compared to those who smoked >15 cigarette per day ( $P$ .Value= 0.772), also there was insignificant difference between the mean of serum iron in smokers and duration of smoking ( $P$ .value=0.159). **Conclusion:** There was no different in serum iron level in smokers subjects compared to non smokers.

**Keywords:** Smoker, Ion, Cigarette, Tobacco, Sudanese

## 1-Introduction:

Smoking is the practice in which a substance most commonly tobacco or cannabis are burned, and the smoke tasted or inhaled. The most common method of smoking today is through cigarette<sup>(1)</sup>. Tobacco use leads most commonly to diseases affecting the heart and the lungs. with smoking being a major risk factor for heart attacks, strokes, chronic obstructive pulmonary disease (COPD), emphysema and cancer<sup>(2)</sup>. It also causes peripheral vascular disease and hypertension, all developed due to exposure time and the level of dosage of tobacco. Minerals are very essential substances involved as catalysts in most cellular enzymatic reactions and assume a major role in metabolism<sup>(3)</sup>.

Iron is example of these essential minerals. Functions of iron include involvement in energy metabolism, gene regulation, cell growth and differentiation, oxygen binding and transport, muscle processes.<sup>(4)</sup> It is involved in more than 300 essential metabolic reaction, some of which are: energy production, synthesis of essential molecules, structural roles, ion transport across cell membranes, cell signaling and cell migration<sup>(5)</sup>. Iron aids in the delivery of oxygen within the body through interaction with hemoglobin and myoglobin. Iron is also the main component of cytochrome C which is responsible for electron transfer within the mitochondria. Directly or indirectly, the iron status can have an effect on the ability of a cell to execute adenosine triphosphate (ATP) production and on the oxidation of glucose and other carbohydrates<sup>(6)</sup>.

Cigarette smoking causes mineral disturbances which lead to serious consequences, smoking leads to tissue hypoxia which leads to inadequate oxygenation of blood circulation that results in erythropoiesis and consequent increased production of erythropoietin. Which enhances erythropoiesis and increases red cell mass above normal level.<sup>(3)</sup>. This leads to increase in number of destroyed cells in the normal turn over process which subsequently increases iron over load which causes hepatocellular damage. Chronic oxidative stress may modulate iron uptake and storage, leading to self-sustained and ever increasing spiral of cytotoxic and mutagenic events<sup>(3)</sup>. Accordingly; this study aimed to determine serum iron in Sudanese cigarette smokers.

## 2. MATERIALS AND METHODS

This cross-sectional study was conducted during the period from period March to October 2019. The study was approved by committee of Hematology and immunology Department in College of Medical Laboratory Science at Sudan University of Science and Technology.

Fifty Sudanese males smokers were recruited as cases and fifty non smokers were enrolled as controls. The case and control groups were age-matched with mean age of 30 years. Adult Sudanese males smoke other than cigarette, females or any person suffers from chronic abnormalities were excluded.

After obtaining informed consent from all participants; the demographic data was collected by using questionnaire. About 2.5 ml of venous blood was collected from the arm of each participant (using sterile disposable plastic syringe after cleaning the vein puncture area with 70% ethanol) into plain container, after formation of clot at room temperature, the samples were centrifuged for 10 minutes at 3000 rpm then the serum was obtained and analyzed.

The serum iron was measured by spectrophotometer. Pathological and normal control sera were used to assure accuracy and precision of results.

The data was analyzed by using Statistical Package for Social Sciences (SPSS) version 16. Independent T-test was used for comparison between groups and P-value less than 0.05 was considered to be statistically significant.

**3. Result:** Hundred participants were enrolled in this study; 50 males smokers as case. Fifty healthy participants serve as control group. The results revealed that, there is no statistical difference in serum iron level between case and control group (p. value =0.301) as in table (1) . There was insignificant difference in serum iron level among different age group (p. value= 0.766) as in table (2). There was insignificant difference between the mean of serum iron in smokers who smoked < 5 cigarette per day compared to those who smoked >15 cigarette per day (P. Value= 0.772) as in table (3), also there was insignificant difference between the mean of serum iron in smokers and duration of smoking (P. value=0.159) as in table (4).

**Table (1) ): mean comparison of serum iron level in case versus control group**

	Number	Mean( $\mu\text{g}/\text{dl}$ )	P. value
Smoker	50	104.78	0.301
Non smoker	50	96.52	

Results given in mean , P. value  $\leq 0.05$  is considered significant.

Independent sample T-test was used for comparison.

