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Hepatic and Post-Hepatic Enzyme Activitiea in Pump Attendants in Aba Metropolis

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011. Ikpeazu et al.

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Abstract: The present study was carried out to evaluate possible changes in liver enzyme activities in petrol attendants exposed to petrol fumes. The study was carried out on 50 petrol attendants from different petrol stations in Aba, Abia State Nigeria and with a corresponding 50 apparently healthy adults who were not exposed to petrol or its fumes as control subjects. All the subjects involved in this study were between 25 to 50 years and also served as the petrol attendants for at least two years , Aspartate Transaminases (AST), Alanine Transaminases (ALT) and Alkaline phosphatase (ALP) activities were determined to monitor for the presence of liver impairment. Serum was obtained from the blood collected from the test and control subjects. Data obtained were analyzed using Statistical Package for Social Sciences (SPSS version 25) and one-way analysis of variance (ANOVA), student t test and expressed as Mean standard deviation. Significant level for the analysis was set at P-value equal to or less than 0.05 (P-0.05) which was considered as being statistically significant. The result of the study showed that serum AST, ALT and ALP activities in the petrol attendants were significantly higher (P=<0.05) when compared with the control and it was more prominent in test subjects who have been exposed for more than four years. The results from the study therefore showed that long time exposure or inhalation of petrol fumes is associated with increase in liver enzyme .This may aid early detection of liver derangement and help prevent subsequent liver dis order

Keywords: Transaminases , Alanine Transaminases , Alkaline phosphatase , Petrol attendants, and Petrol fumes
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INTRODUCTION

The fume resulting from petrol and petrol products come from different sources and these products poses danger to human and its environment Incidentally, the common source of exposure or contact to this products are through petrochemical industries comprising the refineries, oil field, and filling stations . Conversely, individuals that are seriously affected are those who are occupationally and domestically exposed to the products (Patrick et al., 2011).

A high level of benzene around the atmosphere in fuel servicing station during refueling of automobiles has been reported (Tartai *et al.,* 2020). This benzene and other related hydrocarbons are metabolized through liver and are highly reactive. There is, the probability that these reactive species could possibly binds to hepatic microsomal protein and nuclear and nucleic acids resulting to cytotoxicity effects (Nwanjo et al., 2007).

Most chemical metabolize through the liver, damages or causes liver function impairment which may disturb the normal biochemical processes in the hepatobiliary system. This may manifest as increase enzymes activities or hepatic failure. Equally, exposure to petrol is known to contribute to neurological, inhalation and teratogenic disorders (Tartai et al., 2020).

Petroleum hydrocarbons and other related carbon containing compounds are converted into free radicals or activated metabolites during their oxidation in the cells mostly in the liver and kidney cells. It is these metabolites that react with some cellular components such as the lipid membrane to produce lipid peroxidation products, which may result to membrane change. They may also react with some enzymes and cause inactivation through protein oxidation and/or DNA strand breaks. (Nwanjo *et al.*, 2007).

Exposure to petrol fumes causes blood disorders, including anemia and leukaemia, renal damage, hepatic dysfunction and intoxication leading to serious psychotic problems, anaesthetic effects, derma-

titis and others (Nwanjo et al., 2007).

A rise in plasma enzymes such as Aspartate Aminotransferase (AST), Alanine aminotransferase (ALT) and Alkaline Phosphatase (ALP) are good indicators of hepatocellular damage (Patrick et al., 2011, Tartai et al., 2020).

The study was undertaken to investigate the effects of petrol fumes of petrol stations on petrol fuel attendants in Aba metropolis of Abia State Nigeria.

MATERIALS AND METHODS

This study was carried out at the Department of medical laboratory Science, ABSUTH. The subjects were petrol pump attendants and non-petrol pump attendants in Aba metropolis, Abia State.

The study comprises a total of 50 human volunteers from 7 different petrol filling stations in Aba, metropolis of Abia State, Nigeria, who are predisposed to petrol fumes in the course of their duties. Also, another 50 apparently healthy subjects who were not engaged in activities that predisposed them to serious exposure or contact with Petrol fumes were recruited as controls for this study.

Blood samples were collected through venipuncture using a sterile needle and a 5ml syringe. The blood samples were then centrifuged at 12,500rpm for 5 minutes to obtained plasma samples which were used for the assay of liver enzyme activities. The activities of the enzymes were determined using Igboh, et al (2013) methods.

Data obtained were analyzed using Statistical Package for Social Sciences (SPSS version 25) and one-way analysis of variance (ANOVA), student t test and expressed as Mean standard deviation. Significant level for the analysis was set at P-value equal to or less than 0.05 (P-0.05) which was considered as being statistically significant.

