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Research Article

Haematological Parameters of Individuals Exposed to Wood Dust in Ekpoma, Edo State, Nigeria

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Abstract

Occupational exposure to wood dust particles has long been reported of its associated varying degrees of negative health effects due to different extractive chemicals present in the various timber species. This study was carried out to evaluate the haematological parameters of individuals exposed to wood dust in Ekpoma, Edo State, Nigeria. A total of fifty subjects exposed to wood dust were recruited for this study while fifty apparently healthy subjects not exposed to wood dust served as control. Haematological parameters were determined using Sysmex KX-21N Haematology autoanalyzer. The results obtained revealed that the total WBC of the subjects and controls were 5.44± 1.34 and 5.34±1.74 respectively. Similarly, the LYM %, NEUT % and MXD % of the test and control subjects were 41.76±10.87 versus 49.48±8.67, 45.58±10.19 versus 37.74±8.39 and 12.38±4.96 versus 11.65±3.69 respectively. Correspondingly, the LYM ($\times 10^3/\mu l$), NEUT ($\times 10^3/\mu l$) and MXD ($\times 10^3/\mu l$) of the test and control subjects were 2.58±0.79 versus 2.62±0.86, 2.30±0.81 versus 2.10±0.93 and 0.70±0.45 versus 0.58±0.25 respectively. Furthermore, the RBC ($\times 10^6/1$) of the test and control subjects were 4.65±0.62 and 5.04±0.56, HGB (g/dl) 12.30±1.19 and 13.43±1.21, HCT (%) 35.43±4.23 and 39.11±3.48, MCV (fl) 77.84±5.97 and 75.12±9.12, MCH (pg) 27.84±2.62 and 26.02±2.68, MCHC (g/dl) 34.53±1.40 and 34.91±1.75, RDW-SD (fl) 40.36±2.78 and 34.59+5.72 and RDW-CV (%)13.63±1.09 and 12.00±1.72 respectively. In addition, the PLT ($10^3/\mu l$) of the test and control subjects were 201.31±81.85 and 187.71±68.73, PDW (fl) 14.96±3.40 and 13.51±1.76, MPV (fl) 10.56±0.76 and 10.18±1.31 and P-LCR (%) 29.68±5.76 and 25.86±25.86 respectively. Statistically speaking, NEUT%, RDW-SD, RDW-CV, PDW, P-LCR and PLT were significantly higher in test subjects compared to control ($p<0.05$) whereas RBC, HGB and HCT were significantly lower in test subjects in comparison to control. In conclusion, some haematological parameters were variably affected by wood dust in the study area. We hereby recommend that individuals exposed to wood dust should be encouraged to use face masks while working to reduce exposure.

Keywords: Haematological; Parameters; Wood; Dust; Occupational

Introduction

Wood dust, commonly called sawdust in Nigeria, are fine particles of wood produced in the course of wood processing [1]. It is a complex substance that is made up of cellulose, polyose, lignin and other polar and non-polar extracts [1]. It is produced by both hard and soft wood that undergo processes like sanding, sawing, milling, drilling, chipping, cutting, grinding, etc [1]. 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 [2].

In general, exposure to wood dust has been associated with high prevalence of respiratory symptoms and diseases including irritations of the mucous membranes and nasal airways, chronic and acute deterioration of lung functions, asthma and allergies [3,4]. Additionally, wood dust is associated with exposure to pathogenic microorganisms such as fungi and bacteria and is said to increase the risk of nasal cancer in most exposed individuals [5,6]. Furthermore, there are evidences which show that exposure to dust causes alteration in blood cell counts [7]. While much is known about the effect of cement dust on haematological parameters, there is dearth of information on the effect of wood dust on haematological parameters in the study area. Knowledge of the haematological parameters of individuals exposed to wood dust will be useful to clinicians in the treatment and management of diseases associated

with wood dust exposure. Therefore, this research was carried out to determine the haematological parameters of individuals exposed to wood dust in Ekpoma, Edo State, Nigeria.

Materials and Methods

Study area

This study was carried out in Ekpoma, Edo State, Nigeria. Ekpoma is the administrative headquarters of Esan West Local Government Area in Edo state which falls within the rain forest/savannah transitional zone of southwestern Nigeria. The area lies between latitudes 6° 43' and 6° 45' North of the Equator and longitudes 6° 5' and 6° 8' East of the Greenwich Meridian. Ekpoma has a land area of 923 square kilometres with a population of 170, 123 people as at the 2006 census [8].

