

## **ERGONOMIC EVALUATION AND LABOUR INSPECTION IN CLUSTER-SAWMILL IN PORT HARCOURT, NIGERIA**

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### **Abstract:**

*The regulations of labour standards in wood-based industries are not yet optimally observed in Nigeria. In this study, ergonomic conditions and level of compliance to labour standards were investigated. A sample of 50 respondents was purposively selected from ten systematically sampled sawmills in a band-sawmilling cluster comprised of around 18 functional mill units concentrated along the Sand filled dam bank of Mgbodara River, in the plain of Illaobuchi within the Port Harcourt City, Nigeria. Sawmilling tasks were strictly male (100%) dominated with 78% of workers within the active-age range (21-40 years). Of the four categories of workers identified, 72% performed one task and 28% performed dual tasks. The distance between the logs yard and the milling machine ranged between 12.8m and 30.0m in a slightly sloppy terrain. The machines were of age with 89% of them being under service for at least 5 years. Malaria (40%) was ranked 1st occasional sickness/disease and Rheumatism (2%) ranked least (6th). Similarly, body pain (76%) was ranked 1st frequent sickness/disease and Eye pain (4%) ranked least (6th). Exactly 90% of the workers had varied physical injuries. Hand/arm/wrist injury ranked 1<sup>st</sup> (40%), followed by leg/feet injury (32%), head/neck/eyes injury (10%), and Shoulder injury (8%) altogether with Saw Doctors mostly affected, and Log Rollers least affected. The results showed that Labour inspection with mandate to reduce these hazards was grossly inefficient. Such inefficiency directly contributed to high rate of hazards, absenteeism, shortage of workers and invariably low productivity. Academics and press incorporation into inspection system to report the range of health and safety practices of wood-based industries on regular basis will benefits the social and economic values of individuals, State and Nation at large.*

**Key words:** ergonomic conditions; labour inspection; labour standards; sawmilling; sawmilling workers.

### **INTRODUCTION**

Ergonomics can be simply described as the scientific study of human's relationship with their working environments. It comprises primarily, the adaptation of the working environment to the physiological and psychological capability of the workers and prevention of stress and fatigue including health aspect of work organizations (Aiyeloja *et al.* 2015). Adapting tasks, work stations, tools, and equipment to fit the worker can help reduce physical stress on a worker's body and eliminate many potentially serious, disabling work related musculoskeletal disorders (MSDs) (OSHA 2000). Ergonomics in forestry is a discipline that is aimed at finding ways of lessening the strain and friction between the workers and their working surroundings. Ergonomics ultimately aims to achieve a harmonious relationship among: the workers, the tools used and the working techniques. In practice, ergonomics means:

- I. A higher quality of life to the employee,
- II. A higher production to the employer and,
- III. An enhancement of the productivity and welfare of work force to the nation as a whole.

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However, achieving the harmonious relationship among these three factors for higher quality of life, higher production, and enhancement of the productivity require greater efforts for implementing the standard guidelines and policies through the process of labour inspection.

The primary logs conversion of which apparently the sawn woods (the solid woods) are the most important wood products produced, re-processed, traded and consumed in Nigeria uses a semi-mechanized and labour intensive processing system which continues to expose many workers to a wide range of work-related hazards risks. The negligence of health and safety issues by the government institution/agent has made the working population to suffer in terms of vulnerability to varying occupational hazards. The industry has witnessed large number of casualties which have not been given publicity probably due to the status of people involved and /or the informal nature of the occupation. In spite of poor technology and poor attention been paid to workers, the industry has employed appreciable number of people and produced bulk of the sawn wood consumption. Thus, the industry deserves special attention because of its importance to the local and national economies.

Occupational health and safety inspection and supervision have been subject to regulations by many National and International agencies worldwide. In Nigeria, labour inspection is designed to ensure existing working conditions of industries comply with Labour Laws (Labour Act, Workmen's Compensation Decree and the Factories Decree). The ultimate objective of labour inspection as to protect workers and employers rights in their works has however been grossly ineffective. Despite the fact that Nigeria has been dragged before the International Labour Committee for gross violation of labour standards which has virtually made the workplace unsafe for workers in the country (Vanguard 2009), Nigeria has not strived within the human and material resources at her disposal, to monitor the implementation and enforcement of labour standards through the process of labour inspection in forest-based industries, especially logging and primary conversion processing industries.

