Estimation of some Trace Elements, Salts and Immunological variables in People Working in Diesel Generators in Al-Diwaniyah Governorate

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Abstract

This study was conducted on the blood of workers in diesel generators in the province of Diwaniyah, where the study sample included 25 workers and 20 healthy people, as the cases of smokers and patients were excluded from the samples. The studied standards included zinc, iron, magnesium, sodium, calcium and chloride in addition to the immunological tests that included (WBC, IgG, C-reactive,), and the results showed that significant changes occurred at the probability level (P<0.05) in the aforementioned criteria when compared with healthy people, as the results recorded a significant increase (P <0.05) in iron (Fe) concentration and potassium (K), sodium levels (Na), chloride (Cl), and magnesium (Mg) .

The increase also occurred in white blood cells (WBC), in C-reactive protein, and in (IgG) concentration, while the results witnessed a significant decrease (P<0.05) in the concentration of zinc and calcium in the blood of workers in diesel generators compared to control group .

It is concluded from the current study that exposure to diesel generators has an effect on the blood of workers due to direct exposure to pollutants resulting from diesel combustion through changes in the concentrations of the aforementioned standards.

Introduction

Trace elements, Intended the elements that are present in the tissues in very small quantities, and these elements are classified according to the degree of toxicity into toxic and non-toxic elements and can be classified based on their importance in the body into basic and non-essential elements and can also be classified based on the percentage of their presence in the body to major and minor elements, as lead is considered toxic and dangerous to human health (Underwoeder, 1977) .

As lead enters the body by inhaling lead compounds released into the air from the exhaust of cars, factories and laboratories, as well as entering through food or a number of drugs that lead into its composition when lead or its compounds enter the body, so it is absorbed and spread in the body and enters the circulatory system, especially in cases Fasting or in the event that there is a deficiency in iron or calcium (Serif et al., 1999). Lead is found in the blood mainly associated with red blood cells, and there is a small part of it in the blood plasma and the risk of lead lies in the weak ability of the body to get rid of it (Al-Fhady, 2002), cadmium also has toxic effects on the skeletal system due to its effect on phosphorous and calcium metabolism, where there is a decrease in calcium absorption and the result is osteomalacia. It has been observed that lead increases blood pressure through a change in the sensitivity of the soft muscle contractions lining the blood vessels as a result of a decrease in the activity of the enzyme (Na + / K + -ATPase) and a stimulation in the sodium and calcium pump in the soft muscle cells lining the blood vessels, which leads to changes in The rate of their contractions, which ultimately results in an increase in blood pressure (Goyer, 1995).

He also showed that there is a direct relationship between the increase in miscarriages and delayed childbirth in working women with a direct relationship to lead, in addition to that lead affects the male reproductive system as it affects the testicle, which leads to a decrease in sperm production and weakness in its movement (Hussein, 2016), and found Al-Fhady (2002) that there is an increase in the concentration of lead in the blood among traffic employees, bus drivers, battery workers, oil workers, and generator operators who are professionally exposed to lead. Studies have also confirmed the risk of occupational exposure to diesel generators, because they lead to health problems in the body, especially zinc deficiency, which causes a lack of zinc

that causes difficulty healing of wounds, sexual weakness and lack of immunity (Hussein, 2016; Goyer, 1995)

The aim of the research is to investigate contamination of the blood of workers in operating generators with some heavy metals emitted from the exhaust fumes of diesel generators by studying the concentration of some trace elements and the percentage of salts in addition to some immunological parameters in the serum.

Material and method

Samples collections

Samples were collected during the period from February to September of 2020 from separate areas of Qadisiyah Governorate by (20) samples from healthy people and (25) samples from workers with ages from 20 years to 45 years, provided that the period of their work in the generators ranges from more than 6 months and less. From 5 years for workers, excluding smokers and patients suffering from any other disease.

Blood drawing

Brachial venous blood was drawn using medical syringes with a capacity of 5 ml per person and placed in two types of plastic tubes, where a quantity of blood was placed in plastic tubes without anticoagulant to obtain an adequate amount of serum for biochemical tests and was subsequently separated by a Centrifuge centrifuge at 4000 speed. One cycle per minute for 10 minutes. The serum devoid of red blood cells was separated by a micropipette. The serum was divided into several clean and sterile tubes and kept in a freezing state at a temperature of -20 ° C in the laboratory refrigerator for biochemical tests to be performed later.

Study of parameters

Determination of the trace elements represented by (Fe, Zn)

Iron and zinc were estimated by atomic spectroscopy according to a method (Al-Hamish, 2007).

Determination of the salts represented by (Na, Mg, K, Cl, Ca).

The above salts were estimated according to Prise (1970), using an atomic spectrometer.

