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Comparative study of trace elements level in petroleum attendants exposed to petroleum pollutant in Umuahia

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Abstract

This study sought to determine copper, selenium, and zinc level in petroleum pollutant within Umahia ,Abia State, Nigeria. Fifty subjects were petroleum attendants exposed to petroleum pollutant. And fifty subjects were non petroleum attendants selected as control. The level of copper, selenium, and zinc decreases individual working as petroleum attendants, standard method was adopted to assay sample for copper, selenium and Inc(Atomic Absorption spectrophotometer) .The mean standard deviation of serum copper in petroleum attendants is 0.796±0.158µg/l and of serum copper in control is 1.216±0.366 µg/l. The mean± standard deviation of serum selenium is 0.186±0.022 µg/l and of serum selenium in control is 1.029±0.167 µg/l. Interestingly, both copper, selenium and zinc level in petroleum attendants decreases compared to copper, selenium and zinc level in control (0.05).This decreases in the level of copper, selenium and zinc in petroleum attendance exposed to petroleum pollutant is because of the content in petroleum, the content is very harmful to both plants and human health. This can be reduced or eradicated by proving nose mark to the petroleum attendants and reduced the elimination of carbon monoxide from car exhaust and petroleum attendants are advice to increase intake of copper, selenium in their diet.

Keywords: Trace elements, petroleum attendants, petroleum pollutant, Umuahia

Introduction

Trace element is a dietary element that is needed in very miunte quantities for the proper growth, development and physiology of the organism (Bowen, 1996; Obeagu 2018).

Not all element which are found in the human body in trace quantities play a role in life. An element normally considered a toxic in higher amounts, is essential in ultrace quatities,even in mammals, crates, hamsters, goats (Anke, 1986). Zinc is an essential mineral perceived by the public today as being of exceptional biologic and public health importance, especially increasing regarding prenatal and postnatal develoment (Hambidge and krebs,2007) zinc deficiency affects about two billion people in the developing world and is associated with many disease in children it causes growth retardation, delayed sexual maturation, infectionsusceptibityand diarrhea (Prasad,2003). Consumption of excess zinc can cause ataxia, lethargy and copper deficiency (Maret, 2013). Zinc is believed to pose antioxidant properties which may protect against accelerated aging of the skin and muscles of the body. Zinc also helps speed up the healing process after an injury, it is also susppected of being beneficial to the body's immune system. Indeed, zinc deficiency may have effect on virtually all part of the human immune system (keen and Gershwin, 1990). Zinc deficiency has been associated with major depressive disorders (MDD) and zinc supplement may be an effective treament. Zinc serves as a simple, in expensive and critical tool for treating diarrhea episodes among children in the developing world. However other studies have demonstrated that chronic use of zinc supplements in excess of the recomended dosage may actually increase the chance of developing prostrate cancer, also likely due to the natural buliding of this heavy metal in the prostate (Leitzmann *et al.*, 2003).

Semen particulary rich in zinc, which is a key factor in prostate gland function and reproductive organ growth (Berdamier *et al.*, 2007) oysters, lobster and red meat, especially beef, lamb and lever have some of the highest concentrations of zinc in food.

Copper is an essential trace element required plant, animal and human health and also requires for the normal functioning of aerobic micro organisms.

Copper is essential for the normal growth and development of human festuses, infants and children.

Copper essentially was first discovered in 1928, when it was demonstrated that rats fed a copper – deficient milk diet were unable to produce sufficient red blood cells (Hart *et al.*, 1928). The anemia was corrected by the addition of copper – containing ash from vegetable or animal source.