Band-sawmilling, being the totality of all operations involved in producing lumbers from logs, is perhaps an ergonomic issue. The activity encompasses the movement of logs, conversion of logs into lumbers, and grading of lumbers. Hazards associated with conventional sawmilling in many Nigerian sawmills have hitherto, been considered as persistently increasing with serious and/or fatal casualties under increasingly poor working conditions. The conventional sawmilling approaches were characterised by use of poorly remunerated personnel operating with improper equipment and tools, titular administration by monitoring personnel and government agents. The consequences are such that the workers suffer higher range of hazards. A peeked into artisanal history and industrial revolution of sawmilling in Nigeria revealed inadequate attention from the stand point of employee health and safety despite the crucial efforts of International Labour Organisation (ILO) at promoting healthy and safety living as well as ensuring enhanced productivity. The ILO estimated that about 2.2 million workers die annually as a result of work related ill-health and injury across the globe (BSC 2009). ILO has been in the forefront at promoting healthy and safety working environments worldwide. Thus, occupational health and safety issues in forest based industries including sawmilling have for long being one of the critical priorities in advanced countries especially Sweden, Finland, UK, USA, Germany etc. A strong desire and tremendous efforts have been employed towards the reduction of hazards in wood based industries among these countries. However, the managements of Nigeria's forest products industries have not duly recognized the need for employees working condition improvements to help prevent occupational hazards and increase the conversion efficiencies. While the industry is principally saddled with primary production of lumbers, the conversion processing facilities number only a few thousand across the nation and a few ten in Port Harcourt are not ergonomically installed and improved. Having guidelines and policies might not be enough to ensure sound health and safety of workers but efforts at enforcing the standard guidelines are imperative. There is need therefore to provide information on the existing working conditions, policies and level of compliance as it related to prevention of occupational hazards and increasing the conversion efficiencies in Nigerian sawmills.

The 1990 Labour Act 198 of Nigeria clearly stated the general provisions as to protection of wages, contracts of employment, terms and condition of employment (Federal Republic of Nigeria 1990). However, working population in sawmills is still suffering in terms of susceptibility to occupational hazards principally because of labour inspectors negligence. In 2009, International Committee of Experts drew the attention to lapses of Nigerian reporting system as regard to the rights, welfare, health and safety of workers (Vanguard 2009), yet few studies have been conducted and reported on the attendant hazards associated with sawmilling operations in Nigeria. Such researches have been carried out mainly in Southwestern region focused mostly on ergonomics studies with little attention given to labour inspection (Jinadu and Fajewonyomi 1988, Awoyemi 1997, Bello and Mijinyawa 2010, Bamidele *et al.* 2013, Oguntoke *et al.* 2013, Yussuff *et al.* 2014, Adeoye *et al.* 2015).

Illaobuchi clustered-sawmill is one of the only two conventional mills located in the biggest city of Niger Delta, Nigeria with huge social and economic multiplying effects. The volume of lumbers which is the base for the huge social and economic values of the area has drastically reduced in recent time due to the poor conditions of service with shortage and casual nature of workers whose future services are not guaranteed. There is however evidence that ergonomic purposeful visitations of labour inspectors will improve the working conditions and reverse the poor trend of lumbers production for achieving enhanced productivity and reduce risks. This study therefore, was carried out to evaluate the ergonomic conditions of sawmills and the level of compliance to labour standards with the aim of providing useful information for the improvement of working conditions that will be of benefits to the employees and employers in enterprises related to wood industry in Port Harcourt, Niger Delta region and invariably Nigeria.

## **OBJECTIVE**

The main objective of this study was to assess the existing ergonomic conditions in sawmills and level of compliance to labour standards by the employers with a view to recommending improvements of working conditions

### **Specific objectives**

- i. To describe the demographic characteristics of the workers
- ii. To assess the ergonomic conditions of the sawmills
- iii. To evaluate the full range of occupational hazards associated with sawmilling in Port Harcourt, Nigeria
- iv. To assess the level of compliance to labour standards by the employers

## **METHODOLOGY**

### **The study area**

The study was carried out in a band-sawmilling cluster which comprised of around 18 functional mill units concentrated along the Sand filled dam bank of Mgbodara river, in the plain of Illaobuchi (Latitude 4° 78' 77" - 4° 78' 89" N and Longitude 6° 98' 60" - 6° 98' 75" E). The study area is situated within the Port Harcourt city local government area (PHALGA) of Rivers State, Nigeria. The reason for the choice of this site is because it is a conglomerate of functional accessible primary wood processing mills and lumber markets in Port Harcourt.

