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Effects of Polycyclic Aromatic Hydrocarbon on Hematological Parameters of Exposed Individuals

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Abstract
Serious consequences for public health result from exposure to harmful substances, particularly in the workplace. To what extent might exposure to petroleum and its byproducts impact human metabolism was the overarching issue that motivated this investigation. Using a sterile needle, 10 persons were picked from each of the following groups: the control group in Umuahia, the filling station attendants in the Choba district, and the motor mechanics and craftsmen departing from Mbodo Aluu. The hematological indices showed the following: PCV 24.50 (APH) to 44.60 (Control), HB(g/dl) 7.51 (APH) to 13.22 (Control), RBC(X1012/l) 2.45 (APH) to 6.13 (MAFL), WBC(X109/l) 5.63 (APH) to 37,000 (Control), Platelet(X109/l) 135 (MW) to 1416,000 (Control), MCV 4.01 (MW) to 6.70 (Control), MCH 2.37 (Control) to 3.72 (MW), and MCHC 0.307 (APH, MAFL, MW) to 0.308 (Control). There was little to no deviation from control values in the MCV, MCH, and MCHC results. Nevertheless, the experimental and control groups showed a significant disparity in PCV, HB, RBC, WBC, and platelet count at a confidence level of $p<0.05$. The results of this research suggest that polycyclic aromatic hydrocarbons may have a detrimental effect on the evaluated biochemical parameter's health.

Introduction

POLYCYCLIC AROMATIC HYDROCARBONS
PAHs are chemicals naturally found in gasoline, crude oil, and coal . According to Xu X et al. (2010), PAHs are present in a variety of fossil fuel products, including asphalt, coal-tar pitch, creosote, and others. It is possible that PAHs will be released during the conversion of coal into natural gas. This means that PAH levels may be higher at certain coal-gasification locations. Airborne PAHs may also be released when organic materials, fossil fuels, or trash are burned. An increase in the release of PAHs into the atmosphere occurs when combustion is inefficient. One natural source of PAHs is fires that break out in forests or volcanoes Bostrom et al. (2002) found that three- and four-ring PAHs, such pyrene and phenanthrene, are abundant in outdoor air and are therefore more often attached to DEP and other burning particles.

According to research by Ihsanullah et al. (2021) and Premnath et al. (2021), PAHs are produced by inorganic chemicals that melt and burn during desalination and industrial power production, among other related activities. Some of the natural reasons for this include forest fires and volcanic eruptions [,Davoudi et al. 2021,Basaran et al. 2021].

There are PAHs in the environment, and they may linger for a while in the soil, water, and air. Among the hundreds of PAHs known to exist, the following are among the most prevalent:

All three of these chemicals: dimeththene, acetaminophene, and benzo(a,h)anthracene

Amphetamine, hydrazine

The combination of anthracene and fluorene

"Benzo(a)pyrene" and an indole analogue

"Benzo[b]fluoranthene naphthalene"

Fluoranthene, benzoate, and phenanthrene.

The ester of ethylbenzene

A substance known as napthalene

Indeed, phenanthrene's

Undoubtedly, it is trinitrotoluene.

A molecule, O-dihydroxybenzene is known in the chemical world.

Rhodolite Rhysene

EXPOSURE PATHWAYS TO PAHs.

Most people's daily exposure to PAHs comes from ingesting contaminated food, water, soil, and air. At work or elsewhere, there are several possible entrance sites, including swallowing, breathing, and skin-to-skin contact. With certain exposures, such skin and air pollution, there can be many pathways at work, influencing the total quantity absorbed. Diet, smoking, and the combustion of coal and wood are all potential non-occupational exposure sources that should be included in a comprehensive study.

