Original Research Article

Evaluation of Liver Function and Haemorheological Parameters in some Carpenters Exposed to Wood Dust in Port Harcourt.

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ABSTRACT

Aim: To evaluate liver function and haemorheological parameters in some carpenters exposed to wood dust in Port Harcourt.

Methodology: This cross-sectional study was carried out in some parts of Port Harcourt, the capital city of Rivers State in the southern part of Nigeria. The locations of the research included Sandfield mile 2 Diobu, Marine base, and Abuja by-pass Nkpolu-oroworukwo, Port Harcourt. Ethical approval and informed consent of the participants were obtained before commencement of the study. A total of one hundred and fifty (150) apparently healthy subjects aged between 20 t0 50 years were used for the study. Ninety (90) carpenters exposed to wood dust served as test subjects, while sixty (60) non- carpenters, non-wood workers not exposed to wood dust served as controls. Interviewer based sample questionnaire was administered to the subjects. Liver function parameters, Packed cell volume (PCV), erythrocyte sedimentation rate (ESR), haemoglobin concentration (Hb), and fibrinogen were analysed using standard laboratory techniques.

Results: The mean age of the test subjects (36.5 ± 9.9 years) was not significantly different ($P > .05$) from that of the controls (32.1 ± 5.8 years). There were no significant differences ($P > .05$) in alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), Total protein (TP), albumin (ALB), total bilirubin (TB), conjugated bilirubin (CB), PCV and Hb in the test subjects compared to the controls. ESR (19.60 ± 10.67mm/Hr) and fibrinogen (624 ± 60.88ng/mL) were significantly higher ($P< .05$) in the tests (carpenters) compared to ESR (8.41 ± 5.36mm/Hr) and fibrinogen (448.4 ± 67.91ng/mL) in the controls.

Conclusion: Wood dust exposure did not alter the liver function, PCV, and Hb levels of carpenters. However, with increases in ESR and fibrinogen in the carpenters, there may be a risk of inflammation to wood dust exposure in the carpenters, with negative consequences to the vasculature.

Keywords: Carpenters, Wood dust, Liver function, Haemorheology, Inflammation, Occupational exposure, Port Harcourt.

1. INTRODUCTION

Wood dust, commonly called sawdust in Nigeria, are fine particles of wood produced in the course of wood processing. It is a complex substance that is made up of cellulose, polyose, lignin and other polar and non-polar extracts. It is produced by both hard and soft wood that undergo processes like sanding, sawing, milling, drilling, chipping, cutting, grinding, etc. Exposure to wood dust is one of the oldest and commonest occupational exposures encountered by millions of individuals the world over, especially individuals who partake in jobs such as carpentry, cabinetry and sawmilling, pulp and paper milling, and furniture making [1, 2].

There is so much work done on the effects of wood dust on respiratory parameters, however, there is a dearth of research on its effects on haemorheological and liver function parameters in this part of the world.

2. MATERIALS AND METHODS

2.1 Study Design

A total of one hundred and fifty (150) apparently healthy male subjects aged between 20 to 50 years were used for the study. Ninety (90) carpenters exposed to wood dust served as test subjects, while sixty (60) non-carpenters, non-wood workers not exposed to wood dust served as controls. The carpenters did not use personal protective equipment (PPE) in the course of doing their work. This cross-sectional study was carried out in Port Harcourt metropolis, the capital city of Rivers State in the southern part of Nigeria. The locations of the research included Sandfield mile 2 Diobu, Marine base, and Abuja by-pass Nkpolu-oroworukwo, Port Harcourt. Ethical approval was gotten and informed consent of the participants obtained before commencement of the study. Interviewer based sample questionnaires were also administered to the subjects. Proper vene puncture technique was employed in the collection of the blood samples.

2.2 Inclusion Criteria

Apparently healthy male carpenters, who were non-smokers, non-alcohol drinkers.

2.3 Exclusion criteria

Carpenters who were smokers and alcohol drinkers. Carpenters who were hypertensive or had any history of cardiovascular disease.

2.4 Reagents and Biochemical Analyses

All reagents were commercially purchased and the manufacturer's standard operating procedures were strictly followed. The liver enzymes alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were determined using the Reitman-Frankel method [3], as modified by Randox laboratories limited (UK). Alkaline phosphatase (ALP) was determined using the colorimetric endpoint method [4], as modified by Randox laboratories limited (UK). Total protein (TP) was determined using the biuret method [5], as modified by Randox laboratories limited (UK). Albumin was determined using the bromocresol green method [6], as modified by Randox laboratories limited (UK). Total and conjugated bilirubin were determined using the

Jendrassik-Grof method [7], as modified by Randox laboratories limited (UK). Packed cell volume (PCV) was determined using the haematocrit method [8], erythrocyte sedimentation rate (ESR) was determined using the Westergren method [9], haemoglobin concentration (Hb) was determined using cyanmethaemoglobin method [10], and fibrinogen was determined using enzyme linked immunosorbent assay (ELISA) technique [11], as modified by Elabscience Biotechnology Company limited (China).