Port Harcourt is situated in subequatorial region experiencing frequent and prolonged downpour of rainfall inundation. This favoured water transportation method of logging in the area almost throughout the year. A moist south-west wind and northeast trade winds are responsible for the variations in weather conditions experienced in Port Harcourt City. The moist south-east air stream blows over the region between February and November and the region receives its rains, while the northeast trade wind blows over Port Harcourt in from November up to February, which ushers in the dry season. Port Harcourt records a mean annual temperature of 28°C; relative humidity is generally high over Port Harcourt with a mean annual figure of 85%. The peak of rainy season usually occurs from June to October, with the total annual rainfall of more than 2500mm. The soil of Port Harcourt city is of the recent alluvial soil. Port Harcourt is dominated by low-lying coastal plains which structurally belong to the sedimentary formation of recent Niger delta, with an elevation less than 15.24m (Eludoyin *et al.* 2015).

### **Data collection**

A cross-sectional survey study which employed combination of face-to-face interview, questionnaire administration, and on-site observations were used. A sample of 50 respondents (workers) comprising Saw Doctors, Machine Operators, Machine Operator Assistants, and Logs Rollers was purposively selected from ten systematically sampled saw mills in a band-sawmilling cluster which comprised of around 18 functional mill units concentrated along the Sand filled dam bank of Mgbodara river, in the plain of Illaobuchi within the Port Harcourt city local government area (PHALGA) of Rivers State, Nigeria.

Data were analysed using descriptive statistics thus results presented in tables, Venn diagram, and working postural pictures. Results on health hazards were ranked following the methods of Arowosoge *et al.* (2009), and Aiyeloja *et al.* (2010) used for prioritization of furniture wood making species, and determinants of lesser-known species preference among cabinet-makers respectively in Nigeria.

**RESULTS AND DISCUSSION**

**Results**

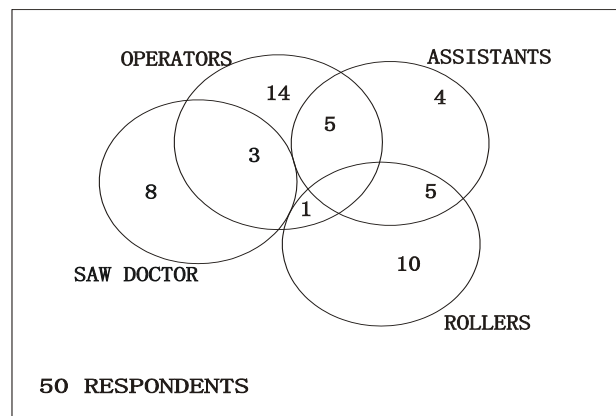
**Demographic characteristics**

Demographic characteristics (age, gender, marital status, family size, educational background, ethnic group, service year, job classification) of the workers are presented in Table 1 and Fig. 1.

Table 1

*Demographic characteristics of the workers*

Parameter	Frequency	Relative frequency (%)
<b>Age group</b>		
18-20	3	6
21-40	39	78
41-60	8	16
61-above	-	-
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Gender</b>		
Female	-	0
Male	<b>50</b>	<b>100</b>
<b>Marital status</b>		
Single	23	46
Married	27	54
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Family size</b>		
0-1	23	46
2-4	14	28
5-7	10	20
8-10	3	6
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Educational background</b>		
Primary (FSLC)	6	12
Secondary (WASC)	40	80
Tertiary (OND/HND)	2	4
Informal education	2	4
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Ethnic group</b>		
Ijaw	31	62
Ibibio	10	20
Igbo	6	12
Orhobo	3	6
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Service year</b>		
0-1	4	8
2-5	19	38
6-10	13	26
11-15	7	14
16-20	3	6
20-above	4	8
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Occupation/Job classification</b>		
One task	36	72
Dual tasks	14	28
<b>Total</b>	<b>50</b>	<b>100</b>