Assessment of the immunological criteria represented by (CRP, IgG WBC)

- White blood cells were determined by the NSysmex-kx21 (Auto Blood Analyzer).
- The percentage of C-reactive protein and IgG percentage were determined using the ELISA device using Atlas Medical equipment.

Statistical analysis

The data were analyzed using the T-Test to test the significant differences of the averages by SPSS (version 23v).

Results and discussion

Study the concentrations of salts and minerals represented by (Zn, Fe, K, Cl)

The statistical analysis indicated in Table (1) that there was an increase in the concentration of iron Fe in the blood group of workers compared with the control group as in figure (1), since iron is an important element in blood formation, but an increase that causes damage in the body as studies have shown Iron excess leads to heart disease and atherosclerosis, as well as its effect on the liver and pancreas as it is associated with diabetes (Alrudiny, 2009), as well as its excess causes blood viscosity, and a study (Fadel et al., 2013) indicated that some people suffer from blood viscosity as a result Accumulation of lead and cadmium in their bodies.

Iron accumulation in the tissues leads to hemochromatosis, which results in kidney damage, fibrosis, and enlargement of the spleen and liver (Monkiewicz *et al.,* 1998) .

The results of the current study indicated in Table (1) as well as Figure (1) that there was a significant decrease in the concentration of zinc in the blood group of workers compared with the control group, as zinc is one of the basic elements that are present in all body systems and is a structural Of 300 enzymes as it is necessary for the metabolism of macromolecules, nucleic acids and minerals, zinc also has an important role in gene expression as a repressor for the transcript (Ballatori et al., 2002), as 10% of the proteins in the human genome possess the ability to bind to zinc, as he explains The reason for the decrease is the result of exposure to gases emitted from generator exhausts and direct contact of workers with generator oils, as it interferes with the metabolism of zinc, as the lack of zinc causes health problems in the body, especially to the difficulty of wound healing, impotence and lack of immunity (Schumann et al., 1990)

The current results shown in Table (1) and (1) witnessed significant differences in the levels of calcium and potassium in the blood of workers in diesel generators, as the level of calcium decreased significantly with the high level of potassium in the blood compared to the control group. Elements have an important role in the body as they work to regulate a large number of biological activities, as calcium in its low concentrations is a necessary factor for normal blood clotting as well as in bone structure, contraction and relaxation of muscles, nerve function and blood pressure, while potassium contributes to many vital processes Such as muscle contraction, neurotransmission and protein synthesis, and an imbalance of these elements causes health problems (Ballatori, 2002).

Explains that the apparent decrease in the level of calcium Ca in the blood of workers may be due to kidney dysfunction or due to poor digestion and absorption in the body, as a study (Shabib and Abd, 2015) that conducted the blood of workers at filling stations in Ramadi noted that there is a correlation in The occurrence of any defect in the liver or kidneys accompanied by a decrease in the value of calcium in the blood, while the cause of the increase in the level of potassium K in the blood of workers may be due to a malfunction in the kidneys or a breakdown in the body tissues, which leads to the exit of potassium into the bloodstream leading to an increase in its level. In the blood of workers, as the results of the study are in agreement with a study (Shabib and Abd, 2015) .

Study the concentrations of trace elements and salts (Cl, Mg, Na)

Table (2) and figure (2) show the effect of exposure of the generators to the blood salt content, as the results witnessed a significant increase in the levels of

sodium, chloride and magnesium in the blood of workers in diesel generators, as the results were consistent with a study (Al-Fahdi, 2002) In a study on workers in contact with carbon monoxide, lead and cadmium pollutants, the results of the study were also in agreement with a study (Shabib and Abd, 2015).

Where direct exposure to pollutants resulting from diesel generators causes interference with the physiological and metabolic processes of cells, and these salts play an important role in their imbalance in the body causing health problems, as chloride and sodium are important components in the fluids inside and outside all cells of the body, and the second general role Trace elements have a function to regulate a large number of biological activities (Caspers, 1980).

A study (Shabib and Abd, 2015) that conducted the blood of workers at filling stations in Ramadi showed an increase in the concentration of sodium in the blood until most of the workers in the gas stations had a state of skin and respiratory allergies, which leads to their use of cortisone drugs, which leads to an increase in the percentage of Sodium.

As sodium works to maintain the ionic concentration in body fluids, while chloride is part of stomach acid and is necessary for complete digestion of food, as magnesium stimulates the activity of many enzymes, and a number of trace elements control muscle contraction and impulse transmission in nerve cells (Schrauzer, 1984 ; Nazia- Uzma et al., 2008)

Immunological parameters

The results shown in Table (3) showed a significant increase in white blood cells (WBC), C-reactive protein, and IgG in the blood of workers at diesel stations compared with healthy people in the control group, as in Figure (3).