MATERIALS AND METHODS
STUDY CENTER

The Choba suburb of Port Harcourt was the site of this investigation.
COLLECTION OF SAMPLES
This study's sample locations were in the states of Choba, Mbodo Alo, and Umuahia in the Owerri region of Nigeria.
MATERIALS
The research supplies were acquired from the medical facility situated at Aba road, not far from the Leventis bus stop. Super conceited.
Protecting the fingers
ETDA anticoagulant containers
a sterilized needle and a syringe that holds 5 milliliters
Dehydrogenated alcohol
wool and spandex
Put the bandage in place.
Also contacted was Mile One Market in Port Harcourt about the purchase of ice blocks and coolers.
METHOD FOR SAMPLE COLLECTION
Ten government officials from Umuahia, Abia State, ten petroleum-specialist artisans near Mbodo Aluu, and ten professionals with at least five years of experience operating along the Choba all submitted blood samples.
The sample should be collected by puncturing a vein with a sterile needle and transferring it to the EDTA container for analysis using a 5 ml syringe.

PROCEDURES FOR PACKED CELL VOLUME (PCV)
BY MICROHEMATOCRIT METHOD.

RESULT

Haematological Test
The table displays the findings of the hematological indices for each location's sample. The following parameters displayed a range of values in the results: PCV (%) 24.50 (APH) to 44.60 (Control), HB (g/dl) 7.51 (APH) to 13.22 (Control), RBC (X1012/l) 2.45 (APH) to 6.13 (MAFL), WBC (X109/l) 5.63 (APH) to 37,000 (Control), Platelet (X109/l) 135 (MW) to 1416,000 (Control), MCV (4.01) (MW) to 6.70 (Control), MCH (2.37) to 3.72 (MW) (Control), and MCHC 0.307 (APH, MAFL, MW) to 0.308 (Control). Experimental group PCV, HB, RBC, WBC, and platelet counts were significantly different from control group values, although MCV, MCH, and MCHC values remained rather consistent.

TABLE

Group	PCV	HB	WBC	RBC
Control	44.60±1.30	13.77±0.44	37000.00±0.35	5.89±0.19
MW	26.60±1.17*	8.15±0.36*	3.02±0.22*	2.49±0.28*
MAFL	35.40±1.55*	10.86±0.48*	31.20±1.84*	6.13±0.66*
APH	24.50±1.485*	7.51±0.45*	5.63±0.59*	2.45±0.79*

Group	Platelets	MCV	MCH	MCHC
Control	141600.00±19810	6.70±0.73	2.37±0.14	.308±0.0008
MW	135.70±12.96*	4.01±1.06	3.72±0.49	.307±0.0004
MAFL	158.60±8.71*	5.38±0.69	2.87±1.28	.307±0.0001
APH	1318.00±75.39*	4.09±0.44	3.63±1.14	.307±0.0001

DISCUSSION

In the Table above, we can see the hemoglobin markers of individuals collected from different locations. These indices include PCV (%) ranging from 24.50 (APH) to 44.60 (Control), HB (g/dl) from 7.51 (APH) to 13.22 (Control), RBC (X1012/l) from 2.45 (APH) to 6.13 (MAFL), WBC (X109/l) from 5.63 (APH) to 37,000 (Control), Platelet (X109/l) from 135 (MW) to 1416,000 (Control), MCV (MW) from 4.01 (MW) to 6.70 (Control), MCH (Control) from 2.37 (MW) to 3.72 (MW), and MCHC (APH, MAFL, MW) from 0.307 (Control) to 0.308 (Control). Compared to the control group, there was a significant difference in the findings for PCV, HB, RBC, WBC, and platelet count with a confidence level of $p<0.05$. With respect to MCV, MCH, and MCHC, nevertheless, no discernible shift occurred.

When comparing the PCV of the MW and MAFL groups, as well as MAFL and APH, significant differences were observed. Both the MW and MAFL groups, as well as the MAFL and APH groups, had distinct HB outcomes. Red blood cells followed the same pattern. In every case, there was a statistically significant difference between the control group and the experimental groups.