**Fig. 1**  
**Venn diagram showing the job classification combinations.**

The number of workers based on age-group increased sharply from 3(6%) (18-20 years) to 39(78%) (21-40), then drastically decreased to 8(16%) (41-60 years) and finally to 0% (61 years-above). The bulk (78%) of workers fell within the active-age range (21-40). This invariably might have good relationship with productivity. Though in most employment relationships, productivity is not often determined by workers age alone but by combination of other factors such as working conditions (Granovetter 1981, Petersen *et al.* 2006) and working hours (Pekkarinen and Uusitalo 2012). Productivity has been reported to be increasing with age until age 40 years after which it roughly stays constant before gradually decreasing (Pekkarinen and Uusitalo 2012). Therefore, 16% of workers age group 41-60 recorded in this study were still very productive if not at their peak. This group of workers could be advantageous because of associated respect and experience with their age, and serve as trainers to new employees. The smallest percentage of workers between 18 and 20 years was not expected but the 3 of them were within the minimum acceptable working age in Nigeria including sawmilling. This result demonstrated that young people showed very low labour participation compared to adults in sawmilling. The trend of this result was similar to those previously reported by Awoyemi (1997), Bello and Mijinyawa (2010), Jerie (2012) in Zimbabwe, Yusuff *et al.* (2014) and Adeoye *et al.* (2015) but varied with reported findings of Bamidele *et al.* (2013).

Sawmilling tasks/operations were strictly found to be gender sensitive with 100% male domination. This was expected because more often than not, females are stereotypically seen to be at a productivity disadvantage in much energy demanding and hazard prone occupations that requiring activities like climbing, lifting, pushing/pulling, digging, cutting, felling etc in Nigeria. These kinds of tasks have grown importance over the years thus peculiar to male. Rather, females are considered to sort low-energy requiring establishment and occupations like marketing of lumbers in lumber shed of sawmills. More so, non improvement of working tools and conditions has put more of a premium on the power of workers muscles than their brains unlike advanced countries. Studies have demonstrated that the outcomes of some job strain had higher impact on females than males (Winefield and Anstey 1991, Mirowsky 1996, Firth-Cozens 1998). The gender pattern of this study differed from those reported by Bello and Mijinyawa (2010), Kwankye (2012) in Ghana, Bamidele *et al.* (2013). This variation could be attributed to the inclusion of cleaners, safety professionals, secondary conversion and lumber (plank) traders, administrators, and people around sawmills in their studies.

The analysis of marital status showed that married workers (54%) were slightly higher compared to unmarried ones (46%). This symbolized the socio-economic and responsibility positions of the workers. Though, the family size trend as reflected in Table 1 was strictly based on immediate family member(s) but workers expressed extension of financial obligation to extended family and relative dependents. The result of marital status of this study was in contrast to 26% (single) and 74% (married) reported by Bamidele *et al.* (2013). This contrast could likely be the result of early marriage.

Educational background (Table 1) indicated that the bulk (80%) of the workers had West African School Certificate (WASC), followed by 12% with First school leaving certificate (FSLC), 4% with tertiary certificate and 4% had informal education. The inculcation achievement of literacy, numeracy, and ability to communicate effectively as the national goal of primary education in Nigeria has presented the workers with at least FSLC to be efficient for long. The employment of workers with informal education has remained relevant over the years simply because of their muscle power, indigenous knowledge and skill potentiality. More so, premium has not been put on higher education for sawmilling and many informal establishment or occupations in Nigeria. However, the levels and

trend of workers education were moderate for enhance productivity and perhaps their moderate literacy would help to understand and adopt machine precautionary measures for accidents reduction. The result agreed with those of Bamidele *et al.* (2013).

The Ethnic group of the workers clustered around the Niger Delta regions such as Ijaw (62%) with highest representation, followed by Ibibio (20%), Igbo (12%), and Orhobo (6%). The highest Ijaw representation recorded in this study was attributed to the aggregate of workers from Rivers and Bayelsa States. Ibibio, Igbo and Orhobo representations were the results of workers from Akwa-Ibom, combined Imo and Anambra, and Delta States respectively. The trend of ethnic workers composition recorded in this study with highest 62% Ijaw people was probably because of regional advantage and sawmills proximity to local people. It could also be due to their mastery of water ways and creeks through which all the logs come into the sawmills. Ethnic group is of importance in turning marketing obstacle or weakness to opportunity or strength in terms of original identification of local resources like indigenous wood species.