Several deficiency of copper in pregnant mothers increases the risk of health problems in their fetuses and infants. Health effects noted include low birth weights, muscles weaknesses, and neurologic problems however can be avoided in the balance diet. Copper cannot be formed by human body. It must be ingested from dietary sources like seafood, organ meats, whole grains, legumes, chocolate nut, wheat, rye, lemons, raisins, cereals, potatoes, peas, red meat, mushrooms, coconuts, papaya, tea, rice and chicken (Georgopoulous *et al.*, 2001, Sadhra *et al.*, 2009). Acquired copper deficiency has recently been implicated in adult – onset progressive myeloneun – pathy and in the development of severe blood disorders including myelody splastic syndrome (Kumar 2006).Other conditions previously linked to copper deficiency include osteoporosis, osteorthrilis,rheumatoid arthitis, cardiovascular disease, colon cancer, and chronic conditions involving, bone, connective tissue, heart and blood vessels (Cordano 1998; Danks 1988) copper excess causes stomach upset, nausea and diarrhea and can lead to tissue lnjury and disease.

Selenium plays a role in the functioning of the thyriod gland and in every cell that uses thyroid hormone.Selenium may inhibit Hashimotos disease, in which the body's non thyroid cell are attacked as alien (Mazokapakis *et al.*,2007). Increase dietary selenium intakes reduce the effects of mercury toxicity (Ralston and Raymond 2008; Penglase *et al.*, 2014), although selenium is an essential the trace element, its toxic if taken in excess. Exceeding the tolerable upper intake level of 400 micrograms per day can lead to selenosis signs of symtoms of selenosis include a garlic odour on the breath , gastrointestinal disorders, hair loss, slougbry of nails, fatigue, irritability, and neurological damage .

Petroleum pollutants which are emitted from exhaust, fuel pump, coal gas, are very toxic to human effect. It has no positive effect on human exposed to it. Exposures to carbon monoxide may cause significant damage to the heart and central nevuous system

especially to globus pallidus (Prockop and Schichkova, 2007). Carbon monoxide may have severe adverse effects on the fetus of pregenant woman (Tucker *et al.*, 2007). Lost of trace element deficency are cause by presence of pollutant in the body.

Sulfur dioxide is a major pollutant and has siginficant impact upon human health. Inhaling sulfur dioxide is associated with increased respiratory symptoms and disease, difficulty in breathing, and premature death (Shah and Balkhair, 2011) .

Long exposure to pollutant like leads to neuphropathy and colic-like abdominal pains. It may also cause weakness in fingers,wrists or ankles. Increased exposure also causes small increases in blood pressure, particulary in middle aged and older people and can causes anemia.

Objectives of the study

The objectives of the study include:

1. To determine serum level of zinc in petroleum attendants exposed to petrol pollutants.
2. To ascertain serum level of copper in petroleum attendants exposed to petrol pollutants.
3. To measure serum level of selenium in petroleum attendants exposed to petrol pollutants.

Materials and Methods

Study subject

The study was conducted within Umuahia metropoils filling station. The filling station has large numbers of workers that have interest in the occupation as petrol attendants. The filling station is located where there is a large population.

Study area

The subject represent the male and female workers in filling station. A total of 100 subjects where used for this study. Fifty where petroleum attendants exposed to petroleum pollutants and 50 where non petroleum attendants. Zinc, copper and selenium level was estimated using Mordern Atomic Absorbance spectophotmeter.

Collection of blood sample/ serum preparation

Blood samples were collected as aseptically by vein punture, using a 5ml sterile disposable syringes and needles from petroluem attendants and non petroleum attendants and was disposed into a labelled plain dry specimen container. The samples were centrifuged at 3,000pm for 5 miuntes to separate and to obtain the serum. The serum were extracted using a pipette and was introduced into another specimen container, and stored at 20^0c until required.

Determination of zinc, copper and selenium.

Zinc, copper and selenium level was determined in sample using the Atomic Absorption spectrophotometers (AAS) assay.

Procedure for zinc, copper, selenium determination in serum.

Digestion procedure for zinc, copper and selenium in serum.

6ml of HNO3 with 3 ml of HCLO3(perchloric Acid) was added to the digestion flask. Then 20 ml of distilled water was added to homogenized the solution and Transferred to the hot plate until colour damges to pale yellow, filtered through funnel with a filter paper of 2.0mm. The solution was aspirated with flame AAs machine and the result is read directly.

