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Research Article

Some Haematological Parameters of Petrol Attendants and Automobile Mechanics in Ekpoma, Edo State, Nigeria

Emelike, O. F[1*], Okhuakhua, O. J.[1], Momodu, M. M.[1], Ogunsuyi, O. E.[1], Ezimah A. C. U.[2]
[1]Medical Laboratory Science Department, Faculty of Basic Medical Sciences, College of Medical Sciences Ambrose Alli University, Ekpoma, Edo State, Nigeria
[2]Department of Physiology, Faculty of Basic Medical Sciences, College of Medical Sciences, Federal University, Abakaliki, Ebonyi State, Nigeria

***Corresponding author**
Emelike, O. F
Email: felixemelike@gmail.com

Abstract: Constant exposure to petroleum products has become a major cause of public health concern. This study seeks to evaluate the consequences of exposure to premium motor spirit (PMS) fumes on some haematological parameters of Automobile Mechanics and Petrol Station Attendants, using apparently healthy non exposed population as control, in Ekpoma, Edo state, Nigeria. A total of 150 subjects were recruited for this study. Fifty, were petrol station attendant (PSA), 50 automobile mechanics (AM) and 50 apparently healthy individuals. Five millilitres of venous blood was collected from the subjects, for haemoglobin concentration (Hb), packed cell volume (PCV), Total White Blood Cell and differential white cell counts. Among which, the Hb level was significantly lower amongst the PSA compared to the AM whose Hb level was significantly reduced compared with the apparently healthy individuals ($p< 0.05$). The PCV of PSA and AM were significantly lower than that of the apparently healthy individuals ($p< 0.001$). The total WBC, Neutrophils and lymphocytes counts were significantly higher than those of the apparently healthy individuals. The monocytes and Eosinophils had no significant difference between those exposed to premium motor spirit and the apparently healthy individuals. This study suggested increased exposure to petrol fumes among automobile mechanics, petrol station attendant, is highly toxic and are potential damaging agents to the haematopoietic stem cell and could cause anaemia.
Keywords: Petrol, White blood cell, Toxic, Haematopoietic, Anaemia.

INTRODUCTION

Petrol is a complex mixture of chemicals and is manufactured by blending different products obtained from the distillation of crude oil with performance-enhancing chemicals. 'Petrol' was first used as a product name by a London chemical company (Carless, Capel & Leonard) at the end of the nineteenth century. The term 'Petrol' is an abbreviation of 'petroleum', derived from the Greek words 'petros' (meaning 'rock' or 'stone') and 'oleum' ('oil'). Petrol has also been sold as 'motor spirit', petroleum spirit', 'mogas' and 'gasoline' (often shortened to 'gas') [1].

Occupational exposure to petroleum fumes has been reported to have toxic effects on various organs and system. Organs such as the heart lungs, skin, and kidneys are affected by these toxic effects resulting in various diseases and different forms of genotoxic, mutagenics, immunotoxic, carcinogenic and nerotoxic manifestation [2, 3]. The daily use of petroleum products both in and outside petroleum industries many have effect on users, and those who work directly in petroleum industries (occupational exposed) are likely to be more affected than their counterparts who do not work in those industries. Breathing in high levels of gasoline for short period of time or swallowing large amounts of gasoline may also cause harmful effects on the nervous system [4]. Exposure to petroleum and its products therefore constitute health hazards. Some of such hazards include nervous system damage, blood disorder (including anaemia, leukaemia), renal damage, hepatic dysfunction and intoxication leading to serious psychotic problems, anaesthetic effects, dermatitis etc [5].

Aim and Objective

The main objective of this study is to investigate the effect of inhalation of petroleum products on some haematological parameters of automobile mechanics and fuel attendants.

MATERIALS AND METHODS

Study Area and population

This study was cross sectional study carried out in Ekpoma, Esan West Local Government Area of Edo State, Nigeria.

Subjects

A total of 150 samples collected for which 50 were petrol station attendants, 50 automobile mechanics and 50 unexposed subjects served as control.

Research design

The research was designed to focus on the haematological parameters of automobile mechanics and petrol station attendants and comparison between these two groups of people with apparently healthy individuals who have nothing to do with petrol.

Sample collection

5ml of venous blood was collected from each of the subject with sterile disposable needles and syringes. This was dispensed into properly labelled EDTA specimen container and mixed properly.