Study population

A total of fifty (50) individuals exposed to wood dust between the ages of 16 and 60 years and of both sexes residing in Ekpoma were recruited as test subjects for this study. Similarly, fifty (50) individuals not exposed to wood dust between the ages of 16 and 60 years and of both sexes also residing in Ekpoma were recruited as control subjects.

Ethical approval

Ethical approval was obtained from the Health Research Ethics Committee of Ambrose Alli University, Ekpoma. Informed consent was sought from participants before sample collection.

Inclusion criteria

Apparently healthy individuals exposed to wood dust on a daily basis such as carpenters and sawmill workers who gave their consent were included in this study.

Exclusion criteria

Individuals who smoke, consume alcohol, hypertensive, had earlier been diagnosed of any acute or chronic inflammatory diseases, cardiovascular or pulmonary diseases, and those who did not give their consent were excluded from the study.

Sample collection

About 5mls of blood was collected from all the subjects via venipuncture and dispensed into Ethylene Diamine Tetra Acetic Acid (EDTA) bottle and mixed immediately by reverse inversion method. In the field, the EDTA samples were stored in a cold box of a temperature range of 2-8°C before analysis.

Haematology assay using sysmex KX-21N autoanalyzer

The haematological parameters were analyzed using Sysmex KX-21N Haematology autoanalyzer within two hours of the blood collection. Quality control was run every day and the analyzer was maintained according to the manufacturer's instructions during the entire period of the study. The KX-21N Sysmex Haematology autoanalyzer performs speedy and accurate analysis of 19 parameters. It displays on the LCD screen the particle distribution curves of WBC, RBC and platelets along with data of 19 parameters as the analysis results.

Statistical Analysis

The results obtained were presented using tables and charts as mean ± standard deviation. Statistical analysis was done using ANOVA and Student's t-test using Statistical Package for Social Sciences (SPSS) version 25. A p-value of less than 0.05 (<0.05) was considered significant.

Results

Socio-demographic characteristics of the subjects

Table 1 showed the socio-demographic characteristics of the subjects. Of the fifty (50) subjects recruited for this study, 45 (90%) were males and 5 (10%) females. Based on the age group classification of the subjects, 22 (44%) belonged to age group of 15-30 years, 21 (42%) belonged to age group 31-50 years and 7 (14%) belonged to age group 51 years and above. The age mean of the subject studied was 34.45+20.62. With respect to ethnicity, 31 (62%) were Esan, 13 (26%) were Etsako and 6 (12%) were Ibo. According to job type, 22 (44%) were furniture workers, 22 (44%) were sawmill workers, while 6 (12%) were carpenters. On the account of religion, Christians were more (86%) in the study compared to Muslims (14%). With respect to work experience, 19 (38%) have worked for 1-5 years, 17 (34%) - 6-10 years, while 14 (28%) have worked for 11 years and above. Finally, based on length of daily work, 5 (10%) worked for 1-5 hours daily, 32 (64%) worked for 6-10 hours daily and 13 (26%) worked for 11 hours or thereabout daily.

Table 1: Socio-demographic Characteristics of the Subjects.

Variables	Number Observed (n = 50)	Frequency(%)
Sex		
Male	45	90
Female	5	10
Age (years)		
16-30	10	22
31-45	21	42
46-60	19	36
Age mean	35.45±20.62	

Ethnicity		
Esan	31	62
Auchi	13	44
Ibo	6	12
Job Type		
Furniture	22	44
Sawmill	22	44
Carpenter	6	12
Religion		
Christians	43	86
Muslims	7	14
Work experience		
1-5years	19	38
6-10years	17	34
11years & above	14	28
Length of Daily Work		
1-5hours	5	10
6-10hours	32	64
11hours & above	13	26

Haematological parameters of individuals exposed to wood dust in the study area

The haematological parameters of individuals exposed to wood dust in the study area is shown in Table 2. The results obtained showed that only the mean values of NEUT %, RDW-SW, RDW-CV, PDW, P-LCR and PLT were significantly higher in test subjects compared to controls while LYM %, RBC, HGB and HCT were significantly lower in test subjects compared with control subjects (P<0.05).

Table 2: Haematological parameters of individuals exposed to wood dust in the study area.