Table 1: Comparison of Mean ± Standard Deviation of Alanine Transaminase, Aspartate Transaminase and alkaline phosphatase of petrol pump attendants (tests) and controls**.**

Parameters	Test (n=50)	Controls (n=50)	Cal. t	Crit t	P (=<0.05)	Sig.
ALT (IU/L)	52.10 ±13.48	46.62 ±19.56	1.615	1.98	0.1096	NS
AST (IU/L)	36.90 ±19.84	34.28 ±18.28	0.680	1.98	0.4983	NS
ALP (IU/L)	170.8 ±52.90	140.68 ±27.80	3.526	1.98	0.00064	NS

Keywords:
ALT - Alanine Amino Transferase
AST - Aspertate Amino Transferase
ALP – Alkaline Phosphatase
Sig- Significance
Ns- Not significant
Crit f- Critical F Value
Calc f-
Calculated F value
P value <0.005 is significant

Table 2: Comparison of Mean ± Standard Deviation of Alanine Transaminase, Aspartate Transaminase and alkaline phosphatase of petrol pump attendants' tests and controls.

Parameters	1-4 months (n=17)	5-11 months (n=15)	1-4 years (n=10)	>4 years (n=8)	P (=<0.05)	Sig.
46.15	52.10 ±10.55	50.75±8.75	56.70±14. 78	60.50±18. 01	0.0647	NS
AST (IU/L)	35.53±13.49	35.87±18.70	37.90±24. 21	40.50±25. 80	0.1269	NS
ALP (IU/L)	162.64 ±54.25	178.73±58.4 0	170.60±49 .46	174.25±38 .73	0.2547	NS

Keywords:
ALT - Alanine Amino Transferase
AST - Aspertate Amino Transferase
ALP – Alkaline Phosphatase

Sig- Significance
Ns- Not significant
Crit f- Critical F Value
Calc f-
Calculated F value
P value <0.005 is significant

Table 3: Comparison of Mean ± Standard Deviation of Alanine Transaminase, Aspartate Transaminases and alkaline phosphatase of petrol pump attendants(tests) and control.

Parameters	Males(n=50)	Females(n=50)	Cal. t	Crit t	P (=<0.05)	Sig.
ALT (IU/L)	53.83±17.40	50.63±8.61	0.825	1.98	0.4136	NS
AST (IU/L)	36.65±23.74	37.11±15.78	0.080	1.98	0.9367	NS
ALP (IU/L)	56.38±40.29	54.12±39.04	3.526	0.197	0.8444	NS

Keywords:
ALT - Alanine Amino Transferase
AST - Aspartate Amino Transferase
ALP – Alkaline Phosphatase
Sig- Significance
Ns- Not significant
Crit f- Critical F Value
Calc f-
Calculated F value
P value <0.005 is significant

This study was aimed at evaluating the activities of serum Transaminases and alkaline Phosphatase of petrol pump attendants in Aba metropolis, Abia State. Alanine Transaminase (ALT), Aspartate aminotransferase (AST), and alkaline phosphatase (ALP) activities were accessed among petrol pump attendants.

The result of the study showed that serum AST, ALT and ALP activities in the petrol attendants were significantly higher (P=<0.05) when compared with the control and it was more prominent in test subjects who have been exposed for more than four years. The results, therefore, points out that long term exposure or inhalation of petrol fumes is associated with increase in liver enzyme activities.

The result of this study has proven that exposure to petrol fumes has significant hepatic damage as shown by the elevation of the activities of the following serum liver marker enzymes, ALT, AST and ALP.

The activity of AST was higher in individuals who were exposed to petrol fumes when compared to the control individuals. This increased in activity of AST had been reported in tetrachloromethane (CCl_4) which had been found to induce toxicity in humans. (Nwanjo, and Ojiako,2007).) This study agreed with the study of Patrick *et al., (2011*), Which stated that AST levels were higher in petrol pump attendants in comparison with the control. The increase in enzyme activities observed may be due to abnormal dynamic characteristics of cellular membranes following exposure to hydrocarbon fractions present in petroleum products.

Equally, from the result, the activity of Alanine Transaminase (ALT) was significantly higher in petrol attendants when compared to control subjects (P=< 0.1096, =1.615). This agrees with the study of Hala *et al., (2015*) which showed that, ALT level was significantly higher in petrol attendants when compared to the control. The level of serum Alanine Transaminase (ALT) activity had been reported to have increased probably as a result of liver injury. The damage is also attributed to reactive radicals which are generated from the Metabolism of aromatic and aliphatic hydrocarbons present in petrol fumes (Bondy *et al.,* 2012). Alanine Transaminases (ALT) might have leaked from damage cells, due to liver cell membrane permeability leading to necrosis indicating organ dysfunction (Bondy et al., 2012).

Alkaline phosphatase (ALP) activity is also higher in petrol attendants when compared with control subjects. This agrees with the study of Nwanjo *et al., (2007*) which stated that the mean ALP activity was found to be significantly higher in petrol station workers compared to the controls. On the other hand, Gupta *et al., (2015*) found that ALP activity was not significantly difference in petrol filling attendants and control. The increase in ALP activity generally originates from the hepatobiliary system. Therefore, toxic effects of the petrol products would have resulted to disturbance in the biliary tree and therefore causing elevation of ALP activity. The disturbance could be attributed to reactive species which are generated from the catabolism and anabolism of aromatic and aliphatic hydrocarbons present in petrol fumes (Bondy *et al.,* 2012).

The results from the study therefore, revealed that long time exposure or inhalation of petrol fumes is associated with increase in liver enzyme and may be

used to monitor these enzymes to aid early detection of liver derangement .

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