The number of years on the job is often of importance in determining the wealth of experience in terms of efficiency and hazards reduction. The longest service workers who have served for at least 20 years were 4(8%), followed by 3(6%) workers with at least 16 years of service, 7(14%) with at least 11 years, 13(26%) of at least 6 years, 19(38%) of at least 2 years, and 4(8%) under 1 year of service. This reduction trend in number of workers after 5 years of service could likely be attributed to the poor remuneration, poor working conditions, menial nature of the job, and informal nature of the job with poor livelihood or without retirement benefits. This result was in sharp contrast with those of Kwankye (2012) who reported highest 52% of workers served for at least 11 years in Ghana compared to highest 38% of workers with at least 2 years recorded in this study. The difference could probably be attributed to better remuneration package, working tools, and conditions.

The analysis of job classification revealed 4 distinct categories (Fig. 1) with 36(72%) of them performing one task and 14(28%) performing dual tasks (Table 1). Only 1 Machine Operator combined tasks with Log Rollers, 3 Machine Operators combined tasks with Saw Doctor, 5 Machine Operators combined tasks with Machine Operator Assistants, and 5 Machine Operator Assistants combined tasks with Log Rollers (Fig. 1). The combination of tasks was a strong indication of poor remuneration and such was seen as a strategy to meet both ends.

### Ergonomic conditions of the sawmills

The distances between the log yards and milling machines, terrain conditions, age of the band saw machines, and working conditions of workers are presented in Tables 2 and 3.

Table 2

**Distance between the log yards and the milling machines**

S/No	Name of sawmill	Distance (m)
1	Abi	25.30
2	Abual	24.70
3	Calabar	30.00
4	Dagogo	12.80
5	Friday I	18.80
6	Friday II	20.70
7	Gogu	20.80
8	New	15.56
9	Obong awo	15.40
10	Opusut	25.30

Table 3

**Terrain condition and age of the band saws' machines**

Parameter	Frequency	Relative frequency (%)
<b>Kinds of terrain</b>		
Sloppy	50	100
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Age of machines</b>		
1-5 year(s)	3	11
6-10 years	8	28
11-15 years	10	36
16-20 years	5	18
20 and above	2	7
<b>Total</b>	<b>28</b>	<b>100</b>

The distance between the log-yard (where logs are dumped upon arrival to the mill) and the milling machine ranged between 12.8m and 30m (Table 2). The typical hauling or rolling approach of logs from the respective individual yards to the milling machines in all the mills frequently required awkward movement of waist, back and neck, and pushed logs uphill manner by means of sticks and improvised hook with legs halt supported for intermittent rest on a distance of at least 12.8m. The numbers of trip varied from one sawmill to another based on the daily flow of logs, number and conversion rate of machines. The kind of terrain existed between the log yards and the milling machines in all the mills were apparently sloppy (Table 3). This was as a result of mills sited or located around river banks. Thus, this necessitated the uphill haul of logs to the machines employing poor tools with human drudgery.

Of the twenty eight (28) functional machines in all the sawmills, 89% had been under service for more than 5 years. From careful observation, 96.4% of the machines were obsolete and most of their parts were not functioning properly. Hence, Machine Operator and Assistants tended to push and pull the machines to and fro manually (with hands and legs). This result was similar with reported observations of Jerie (2012) in wood processing industries in Mutare, Zimbabwe, and Bello and Mijinyawa (2010) in sawmill industries of South Western Nigeria.

Working conditions of workers as observed indicated awkward postures in the cause of their duties. These awkward postures were as the results of equipment not ergonomically installed, old age, and poor maintenance of machines. This result agreed with observations of Bello and Mijinyawa (2010), Qutubuddin *et al.* (2013).

### Occupational hazards

The occupational hazards health (sickness/disease causing) and safety (injuries causing) hazards and human induced predisposing factors to hazards are presented in Tables 4-7.