Parameters	Test Subjects	Control Subjects	t-Value	p-Value
	Mean ± SD (n = 50)	Mean ± SD(n = 50)		
WBC (x10^3/µl)	5.44±1.34	5.34±1.74	0.293	0.771
LYM (%)	41.76±10.87	49.48±8.67	3.984	0.000*
NEUT (%)	45.58±10.19	37.74±8.39	4.096	0.000*
MXD (%)	12.38±4.96	11.65±3.69	0.802	0.426
NEUT (x10^3/µl)	2.30±0.81	2.10±0.93	1.151	0.255
LYM (x10^3/µl)	2.58±0.79	2.62±0.87	0.247	0.806
MXD (x10^3/µl)	0.70±0.45	0.58±0.25	1.637	0.108
RBC (x10%/µl)	4.65±0.62	5.04±0.56	3.519	0.001*
HGB (g/dl)	12.30±1.19	13.43±1.21	4.859	0.000*
HCT (%)	35.43±4.23	39.11±3.48	4.554	0.000*
MCV (fL)	77.84±5.97	75.12±9.12	1.742	0.088
MCH (pg)	27.84±2.62	26.02±2.68	0.344	0.732
MCHC (g/dl)	34.53±1.40	34.91±1.75	1.139	0.26
RDW-SD (fL)	40.36±2.78	34.59±5.72	5.764	0.000*
RDW-CV (%)	13.63±1.09	12.00±1.72	5.426	0.000*
PLT (x10^3/µl)	201.31±81.85	187.71±68.73	1.121	0.268
PDW (fL)	14.96±1.76	13.51±3.40	2.467	0.017*
MPV (fL)	10.56±0.76	10.18±1.31	1.63	0.11
P-LCR (%)	29.68±5.76	25.86±8.65	2.386	0.021*

Keys: S.D: Standard Deviation; WBC: White Blood Cells, RBC: Red Blood Cells, MCV: Mean Cell Volume; MCHC: Mean Cell Haemoglobin Concentration, PLT: Platelet Count, P-LCR: Plateletcrit; HGB: Haemoglobin, HCT: Haematocrit, MCH: Mean Cell Hae-

moglobin; RDW: Red Cell Distribution Width; RDW-CV: Red Cell Distribution Width-Coefficient of Variation; RDW-SD: Red Cell Distribution Width-Standard Deviation; MPV: Mean Platelet Volume; PDW: Platelet Distribution Width; NEUT: Neutrophils; LYM: Lymphocyte; MXD: Middle cell ratio; fl: Femtolitre; Pg: Picogram; %: Percentage; µl: Microlitres

Haematological parameters of individuals exposed to wood dust with respect to gender

Table 3 showed the haematological parameters of individuals exposed to wood dust with respect to gender. The results obtained showed that the male subjects had significantly higher ($p<0.05$) HGB, HCT and MCV but significantly lower PLT ($p<0.05$) compared to female subjects.

Table 3: Haematological parameters of individuals exposed to wood dust with respect to gender.

Parameters	Test Subjects	Control Subjects	t-Value	p-Value
	Mean ± SD(n = 50)	Mean ± SD(n = 50)		
WBC (x10^3/µl)	5.45±1.41	5.07±0.75	1.403	0.168
LYM (%)	40.75±9.96	45.35±15.03	1.717	0.093
NEUT (%)	47.21±9.56	45.17±13.74	0.852	0.399
MXD (%)	12.41±5.19	12.82±3.96	0.378	0.707
NEUT (x10^3/µl)	2.27±0.82	2.27±0.76	0.013	0.99
LYM (x10^3/µl)	2.66±0.78	2.37±0.72	1.094	0.121
MXD (x10^3/µl)	0.71±0.48	0.65±0.27	0.737	0.466
RBC (x10%/µl)	4.51±1.11	4.41±0.51	0.935	0.352
HGB (g/dl)	13.16±0.09	12.52±1.01	5.646	0.000*
HCT (%)	40.12±6.11	37.17±3.19	2.193	0.031*
MCHC (g/dl)	35.31±9.18	32.82±2.80	1.525	0.13
MCH (pg)	34.21±10.16	29.83±3.17	1.617	0.109
MCV (Fl)	93.21±15.27	85.72±4.08	2.786	0.006*
RDW-CV (%)	12.81±0.08	13.21±1.02	-1.935	0.056
RDW-SD (fL)	52.11±10.01	48.82±3.90	1.923	0.057
PLT (x10^3/µl)	241.52±69.17	280.12±84.08	-2.498	0.014*
MPV (fL)	9.10±0.17	8.08±0.60	1.299	0.197
PDW (fL)	14.16±1.22	14.18±1.01	-1.238	0.219
P-LCR (%)	34.57±7.17	33.91±6.7	0.57	0.507