METHODS

Packed cell volume

Microhaematocrit technique [6]

Principle and Procedure

An anticoagulant blood in a glass capillary tube of specified length, bore size and wall thickness was centrifuged in a micro-haematocrit centrifuge at 11,000-15,000rpm, for 3-5 minutes to obtain constant and maximal packing of the red cells. A small amount of plasma remains trapped between the packed cells. The PCV value was read from the scale of a microhaematocrit reader and record in percentage.

Haemoglobin estimation

Cyanmethaemoglobin Method [7]

Principle

Whole blood is diluted 1 in 20 in a diluted modified Drabkin solution which contains potassium ferricyanide and potassium cyanide. The red cells are haemolysed and the hemoglobin oxidized by the cyanide to stable hemoglobin cyanide (H_1CN). Absorbance of the HiCN solution is read in a spectrophotometer at wavelength 540nm. The absorbance obtained is compared with that of a reference HiCN standard solution.

Procedure

A Twenty microlitre (0.02µl) volume of the EDTA anticoagulant venous blood was diluted with 4ml of drabkin solution contained in a test tube by properly mixing the content. The mixture was allowed to stand at room temperature for 10 minutes. Solution was read and the hemoglobin concentration of the sample was calculated using the formular below.

Hemoglobin conc. of samples =

$$\frac{\text{Absorbance of test sample}}{\text{Absorbance of standard}} \times \text{Conc. Of standard}$$

Total white blood cell (WBC) [8]

Principle

The total WBC is determined in whole blood in which red cells has been lysed. The lytic agent (diluting fluid) is required to destroy the red cells and reduce the red cell stroma to a residue, which causes no detectable response in the counting system and without affecting the leucocytes in such a manner that the ability of the system to count them is altered.

Procedure

A Twenty microlitre (0.02µl) of blood was added into 0.38ml of WBC diluting fluid (Turk's fluid) and mixed properly. The mixture was allowed to stand for 5minutes at room temperature. A completely cleaned and dry counting chamber was charged by sliding a cover slip over the grid areas and pressed down on each slide until rainbow colours (Newton rings) were seen. The diluted sample was remixed and a drop of it was loaded into the chamber using a Pasteur pipette. The chamber was left undisturbed for 2minutes to allow time for a white cell to settle. Using the 10X objective, with the condenser iris closed sufficiently to give good contrast, the white cell were viewed and counted as small black dots. The cells in the large four corner squares of the chambers were counted and calculated as shown below.

Calculation:

Total white cell count u/L (mm)

$$= \text{No of cell counted in four squares (N)} \times \frac{1}{\text{area counted (mm}^2\text{)}} \times \frac{1}{\text{dilution(mm)}} \times \text{dilution}$$

$$= N \times \frac{1}{4} \times \frac{1}{0.1} \times 20$$

$$= N \times 50$$

NB: Length of 1 square = 1mm
Breath of 1 square = 1mm
Area of 1 square = $1mm^2$
Area of 4 squares = $1 \times 4 = 4mm^2$
Depth of square = 0.1mm

Differential count [8]

Principle

The Romanowsky stains contain ethylene blue (a basic dye), eosin (an acidic dye) and polychrome ethylene blue or methylene azure. Using these stains, the acidic cell components such as nuclear DNA and cytoplasm RNA are stained bluish purple with polychrome ethylene blue while basic components such as hemoglobin and granules in eosinophil are stained orange to pink with eosin.

Procedure

A drop of CPDA anticoagulant blood was placed on one end of a clean dry slide. Using a clean smooth-edge spreader, kept at an angle of 30^0 to the slide, the blood was spread over the slide towards the opposite end to make a film of about 40-50mm length (two-thirds of the slide). The film was air-dried and labeled, after which it was placed on a staining rack for staining. The surface of the thin film was flooded with Leishman stain and allowed to stand for 10 minutes before being washed off with tap water. The back of the slide was wiped clean and kept standing in a rack to dry. The stained film was viewed microscopically using 40x objective 100X objectives (oil immersion) to examine.