Where the rise in white blood cells WBC is explained by the occurrence of infections and allergies to workers, and thus this increase is a means of defense against pollutants as a result of continuous exposure to chemical pollutants from generators due to direct interaction (Ganong, 1995), as the results of the current study agreed with a study (Shabib and Al-Ani, 2015) Conducted on workers at Ramadi gas stations.

As the study of Löwenberg et al. (1999) showed that exposure to benzene caused an increase in white blood cells as a result of the bone marrow being affected and its increased production of cells, while a study indicated that occupational exposure to diesel fuel has a major relationship in increasing the

imbalance of blood components such as Chronic Marrow Cancer myeloid and lymphoid leukemia acute (Jae, 2008; Savelkoul and Neijens, 2000)

The rise in C-reactive protein in the serum of workers has an important role when there are unwanted substances in the body, a compound component capable of attacking and destroying the pathogen, and its elevation may be associated with liver dysfunction, as it is a sign of sensitivity to inflammatory. In the liver in response to tissue injury due to damage from pollutants, as it contributes to the regeneration of damaged liver cells as a result of exposure to toxic substances such as benzene and lead (Savelkoul and Neijens, 2000)

The results of the study also showed that there are significant differences in the concentration of IgG in the blood of workers at diesel stations compared with the control. The current study agreed with a study (Shabib and Al-Ani, 2015) that was conducted on workers at Ramadi fuel stations, and the reason for an increase in IgG is due to the immune response. Continuous exposure to workers as a result of continuous exposure to chest and respiratory infections, which subsequently causes an increase in the immune response in the blood of workers at diesel stations (Rana and Verma, 2005) .

Table (1): shows the concentration of salts and minerals in the control groups and workers in diesel generators.

Groups	Ca	K	Zn	Fe
Workers	8.05±0.12B	7.10±0.12A	0.85±0.01B	76.32±1.93B
Control	9.85±0.15A	5.05±0.03B	1.05±0.01A	101.36±1.79A
Value t-test	9.409	14.17	10.77	9.28

Groups	Cl	Mg	Na
Workers	123.5±1.12A	2.77±0.04A	131.37±2.68A
Control	113.6±0.78B	2.14±0.02B	111.91±0.78B
Value t-test	6.83	13.45	12.691

Values represent mean ± SEM

Different letters indicate significant difference (P <0.05)

Table (2): shows the concentration of salts and minerals in the control groups and workers in diesel generators.

Values represent mean ± SEM

Different letters indicate significant difference (P <0.05)

Table (3): shows the immunological parameters in the control groups and workers in diesel generators.

| Groups	CRP	IgG	WBC
Workers	2.56±0.04A	1432.5±9.21A	10.72±0.23A
Control	1.47±0.04B	1250.5±11.16B	6.30±0.36B
Value t-test	17.94	12.69	10.462

Values represent mean ± SEM

Different letters indicate significant difference (P <0.05)