Keys: S.D: Standard Deviation; WBC: White Blood Cells, RBC: Red Blood Cells, MCV: Mean Cell Volume; MCHC: Mean Cell Haemoglobin Concentration, PLT: Platelet Count, P-LCR: Plateletcrit; HGB: Haemoglobin, HCT: Haematocrit, MCH: Mean Cell Haemoglobin; RDW: Red Cell Distribution Width; RDW-CV: Red Cell Distribution Width-Coefficient of variation; RDW-SD: Red Cell Distribution Width-Standard Deviation; MPV Mean Platelet Volume; PDW: Platelet Distribution Width; NEUT: Neutrophils; LYM: Lymphocyte; MXD Middle Cells Ratio, fl: Femtolitre, Pg: Picogram; %: Percentage; µl: Microlitre

Haematological parameters of individuals exposed to wood dust with respect to age

Table 4 showed the haematological parameters of individuals exposed to wood dust with respect to age. The results obtained showed that the total WBC and NEUT (#) were significantly higher ($p<0.05$), while PLT was significantly lower ($p<0.05$) in age group 46-60 years when compared with age group 16-30 years and 31-45 years respectively.

Table 4: Haematological parameters of individuals exposed to wood dust with respect to age.

Parameters	16-30Years	31-45Years	46-60Years	f- Value	p-Value
	Mean ± SD(n = 10)	Mean ± SD(n = 21)	Mean ± SD(n = 19)		
WBC (x10^3/µl)	5.28±0.96^a	5.32±1.77^a	6.24±0.35^b	4.487	0.000*
LYM (%)	41.07±10.13^a	42.61±12.39^a	43.44±7.74^a	0.85	0.406
NEUT (%)	47.64±11.56^a	45.34±9.13^a	45.30±8.86^a	0.752	0.461
MXD (%)	12.97±4.25^a	12.07±5.54^a	11.36±5.61^a	0.634	0.533
NEUT #)	2.14±0.61^a	2.38±0.65^{a,b}	2.64±0.46^b	2.919	0.008*
LYM (#)	2.57±0.83^a	2.47±0.81^a	2.80±0.55^a	1.699	0.105
MXD (#)	0.69±0.26^a	0.70±0.62^a	0.72±0.35^a	0.384	0.705

RBC (x106/µl)	5.11±0.56[a]	4.96±0.54[a]	4.36±0.64[a]	0.697	0.362
HGB (g/dl)	13.63±1.21[a]	13.24±1.10[a]	12.12±1.36[a]	0.789	0.369
HCT (%)	39.25±3.48[a]	38.19±2.15[a]	36.26±2.66[a]	0.564	0.214
MCV (Fl)	76.25±5.97[a]	79.27±5.28[a]	78.26±4.86[a]	0.699	0.366
MCH (pg)	27.41±2.62[a]	28.61±2.29[a]	29.32±2.54[a]	0.825	0.275
MCHC (g/dl)	33.36±1.40[a]	32.41±1.81[a]	33.21±2.01[a]	0.878	0.265
RDW-SD (fL)	40.36±2.78[a]	41.56±2.64[a]	41.68±3.10[a]	0.914	0.126
RDW-CV (%)	12.63±1.09[a]	12.84±2.55[a]	13.01±3.41[a]	0.745	0.379
PLT (x10^3/µl)	200.71±38.73[a]	182.32±60.17[b]	171.02±45.36[c]	3.698	0.002*
PDW (fL)	14.51±1.76[a]	15.6±1.15[a]	14.62 ±0.96[a]	0.784	0.356
MPV (fL)	9.61±1.64[a]	10.07±1.14[a]	10.24±1.05[a]	0.68	0.35
P-LCR (%)	25.68±5.76[a]	24.32+6.21*	23.45±4.36[a]	0.912	0.188

Values with different superscript across row are significantly different.

Keys: S.D: Standard Deviation; WBC: White Blood Cells, RBC: Red Blood Cells, MCV: Mean Cell Volume; MCHC: Mean Cell Haemoglobin Concentration, PLT: Platelet Count, P-LCR: Plateletcrit; HGB: Haemoglobin, HCT: Haematocrit, MCH: Mean Cell Haemoglobin; RDW: Red Cell Distribution Width; RDW-CV: Red Cell Distribution Width-Coefficient of Variation; RDW-SD: Red Cell Distribution Width-Standard Deviation; MPV Mean Platelet Volume; PDW: Platelet Distribution Width; NEUT: Neutrophils; LYM: Lymphocyte; MXD % Middle Cell Ratio, fl: Femtolitre, Pg: Picogram; %: Percentage: µl: Microlitre

Haematological parameters of individuals exposed to wood dust with respect to duration of exposure

Table 5 showed the haematological parameters of individuals exposed to wood dust with respect to duration of exposure. There was no significant difference (p>0.05) in the haematological parameters in subjects with respect to duration of exposure to wood dust.