### Health hazards

Table 4

**Occupational diseases/sicknesses and ranking**

Parameter	Frequency of mentioned	% mentioned	Ranking
<b>Occasional sickness/disease</b>			
Malaria	20 [50]	40	1 <sup>st</sup>
Typhoid	9 [50]	18	2 <sup>nd</sup>
Arthritis	6 [50]	12	3 <sup>rd</sup>
Cough	3 [50]	6	4 <sup>th</sup>
Pneumonia	2 [50]	4	5 <sup>th</sup>
Rheumatism	1 [50]	2	6 <sup>th</sup>
<b>Frequent sickness/disease</b>			
Body pain	38 [50]	76	1 <sup>st</sup>
Catarrh	18 [50]	36	2 <sup>nd</sup>
Athlete foot	13 [50]	26	3 <sup>rd</sup>
Fever	6 [50]	12	4 <sup>th</sup>
Ear itch	4 [50]	8	5 <sup>th</sup>
Eye pain	2 [50]	4	6 <sup>th</sup>

Note: Figures in brackets are the numbers of respondents

### Safety hazards

Table 5

**Injuries among workers and body parts affected**

Workers	Frequency of body parts affected with percentage (%) and ranking []				
	Head/neck/eyes	Leg/feet	Hand/arm/wrist	Shoulder	TOTAL
Saw Doctors	4 (8%) [1st]	0 (0%) [4th]	9 (18%) [1st]	2 (4%) [1st]	<b>15 (30%)</b>
Machine operators	0 (0%) [3rd]	3 (6%) [3rd]	6 (12%) [2nd]	2 (4%) [1st]	<b>11 (22%)</b>
Logs' rollers	0 (0%) [3rd]	9 (18%) [1st]	0 (0%) [4th]	0 (0%) [3rd]	<b>9(18%)</b>
Machine operator assistants	1 (2%) [2nd]	4 (8%) [2nd]	5 (10%) [3rd]	0 (0%) [3rd]	<b>10 (20%)</b>
<b>TOTAL</b>	<b>5 (10%) [3rd]</b>	<b>16 (32%) [2nd]</b>	<b>20 (40%) [1st]</b>	<b>4 (8%) [4th]</b>	<b>45 (90%)</b>

Table 6

<i>Type of injury</i>		
Nature of injury	Frequency	Relative frequency (%)
Bruises	15	30
Burn	7	14
Fracture	4	8
Cut	18	36
Dislocation	1	2
No injury	5	10
<b>Total</b>	<b>50</b>	<b>100</b>

Table 7

<i>Smoking and alcoholic consumption</i>		
Parameter	Frequency	Relative frequency (%)
<b>Smoking and Drinking</b>		
Yes	35	70
No	15	30
<b>Total</b>	<b>50</b>	<b>100</b>

Workers expressed having occasional health hazards ranging from Malaria to Rheumatism, and frequent health hazards ranging from body pain to eye pain (Table 4). Malaria was the most common and prevalent occasional sickness/disease among the workers thus, ranked 1st (40%), followed by typhoid 2nd (18%) and arthritis 3rd (12%), cough 4th (6%), pneumonia 5th (4%), and rheumatism 6th (2%). Similarly, body pain was ranked 1st of frequent sickness/disease, followed by catarrh, athlete foot, fever, ear itch, and eye pain (Table 4). The highest infestation occurrence of malaria as occasional health hazards could be attributed to proximity of mills to varying water ponds, and favourable climate for breeding of mosquitoes. Typhoid occurrence could be the result poor sources of drinking water and food. Arthritis could be attributed to long energy and nutrients expending tasks. Cough could be attributed to poor diet, inhalation obnoxious gas, non use of adequate body protected clothes, and stress. Pneumonia could be the result of exposure to and inhalation of fumes, smokes, and wood dusts. Rheumatism could be attributed to prolong and repetitive work under awkward conditions as well as poor diet.

Expectedly, body pain (76%), being the most frequent sickness could be attributed to the totality of effects of sawmilling operation tasks coupled with smoking and alcoholic drinking as predisposing factors. A pained body would not have adequate antibody resource to respond to pathogens, and may become increasingly susceptible to additional disease infestation factors. Catarrh could be attributed to inhalation of sawdust and other particles, poor diet, non use of adequate body protected clothes, stress, and fatigue. Athlete foot was the result of perennial soil moisture saturation and use of non-protected foot boots. Fever could be attributed to combined effects of inhalation of obnoxious dust and gases, poor drinking water and food. Ear itch could be attributed to effects of machine vibration and noise. Eye pain could be attributed to entrance of irritating wood dust and smoke into the eyes, manifestation symptom of fever, and effects of strong rays of light during welding and sharpening of saw blades. Health hazards altogether corroborated the previously work of Dickson (1991), Mohammed (2005), Jerie (2012), Qutubuddin *et al.* (2013), Adeoye *et al.* (2015).