2.3 Statistical Analysis

Data was analysed using Graph Pad Prism version 8.0.2. Groups were compared using the independent student t-test. Results were considered statistically significant at 95% confidence interval ($p \leq 0.05$). Values are expressed as Mean ± SD.

3. RESULTS AND DISCUSSION

Table 1: Liver Function Parameters of the Subjects

	ALT (IU/L)	AST (IU/L)	ALP (IU/L)	Total protein (g/L)	Albumin (g/L)	Total Bilirubin (µmol/L)	Conjugated Bilirubin (µmol/L)
Test N=90	9.05 ± 4.38	18.65 ± 3.54	31.85 ± 8.34	71.98 ± 5.97	36.77 ± 3.36	7.60 ± 3.18	2.90 ± 2.12
Control N=60	10.00 ± 3.45	16.75 ± 5.25	31.65 ± 7.62	70.23 ± 5.18	37.64 ± 3.30	7.28 ± 3.28	2.98 ± 1.82
p-value	0.2844	0.0613	0.9112	0.1655	0.3575	0.6736	0.8657

N- Number of subjects

Table 1 shows results of liver function parameters of the carpenters (Tests) and non-carpenters (Controls). It shows there were no significant differences ($P > .05$) in ALT, AST, ALP, total protein, albumin, total bilirubin and conjugated bilirubin levels of the carpenters when compared with that of the control subjects. This implies wood dust exposure had no effect on the liver function of the carpenters. In a similar study, Brown *et al*. [12] reported significantly elevated plasma levels of AST, ALT, ALP in carpenters who were smokers and regular alcohol drinkers, compared to non-smokers and occasional alcohol drinkers. In another study, Mojiminiyi *et al*. [13] reported no significant differences in liver function in factory workers

exposed to cement dust, except AST and ALP activities which were significantly lower. Ibama *et al*. [14] reported significantly elevated serum creatinine and urea levels, and significantly reduced estimated glomerular filtration rate (eGFR) in carpenters exposed to wood dust compared to controls not exposed to wood dust.

Table 2: Packed Cell Volume (PCV), Haemoglobin (Hb), Erythrocyte Sedimentation Rate (ESR) and Fibrinogen levels of the Subjects.

	PCV (%)	Hb (g/dl)	ESR (mm/Hr)	Fibrinogen (ng/mL)
Test N=90	42.37 ± 4.11	13.84 ± 1.34	19.60 ± 10.67	624.4 ± 60.88
Control N=60	42.40 ± 4.21	14.03 ± 1.32	8.41 ± 5.36	448.4 ± 67.91
p-value	0.9753	0.6193	< 0.0001	< 0.0001

N- Number of subjects

Table 2 shows results of PCV, Hb, ESR and fibrinogen levels in the subjects. There were no significant differences ($P > .05$) in PCV and Hb levels in the carpenters, compared to the non-carpenters. ESR and fibrinogen levels were significantly higher ($P < .05$) in the carpenters when compared to the non-carpenters. With fibrinogen being a positive acute phase protein, and ESR, a marker for inflammation, this may imply an increased inflammation in the carpenters exposed to wood dust. In a similar study, Osime & Ojuh [15] reported a significant increase in haemoglobin, haematrocrit and granulocyte levels of sawmill workers exposed to wood dust when compared to the non-exposed controls. They however reported no significant differences in prothrombin time (PT), activated partial thromboplastin time (APTT) and other complete blood count (CBC) parameters. Mojiminiyi *et al*. [13] reported that haemoglobin concentration and packed cell volume of factory workers exposed to cement dust were significantly lower compared to non-exposed controls. In a similar study, C-reactive protein (CRP) an inflammatory marker, and malondialdehyde (MDA) were significantly increased in sawmill workers exposed to wood dust [16]. Wultsch *et al*. [17] reported that wood dust causes cytotoxic effects which may lead to inflammation. Repeated airway exposure to wood dust can elicit lung inflammation, which is accompanied by induction of several pro-inflammatory cytokines and chemokines,

suggesting that the inflammatory responses induced by the wood species may rise via different cellular mechanisms [18].

4. CONCLUSION

Wood dust exposure did not alter the liver function, PCV, and Hb levels of carpenters. However, with increases in ESR and fibrinogen in the carpenters, there may be a risk of inflammation to wood dust exposure in the carpenters, with negative consequences to the vasculature. Personal protective equipment (PPE) should be worn be carpenters, to prevent or limit the exposure to wood dust.

Ethical Approval

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

Consent

As per international standard or university standard, Participants' written consent has been collected and preserved by the authors.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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