RESULTS

Table 1 shows some haematological parameter of fuel attendants, automobile, mechanics and apparently healthy subjects. The table revealed the haemoglobin concentration (g/l) of fuel attendants, automobile mechanics and apparently healthy subjects were as follow; 126.7±10.32, 134.15±5.78 and 144.85±19.43 respectively. The Hb concentration of the fuel attendants were significantly lower than that of the automobile mechanics and the apparently healthy subject ($p < 0.001$) likewise the Hb of the automobile mechanics which was significantly lower than that of the automobile mechanics which was significantly lower than that of the apparently healthy subject ($p< 0.001$). The PCV (l/l) of the fuel attendants, automobile mechanics and apparently healthy subjects was 0.38±0.03, 0.40±0.02 and 0.43±0.04 respectively. The PCV of fuel attendants was significantly lower than that of the automobile mechanics and apparently healthy subjects ($p< 0.001$). The total WBC counts ($x10^{9/l}$) of the fuel attendants, automobile mechanics and apparently healthy subjects were 7.55±0.74, 7.42±1.43 and 4.46±1.18 respectively. The total WBC counts of the apparently healthy subjects were significantly lower than that of the fuel attendants and automobile mechanics ($p< 0.05$). The Neutrophile counts ($ntx10^{9/l}$) of the fuel attendant automobile mechanics and apparently healthy subjects were 5.29±0.92, 5.31±1.51 and 2.62±0.68 respectively. The Neutrophil counts of the apparently healthy subjects were significantly lower than that of the fuel attendants and automobile mechanics ($p< 0.001$). The lymphocyte counts ($x10^{9/L}$) of the fuel attendants, automobile mechanics and apparently healthy subjects were as follow: 2.19 ±1.53, 1.82±0.39 and 1.75±0.57 respectively. The lymphocyte counts of the fuel attendant were significantly higher than healthy subjects ($p<0.001$).

Table 1: Some haematological parameters of fuel attendant, automobile mechanics and apparently healthy subjects

Parameter	Fuel Attendants	Automobile Mechanics	Apparently Healthy Subjects	Fraction	p – value
Hb (g/l)	126.75±10.32	134.15±5.78	144.85±19.43	19.203	0.001
PCV (L/L)	0.38±0.003	0.40±0.002	0.43±0.04	19.381	0.001
WBC ($X10^{9/L}$)	7.55±0.74	7.40±1.43	4.46±1.18	91.739	0.001
NEUT ($X10^{9/L}$)	5.29±0.92	5.31±1.51	2.62±0.68	79.580	0.001
LYM ($X10^{9/L}$)	2.19±1.53	1.82±0.39	1.75±0.57	2.385	0.001
MONO ($X10^{9/L}$)	0.13±0.005	0.15±0.006	0.13±0.05	0.326	0.01
EOS ($X10^{9/L}$)	0.49±0.27	0.39±0.28	0.10±0.00		

Key: Hb – Heamoglobin, PCV – Packed cell volume, NEUT – Neutrophil, LYM – Lymphocyte, MONO – Monocyte, EOS – Eosinophil

DISCUSSION

This study was aimed at determining the effect of petrol premium spirit on some haematological parameters among automobile mechanics and petrol station attendant. From this study, it was observed that the haemoglobin concentration of the automobile mechanics and petrol station attendants was significantly reduced as compared with the apparently healthy individual ($p< 0.001$). This finding agrees with the study of d'Azenedo *et al.* [2], Mohorovic L [9]; Linz *et al*. [10] and Udonwa *et al*. [11]. The Hb of petrol attendant was significantly lower than that of automobile mechanics. This however may be due to the primary route of exposure to benzene; a volatile chemical organic compound is by inhalation of petrol motor spirit fumes. The PCV of the automobile mechanics and petrol station attendant exposed to petrol motor spirit fumes were significantly lower as compared with the PCV of the apparently healthy individual. This also was in agreement with the work of Ovuru and Ekweozor [12] and Dede and Kagbo [13]. The total WBC counts of the apparently healthy individuals were significantly lower than that of the automobile mechanics and petrol station attendants. This was in accordance with the work carried out by Ita and Udofia [14]. The neutrophil of the automobile

mechanics and petrol station attendant were significantly higher than those of the apparently healthy individual. This also agrees with the work of Ita and Udofia [14]. It is suggestive of a high degree of infection as neutrophils are the first responder to inflammation and cell damage. The lymphocyte of the petrol station attendants was significantly higher than that of the apparently healthy individuals. There was no significant difference with the monocyte of automobile mechanics, petrol station attendants as compared with those of apparently healthy individuals. This also was in agreement with the work of Ita and Udofia [14]. There was no significant difference in the eosinphil of the automobile machanics and petrol station attendants as compared with those of the healthy individuals.

CONCLUSION

This study has provided insight into the possible toxicity of petrol motor spirit and the degree to which they can alter the integrity of haematological response by the side effect of the toxic constituent of these products on the haematopoietic system. It has been observed that chronic inhalation of petrol motor spirit might result in anaemia, as the haemopoietic system is the major target of challenge, we therefore concluded that petrol motor spirit are highly toxic and damaging to the haemopoietic system.

Recommendation

We hereby recommended that nose guard should be used by people working with premium motor spirit in order to avoid direct inhalation of these products and regular check-up should always be done by works.

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