

Effect of Sawmill Environment on the Leucocyte Counts in Sawmill Workers

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Abstract: The study investigated the effect of sawmill environment on the leucocyte counts of sawmill workers. Blood samples were collected from 300 Nigerian male subjects of age range 22-42 years made up of 150 sawmill workers and equal number of non-sawmill workers as control during the rainy season. Collection was with the aid of 5 mL sterile syringe from one of the prominent veins of the cubital fossa of each of the subjects into tubes containing Ethylene Diamine Tetra-Acetic Acid (EDTA) at a concentration of $2 \mu\text{g mL}^{-1}$ of blood. The complete randomized design study revealed that total leucocyte count was not significantly ($p>0.05$) but only marginally higher in test subjects ($5.70 \text{ Vs } 5.10 \times 10^9$) than the control. The eosinophil differential count values in the test subjects were significantly ($p<0.05$) higher (9.66% Vs 3.86%) than control subjects, indicating a possible condition of relative eosinophilia in sawmill workers. Individual variation in adaptability to aerosol exposure was revealed by the very wide range in the values of each parameter between sawmill workers. Such wide individual variations were not noticed in the parameters with non-sawmill workers. It was concluded that relative eosinophilia observed in sawmill workers must have resulted as a consequence of inflammatory, allergic reactions to the wood dust aerosol and other attending contaminants by sawmill workers with conspicuous individual variations.

Key words: Sawmill workers • sawmill environment • total leucocyte count • differential leucocyte counts • eosinophilia

INTRODUCTION

Sawmill business is a thriving business in Nigeria because of the availability of Timber as well as the current high demand for the product in the export market that has recently developed in the Country. The business continues to attract many young and able bodied men. Sawmill workers are daily exposed to wood dust aerosol. This often results in health hazards grouped into upper and lower respiratory diseases amongst which are nasal carcinoma [1, 2] allergic rhinitis [3-5] urticaria [5] chronic sinusitis [6] chronic obstructive pulmonary diseases [7] hypersensitivity reactions [8] and hypersensitivity pneumonitis [9].

Exposure of sawmill workers to the wood aerosol thus constitutes a major occupational hazard facing the industry [3] as chronic respiratory symptoms are quite common [10]. According to Sosman *et al.*, [8] respiratory diseases, resulting from prolonged exposure to wood dusts may be due to a hypersensitivity reaction in addition to the non-specific toxic or mechanical irritant effects of the inhaled materials.

Respiratory symptoms such as chronic cough, corrhiza, breathlessness and wheeze are common among wood workers with a high prevalence in impairment of ventilatory function

influenced by degree of exposure to wood dust [10, 11]. The reaction of saw mill workers to wood dust aerosol can be monitored through Leucocyte studies in line with the assertion of Emeriole [12] that hematological studies are of importance in detecting responses to therapy.

Leucocytes comprise the polymorphonuclear and mononuclear cells. The polymorphonuclear cells are the primary cells of acute inflammation while the mononuclear cells, especially the lymphocytes, are those that predominate in chronic inflammation [13].

Information on the hematological status of workers in the saw mill industry is non-existence in this part of the country and there is generally a dearth of information on the subject matter. This study was therefore conducted to compare the leucocyte distribution of sawmill workers with those of non-sawmill workers in order to elucidate the pathophysiology of the wood dust aerosol inhalation in respect of the leucocyte status in the blood.

MATERIALS AND METHODS

The study was carried out at Oko-Baba, Ebute Metta Sawmill in Lagos metropolis, Nigeria. One hundred and fifty

Table 1: Total leucocyte and leucocyte differential counts in sawmill and non-sawmill workers

Cell type	Test	Control	Mean	Sed	P-value
Total Leucocyte ($\times 10^9$)	5.69	4.99	5.34	0.26	0.01
(Range)	(2.5-12.0)	(3.8-6.0)	(2.5-12.0)		
Neutrophils (%)	53.36	57.30	55.33	2.64	0.142
(Range)	(5.0-90.0)	(47-70)	(5.0-90.0)		
Lymphocytes (%)	31.52	32.60	32.06	2.78	0.699
(Range)	(5.0-90.0)	(20.0-45.0)	(5.0-90.0)		
Eosinophils (%)	9.50	4.02	6.76	1.12	0.0001
(Range)	(2.0-25.0)	(2.0-10.0)	(2.0-25.0)		
Monocytes (%)	5.68	5.82	5.75	0.58	0.81
(Range)	(2.0-10.0)	(1.0-10.0)	(1.0-10.0)		
Basophils (%)	0.04	0.00	0.02	0.04	0.32
Neutrophil: Lymphocyte Ratio	2.77	1.90	2.34	0.40	0.045
(Range)	1.0-3.0	1.0-3.0	1.0-3.0		