Results

A total of hundred (1000) subjects were selected for the study. Fifty (50) were petroleum attendants exposed to petroleum pollutants and fifty (50) where individuals who work far from the petroleum filling station were used as control.

TABLE 1 : Showing Trace Elements(C, Se,Zn) level in petroleum attendant and control with statistical evaluation (n=50) for petroleum attendant and (n=50) for control.

PARAMETERS	PETROLEUM ATTENDANT	CONTROL	P. VALUE
COPPER(µg/l)	0.796±0.159	1.216±0.366	0.0001
SELENIUM(µg/l)	0.186±0.022	0.246±0.015	0.0001
ZINC(µg/l)	0.704±0.105	1.029±0.167	0.0001

In table 1 above copper, selenium, zinc significantly decreased in petroleum attendant exposed to petroleum pollutant(P<0.005).

TABLE 2: Showing copper, selenium, zinc level in male and female petroleum attendants exposed to petroleum pollutants with statistical evalution (N=25) for males and (N=25) for females.

PARAMETERS	MALES MEAN±S.D	FEMALES MEAN± S.D	P. VALUE
COPPER(µg/l)	0.803±0.187	0.786±0.228	0.8571
SELENIUM(µg/l)	0.192±0.032	0.177±0.000	0.2054
ZINC (µg/l)	0.727±0.122	0.669±0.055	0.2260

In table 2 above is showing that there is no significant difference between the male and female petroleum attendant exposed to petrol pollutants. Copper, selenium, zinc decrease in both male and female (P<0.05).

TABLE 3: Showing copper, selenium, zinc level in petroleum attendance exposed to petroleum pollutants in relationship with their years of exposure.

PARAMETERS	1-5 YEARS MEAN±S.D	6-10 YEARS MEAN ±S.D	11 YEARS & ABOVE MEAN±S.D	P.VALUE
SELENIUM(µg/l)	0.439±0.265	0.196±0.000	0.200±0.000	0.072
COPPER(µg/l)	0.786±0.173	0.871±0.0045	0.805±0.000	0.785
ZINC(µg/l)	0.179±0.210	0.585±0.161	0.717±0.100	0.691

In table 3 above selenium level is significant as it decreases as the year of exposure increases, copper and zinc decreases as year of exposure increase but not significant.

Discussion

Studies have shown that copper, selenium and zinc level decreases in individual exposed to petroleum pollutants working as a petroleum attendants.

Petroleum pollutant causes breathing problems, damage to the lungs and tissue, heart failure, hypertension reproductive disorders and reduce fertility in males (Golub, 2005). This study is to show the level of copper, selenium and zinc in individuals working in filling station exposed to petroleum pollutants.

In this study in petroleum attendants exposured to petroleum pollutant thier copper level showed mean±standard deviation value of 0.796±0.158µg/l, selenium level showed mean±standard deviation value of 0.186±0.022µg/l, zinc level showed mean±standard deviaton value of 0.704±0.105µg/l and the control which are non petroleum attendant where the copper showed mean ±standard deviation value of 1.216±0.366µg/l, selenium level showed mean±standard deviation value of 0.246±0.015µg/l, zinc level showed mean±standard deviation 1.029±0.167µg/l.

The investigation and result obtained showed that serum copper, selenium, zinc level was significantly lower in petroleum attendant compare to control ($P<0.05$).

Conclusion

Petroleum attendants expose to petroleum pollutants were screened for copper, selenium and zinc level in their serum. This is to compare the serum level of copper, selenium and zinc and realating them to control. This study shows that serum copper, selenium and zinc level was significantly lower in petroleum attendant expose to petroleum pollutant than the control. Other studies have shown that petroleum pollutants has a significant impacts upon human health.. Therefore reduction in the level of copper, selenium and zinc indicates the needs for the emission of petroleum pollutants and increase in dieatary supplements of copper, selenium and zinc.

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