**Table (2): mean comparison of serum iron level among different age group.**

age group(Years)	N	Mean( $\mu\text{g}/\text{dl}$ )	%	P. Value
20-30	60	102.82	60	0.766
31-40	28	98.57	28	
41-50	12	94.67	12	
Total	100	100	100	

Results given in mean , P. value  $\leq 0.05$  is considered significant.

Independent sample T-test was used for comparison.

**Table (3): mean of serum iron in smokers according to number of cigarette per day.**

Cigarettes /day	N	%	Mean( $\mu\text{g}/\text{dl}$ )	P. Value
< 5	10	10	89.2	0.772
5-10	15	15	95.4	
10-15	8	8	127.5	
>15	17	17	111.5	
Total	50	50		

**Table (4): mean of serum iron in smokers according to duration of smoking.**

Duration (years)	N	%	Mean( $\mu\text{g}/\text{dl}$ )	P. Value
< 5	12	12	107.67	0.159
5-10	17	17	101.24	
10-15	7	7	115.29	
>15	14	14	101.36	
Total	50	50		

#### 4- Discussion:

Smoking is a practice in which a substance, most commonly tobacco or cannabis is burned and the smoke tasted or inhaled. The most common method of smoking today is through cigarettes<sup>(7)</sup>

This is a cross-sectional study conducted in Khartoum State during period from March to November 2019. Hundred volunteers were recruited to participate in this study, fifty of them were smokers and the remaining were non-smokers considered as control group. All of the participants were males, the ages of smokers and non-smokers were matched (20-50) years. The study aimed to measure serum iron levels among Sudanese males smokers.

This study shows that, insignificant variation in the mean of serum iron in study groups, with (p. value of 0.301). This result disagreed to another result which reported: significant increased in serum iron in smokers compared to non smokers (p. value  $\leq 0.05$ ), this elevation may be due to the inhalation of cigarette smoke increases carbon monoxide levels, leading to increases in hemoglobin levels in smokers, the levels of serum iron were significantly associated with blood hemoglobin concentrations<sup>(8)</sup>.

This finding was different with results obtained by-.Shivasekar *et al*, 2018 in a study showed that, serum iron was significantly increased in smokers when compared to non-smokers (p value  $\leq 0.05$ )<sup>(3)</sup>. Different results found a significant increase in serum iron level in smokers compared to non-smokers (p value  $\leq 0.05$ )<sup>(9)</sup>. Also this result disagreed with another result which found significant different in serum iron level in smokers compared to non smokers<sup>(10)</sup>. The elevation of serum iron in smokers subjects may be due to: cigarette smoking induces hypoxia which stimulates erythropoietin production which induces hyperplasia of the bone marrow, the latter contributes to the development of secondary polycythemia and in turn to increased red cell mass and turnover, this increased erythropoiesis and increased red cells mass increases the number of destroyed red cells in normal turnover process leading to increased iron overload this finally causes deposition of excessive iron in parenchymal cells of the liver which causes hepatocellular damage<sup>(11)</sup>. Another result showed significant increased in serum iron in smokers subjects, this due to Hypoxia represents stress that induced cell growth arrest and injury that lead to acidosis and electrolyte imbalance<sup>(12)</sup>. The age group 20-30 years old were found to be with higher frequency in the study population.

In the study group with age of (20-30) years had mean of serum iron (102.82 $\mu$ g/dl) while in group with age of (31-40) years, the mean was (98.57 $\mu$ g/dl) and in group with age of (41 -50) years the mean was (94.67 $\mu$ g/dl). Statistical analysis revealed that there was insignificant variation between serum iron and age (p. value=0.766). This result in agreement with another result carried out by Ali *et al.*, which found the same result<sup>(10)</sup>. There was insignificant difference between the mean of serum iron in smokers who smoked < 5 cigarette per day compared to those who smoked >15 cigarette per day (P. Value= 0.772). This result parallel to another result which finding confirmed that; There was insignificant difference between the mean of serum iron in smokers who smoked  $\leq 15$  cigarettes per day (138 $\pm$ 50)  $\mu$ g/dl compared to those who smoked  $\geq 15$  cigarettes per day (145 $\pm$  55)  $\mu$ g/dl, p value 0.6<sup>(10)</sup>. Results showed that, the mean of serum iron is not increased with increasing the duration of the smoking and indicate that no significant variation, (p. value = 0.159). This result similar to another result which reported; There was insignificant difference in serum iron with different smoking durations; p value 0.7<sup>(10)</sup>.

#### 5-Conclusion

Level of serum iron is not increased in cigarette smokers, whereas it is not affected by age differences, number of cigarettes, and duration of smoking.

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