(150) randomly selected male sawmill workers and one hundred and fifty (150) male non-sawmill workers all of age range of 22-42 years were sampled for this study. Written, informed consent was received from all participants. Four (4) milliliter of blood was collected from a prominent vein in the cubital fossa of the arm of each subject with a sterile syringe into sample bottles, which contained dipotassium salt of Ethylene Diamine Tetra Acetic acid (EDTA) at a concentration of $2 \mu\text{g mL}^{-1}$ of blood. Gentle mixing was done immediately for one minute to ensure complete anticoagulation of the blood. The samples were collected during the rainy season of the year to eliminate the effect of dry dusty harmattan season. Total Leucocyte count (TLC) and differential leucocytes comprising Neutrophils, Lymphocytes, Eosinophils, Monocytes and Basophils were estimated according to the methods of Dacie and Lewis [14].

Data analysis: Data collected were subjected to one way analysis of variance (ANOVA) and means, where significant, were separated using students t-Test [15].

RESULTS

Table 1 shows the mean Total leucocyte counts in the sawmill and non-sawmill workers. The mean total leucocytes count did not differ significantly ($p > 0.05$) between the two groups but the mean value observed in the sawmill workers (5.7 Vs 5.1) was marginally higher. The individual values observed for both the total and differential leucocyte counts varied more widely in sawmill workers than in the non-sawmill workers with range values of (2.5-12) Vs (3.8-6.0) for total leucocyte counts in sawmill and non sawmill workers, respectively. The individual variations follow the same trend in all the other differential leucocyte counts except the eosinophil differential count, which was significantly ($p < 0.05$) higher in the test (9.66 Vs 3.86%) than the control subjects. The mean values

of all the other differential counts were not significantly ($p > 0.05$) different between the test and the control subjects (Table 1).

DISCUSSION

The non significant ($p > 0.05$) difference in total leucocyte counts between the test and control subjects can be explained by the fact that the bronchial obstructive disease, caused by exposure to wood dust is reversible and self-limiting, with resolution within a short period [10]. Thus the individual is generally capable of returning to his normal healthy status within reasonable limit of time.

Acheson *et al.*, [16] had reported the presence of small doses of bacteria, fungi, virus, silica and carborundum in the sawmill vicinity. These often accompany wood dust inhalation. According to Rubin and Faber [17] eosinophil is increased in allergic reactions to foreign agents that cause bronchitis and asthma among workers that are exposed to toxic industrial inhalants. The significantly ($p < 0.05$) higher eosinophil count in sawmill workers is therefore a pointer to the inflammatory, allergic response of the sawmill workers to wood dust aerosol in combination with other contaminants in such environment. This suggestion corroborates the reports of Sosman *et al.*, [8], Eaton [18] and Paggiaro *et al.*, [19]. According to Gross and Siegel [20], the Neutrophil /lymphocyte ratio is increased under stress conditions. The significantly ($p < 0.05$) higher neutrophil /lymphocyte ratio observed in the sawmill workers is a pointer to some attending stress condition in this group of subjects on account of inhalation of wood dust aerosol and the attending pollutant.

The conspicuously wide range observed in differential leucocyte count values between individual subjects within the test group, is an indication that some individuals are more adaptable to the discomforting effect of the wood dust aerosol. However, according to Bosan and Okpapi [11] such adaptation

would depend on the degree and duration of exposure of the individual subject.

Neutrophils and Lymphocytes are types of leucocytes in differential counts, which are respectively involved with defense and immune response mechanisms [13]. The non-significant ($p>0.05$) difference between the test and control subjects in both neutrophil and lymphocyte cell type differential counts is an indication of the fact that the inflammatory allergic response of sawmill workers to the aerosol and its attending contaminants, might not negatively have impact on both the defense and immune response mechanisms of the workers.

CONCLUSION AND RECOMMENDATION

It was concluded that the relative eosinophilia observed in saw mill workers must have resulted as a consequence of inflammatory allergic reactions to the wood dust aerosol and other attending contaminants in the sawmill environment, with conspicuous individual variations. It is therefore recommended that the environmental protection agency should introduce and enforce the use of masks in such environment after proper education on the use of such mask. A periodic, comprehensive medical check up on the cardio thoracic region of such workers should also be made mandatory.

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