Table 5: Haematological parameters of individuals exposed to wood dust with respect to duration of exposure.

Parameters	1-5years	6-10years	11 years & above	f-value	p-value
	Mean ± SD(n = 19)	Mean ± SD(n = 17)	Mean ± SD(n = 14)		
WBC (x10^3/µl)	5.37±1.90[a]	5.30+0.99[a]	5.57+0.91[a]	0.713	0.488
LYM (%)	41.24±8.13[a]	43.44±7.71[a]	42.14±12.92[a]	0.105	0.918
NEUT (%)	47.41±10.12[a]	45.33±8.84[a]	45.45±9.31[a]	0.413	0.685
MXD (%)	12.73±5.20[a]	11.30±5.60[a]	12.01±5.45[a]	0.534	0.602
NEUT (#)	2.40±0.51[a]	2.32±0.43[a]	2.28±0.51[a]	0.196	0.366
LYM (#)	2.66±0.53[a]	2.76±0.51[a]	2.77±0.80[a]	0.581	0.462
MXD (#)	0.71±0.25[a]	0.74±0.31[a]	0.72=0.60[a]	0.62	0.477
RBC (10^3/µL)	4.66±0.41	4.18±0.53	4.43±0.36	0.662	0.135
HGB (g/dl)	13.42±1.10	13.10±0.85	13.04±1.33	0.744	0.3
HCT (%)	40.92+2.25	38.36±2.17	39.77±3.15	0.715	0.866
MCHC (g/dl)	32.61± 0.19	32.71±0.51	32.96±0.78	0.7	0.095
MCH (pg)	29.13± 1.28	31.79±0.42	29.64±1.06	0.681	0.407
MCV (fL)	89.74± 1.80	93.24±2.15	90.26±3.12	0.505	0.235
RDW-CV (%)	12.34± 0.55	12.65±0.65	12.80±0.42	0.599	0.124
RDW-SD (fL)	49.54± 2.41	50.63±2.16	50.22=2.16	0.632	0.366
PLT (10^3/µL)	205.03± 76.70	198.81±64.66	184.65±103.35	0.654	0.269
MPV (fL)	8.92± 0.37	9.14±1.12	9.00±0.62	0.498	0.456
PDW (fL)	14.74± 1.24	15.60±1.35	14.64±0.36	0.896	0.321
P-LCR (%)	23.12± 3.11	19.14±4.15	21.22±3.51	0.63	0.288

Keys: S.D: Standard Deviation; WBC: White Blood Cells, RBC: Red Blood Cells; MCV: Mean Cell Volume; MCHC: Mean Cell Haemoglobin Concentration; PLT: Platelet Count; P-LCR: Plateletcrit; HGB: Haemoglobin; HCT: Haematocrit; MCH: Mean Cell Haemoglobin; RDW: Red Cell Distribution Width; RDW-CV: Red Cell Distribution Width-Coefficient of Variation; RDW-SD: Red Cell Distribution Width-Standard Deviation; MPV: Mean Platelet Volume; PDW: Platelet Distribution Width; NEUT: Neutrophils; LYM: Lymphocyte; MXD Middle Cell Ratio; fl: Femtolitre; Pg: Picogram; %: Percentage; µl: Microlitren

Discussion

Occupational exposure to wood dust particles has long been reported of its associated varying degrees of negative health effects due to different extractive chemicals present in the various timber species [9]. In this study, the results of the WBC total count of the test subjects compared to control were 5.44±1.34 and 5.34±1.74 respectively. Statistical comparison did not reveal any significant difference ($p>0.05$). Our finding is similar to the previous report of Gripenback, et al. [10] who found a non-significant result in eleven (11) healthy individuals before and after a one-hour exposure to wood dust. In contrast, our result is contradicted by the previous study of Ennin, et al. [9] who reported a significant difference in the total WBC count of tropical hard wood workers in Kumasi, Ghana. Similarly, Osime and Ojuh [11] also reported a significantly increased granulocyte level in their test subjects compared to control. Correspondingly, Ennin et al. [9] noted that the increased inflammatory cells in peripheral blood suggested that wood dust may have induced inflammatory reactions in the wood workers.