Hematcrit, abbreviated as PCV, is a measure of the proportion of blood volume that is made up of red blood cells relative to the total amount of blood. It is often expressed as a decimal fraction or a percentage (e.g., 0.41). Newborns at one week of age had PCV ranging from 37 to 49%, babies at three months from 30 to 36%, infants at one year from 28 to 45%, children at ten years old from 36 to 40%, adult females from 36 to 46%, and adult males from 38 to 50%. These results are in line with the PCV values recorded by the study's control group. The results indicated that there was a potential of sickness as data from other groups differed substantially from the control group (@ p> 0.05). The normal PCV for males is 50-52%, but women usually have a PCV of 36-48%. The packed cell volume may increase in patients with chronic obstructive pulmonary disease (COPD). Diseases characterized by abnormally high or low packed cell volumes may be fatal, as stated by Zubieta et al. (2007).

Red blood cells contain a protein known as hemoglobin (HB). All of the cells in the body rely on it to carry oxygen from the lungs. Anemia is diagnosed when hemoglobin levels in males drop below 13.5 g/dL and in women they drop below 12 g/dL. In contrast to the control group's normal hemoglobin levels, all three groups tested—the mechanic workshop (MW), the artisan petroleum product handlers/workers (APH), and the control—had levels below the standard. Low hemoglobin concentrations, sometimes called anemia, may be a cause of hemoglobin failure. An further potential reason might be that the molecule is unable to bind oxygen. When blood oxygen pressure is low, a condition known as hypoxemia, is distinguished from hemoglobin failure. Numerous medical conditions, such as kidney illness, chemotherapy, malnutrition, blood loss, bone marrow malignancy, and others, were cited by Padmanaban (2011) as potential causes of low hemoglobin levels.

Not enough oxygen-carrying red blood cells mean that certain parts of the body don't get what they need. One sign of anemia is extreme fatigue. A low red blood cell count may manifest itself in a variety of ways, including but not limited to: lethargy, loss of weight, indigestion, irregular periods, diarrhea, headache, nausea, dizziness, vertigo, migraines, vertigo, exhaustion, and irregular menstrual cycles. Researchers have shown that red blood cell counts tend to be lower in women than in males. This disparity is further amplified by the fact that RBC counts naturally fall with age. The National Health Service (NHS) states that in 2019, males should have blood cell counts between 4.7 and 6.1 million cells/mcL, while women should have numbers between 4.2 and 5.4 million cells/mcL.

One possible indicator of the body's white blood cell abundance is a white blood cell count (WBC) According to MCS (2018), adults' white blood cell (WBC) counts should range between 4.00 to 11.0 x 109/L, and if they are too high or too low, the appropriate measures should be taken to restore or maintain the normal range.

In this investigation, hemostatic markers showed significant alterations ($p<0.05$). The amounts of red blood cells (RBCs) and haemoglobin were lower than those in the control group.

CONCLUSION

Dangerous chemicals have altered people's lives significantly on several occasions. Although prior research indicated that PAH exposure may have negative impacts, more research was necessary to determine the exact nature of these effects on various biochemical markers, particularly exposure via occupational performance. Why? Reason being, ensuring a safe working environment is among the top priorities for public health officials. The quantity of certain biochemical indicators in individuals exposed to petroleum and its derivatives is altered by exposure to polycyclic aromatic hydrocarbons, according to studies.

The hematological parameters indicators showed significant alterations ($p<0.05$) in this research. Several sites showed decreased hemoglobin and RBC levels relative to the control. These detrimental health outcomes may have been exacerbated by this person's exposure to PAH-containing petroleum products. This is due to the fact that the examined individuals' blood samples included polycyclic aromatic hydrocarbons (PAHs). The following sequence was noted for total PAHs contents: MW ~ MAFL ~ APH ~ Control. The biochemical parameter under investigation was negatively impacted by polycyclic aromatic hydrocarbons.

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