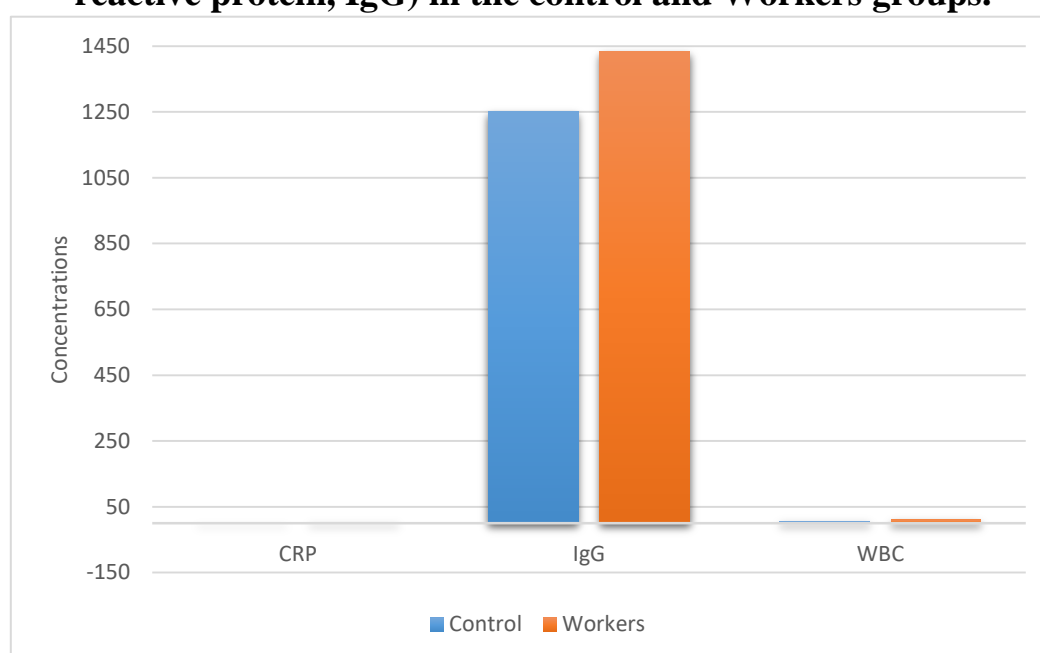**Figure (1): shows the concentration of (Zn, Fe, K, and Cl) in the control and Workers groups.**
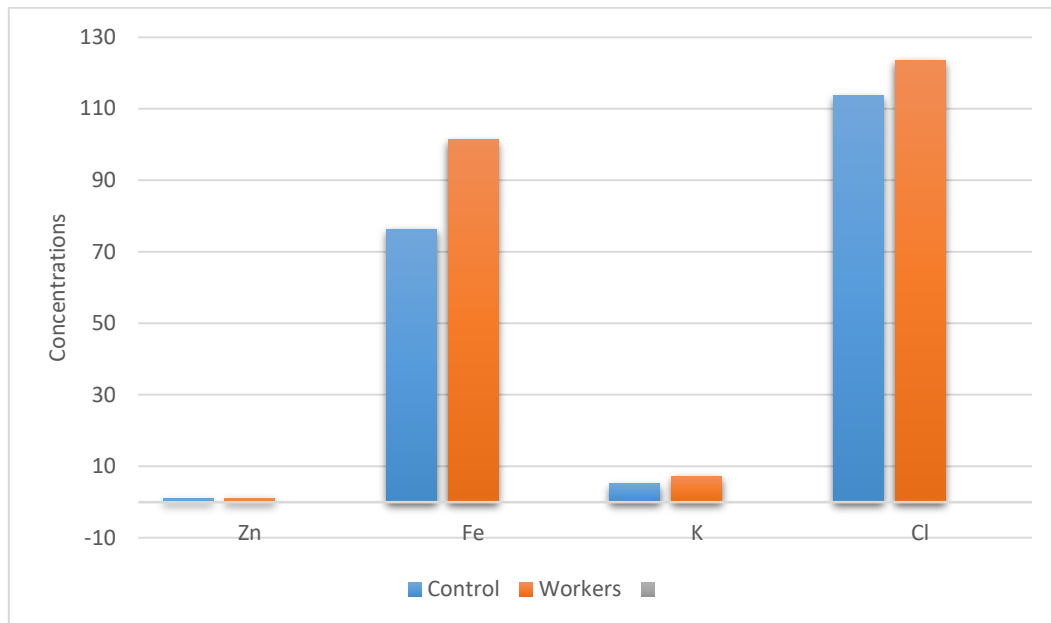
Figure (2): shows the concentration of (Cl, Mg, Na) in the control and Workers groups
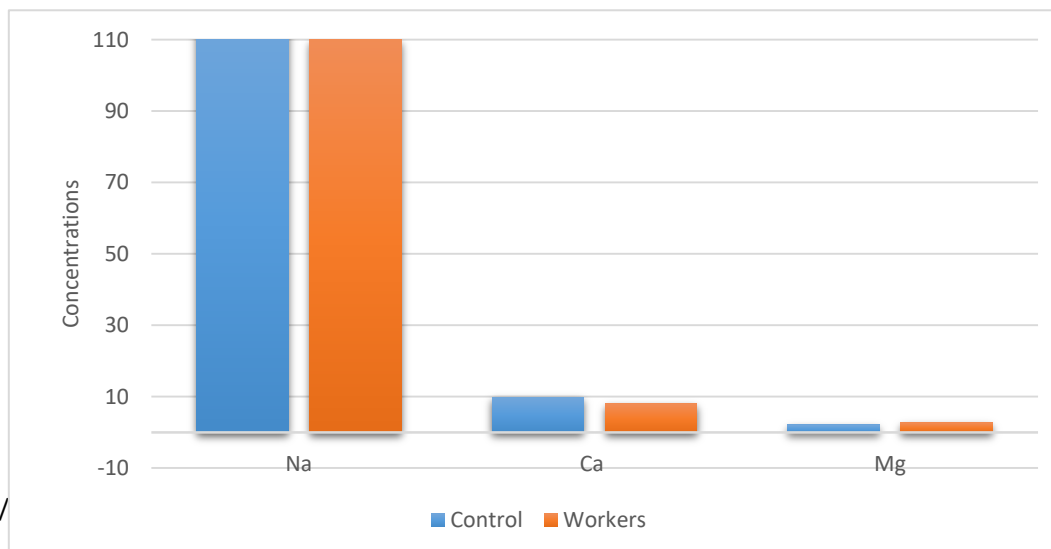
Figure (3): Shows the immunological parameters represented by (WBC, C-reactive protein, IgG) in the control and Workers groups.

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