With respect to differential leucocyte count (DLC), our study reported that the LYM % was significantly decreased ($p<0.05$) in the test subject compared to control. On the other hand, the NEUT % was significantly increased ($p<0.05$) in test subject compared to the control. The significantly decreased lymphocyte count (LYM %) reported in our study is in line with the previous study of Osime and Ojuh [11] who found a decreased lymphocyte count in individuals with longer exposure time to wood dust. Furthermore, Gripenback, et al. [10] also observed a significant difference in the LYM % of healthy individuals exposed to wood dust. Conversely, the NEUT % was significantly increased ($p<0.05$) in test subjects compared to control. This finding is in tandem with the work of Ennin, et al. [9] who found a significantly higher neutrophil % count in individuals exposed to tropical hardwood. Correspondingly, Gripenback, et al. [10] found a significantly increased number of neutrophils in the peripheral blood of healthy volunteers exposed to wood dust. As earlier stated, Ennin, et al. [9] in their observation noted that the increased inflammatory cells in the peripheral blood suggests that wood dust may have induced inflammatory reactions in the wood workers.

In relation to red blood cell parameters, the RBC, HGB. HCT, RDW-SD and RDW-CV of the test subjects when compared to control were significantly decreased ($p<0.05$). Our finding is in harmony with the previous report of Osime and Ojuh [11] who found the haemoglobin and haematocrit levels to be significantly increased in their test subjects when compared with control subjects. However, our result is dissimilar to the findings of Briggs, et al. [12] who reported that there were no significant differences ($p>0.05$) in the PCV and Haemoglobin of the test subjects compared to control. The reason for the significant increase in some of the red blood cells parameters of individuals exposed to wood dust in the study area is not clear. Nonetheless, Osime and Ojuh [11] implied that this may be due to an increased rate of blood flow in the circulation of these individuals.

From this study, the HGB, HCT and MCV results of the female subjects were statistically significantly decreased compared to male subjects. Nonetheless, we are of the opinion that because few female subjects were recruited in our study, this might have skewed our statistics hence the statistically significantly decreased results we reported. Inspite of our observation, the result is in consonance with the previous studies of Usman, et al. [13] and Miri-Dashe, et al. [14] who found significant differences to be more obvious among the female group counterparts. The plausible reason for this difference may be due to the variations in hormone types and the effect of erythropoietin release in response to regular menstruation.

With respect to age, the WBC total and neutrophil counts of individuals exposed to wood dust were significantly increased in the age bracket of 46-60 years compared to other age groups. This finding is in agreement with the previous study of Bolaji, et al. [15] who reported that the age group of 50-69 years had a significantly higher total WBC count compared to other age groups they studied. Similarly, Afolabi, et al. [16] found that the total leucocyte count was affected by age in adults. On the hand, PLT was significantly reduced in subjects that belonged to the age group of 46-60 years. The reason for this is also not clear. However, Wultsch, et al. [17] reported that wood dust cause cytotoxic effects which may lead to inflammation. Maatta, et al. [18] also observed that repeated 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.

From the viewpoint of duration to exposure to wood dust, there was no significant difference ($p>0.05$) in the haematological parameters of the test subjects compared to control. In contrast, Osime and Ojuh [11] found decreased lymphocytes counts of individuals with longer exposure time to wood dust. According to Wultsch, et al. [2017], wood dust causes cytotoxic effects which may lead to inflammation. In the same vein, Osime and Ojuh [11] implied that this may be caused by an increased rate of blood flow in the circulation of the individuals they studied.

In conclusion, NEUT %, RDW-SD, RDW-CV, PDW, P-LCR and PLT were significantly higher in the test subjects compared with control ($p<0.05$) while RBC, HGB and HCT were significantly lower in test subjects compared to control ($p<0.05$). With respect to sex, the male subjects had significantly higher ($p<0.05$) HGB, HCT and MCV but significantly lower ($p<0.05$) PLT compared to female subjects. Lastly, haematological parameters in subjects were not affected by duration of exposure to wood dust. It is hereby recommended that individuals exposed to wood dust should be encouraged to use Personal Protective Equipment (PPE) such as face mask while working to reduce exposure.

Conflict of Interest

The authors declare no conflicts of interest. The authors alone are responsible for the content and the writing of the paper.

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Authors' Contributions

The entire study procedure was conducted with the involvement of all authors.

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