Exactly 90% of the workers had varied physical injuries. Hand/arm/wrist injury was highest (40%), followed by leg/foot injury (32%), head/neck/eyes injury (10%), and Shoulder injury (8%) altogether with Saw Doctors (30%) mostly affected, followed by Machine Operators (22%), Machine Operator Assistants (20%), and Log Rollers (18%) least affected (Table 5). The highest injury cases recorded among the Saw Doctors could be attributed to incessant contact with machines, sharpened and lighting objects in the course of welding, sharpening, straightening of wear/damaged blades, and combined tasks with Machine Operators. The injury cases as expressed by Machine Operators and Assistants were as a result manual setting of logs, pushing and pulling of the machine to and fro during conversion, dual tasks. That of Logs Rollers could be the result of fallbacks, pushing, rolling or lifting of heavy logs, and dual tasks. This result was in congruity with those of Bello and Mijinyawa (2010), Bamidele *et al.* (2013). The hand/arm/wrist was the most affected part of the body and therefore ranked first with 40%, while the leg/feet was the second with 32% and the head/neck/eyes was the third with 10% while the body part where injuries occurred less is the shoulder with 8%.

The analysis of injury type revealed cut (36%) as highest injury sustained, followed by bruises, burn, fracture, and dislocation (Table 6). Evidence of old and new cuts were abounding mostly on the



hands, and legs probably sustained during log conversion, equipment repairing, and saw doctoring. Bruises accounted for 30% injury sustained and were mostly common among Log Rollers and Machine Operators probably due to the effects of frequent kickbacks or fallbacks during logs rolling, and lifting and moving heavy sawn lumber to stacking sheds. Burn injury sustained was 14% and more common among the Saw Doctors due to the frequent use of light energy and contact with very hot machines and equipment without protective equipment. Fracture accounted for 8% and perhaps was expressed as being the most dreadful injury sustained in the study area. That the injury was considered dreadful was not because it could cause both internal and external injuries concurrently but could also cause permanent disability. Therefore, the most economically effective way of using human labour with fracture prevention is inevitable. Dislocation injury sustained was minimal (2%). This suggested that there is an ample room for prevention of dislocation injury. This result was in consonance with those of Bello and Mijinyawa (2010), Ochire-Boadu *et al.* (2014), Adeoye *et al.* (2015).

The lifestyle of the workers was also considered as predisposing factors to occupational hazards. Among the 50 respondents, 35 workers representing 70% were both cigarette smokers and alcohol consumers. However, levels of smoking and alcohol consumption among the workers varied considerably. Alcohol consumption could cause dizziness and predispose workers to safety hazards while smoking could cause respiratory disease thus making the workers highly susceptible to health hazards. The result was in agreement with the findings of Jerie (2012).

#### **Level of compliance to Labour laws and regulations**

Table 8 showed the level of compliance to labour guidelines and labour inspection visitations.

Table 8

*Level of compliance to labour laws and regulations*

Parameter	Frequency	Relative frequency (%)
<b>Terms of employment</b>		
Written contract	2	4
Non-written	48	96
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Working hours</b>		
5 hours	3	6
6 hours	4	8
8 hours	23	46
10 hours	9	18
12 hours	11	22
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Resting period</b>		
Yes	37	74
No	13	26
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Regular payment of salary</b>		
Yes	50	100
No	0	0
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Mode of payment</b>		
Weekly	44	88
Daily	6	12
<b>Total</b>	<b>50</b>	<b>100</b>
<b>In-service training</b>		
Yes	4	8
No	46	92
<b>Total</b>	<b>50</b>	<b>100</b>
<b>First aid box</b>		
Available	1	10
Unavailable	9	90
<b>Total</b>	<b>10</b>	<b>100</b>

<b>Compensation in case of hazard</b>		
Yes	5	10
No	45	90
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Personal protective equipment (PPE)</b>		
Provided	0	0
Not provided	50	100
<b>Total</b>	<b>50</b>	<b>100</b>
<b>Visitations by Labour inspectors</b>		
Yes	0	0
No	50	100
<b>Total</b>	<b>50</b>	<b>100</b>

The terms of employment of the workers indicated that 96% (n=48) were employed without a written contract and are therefore responsible for their health and safety since no agreement exists between the employer and the employee while 4% (n=2) of the workers were properly employed with a written contract. This was however, in contrast with the labour laws (Labour Act 198 of 1990) which states that a written contract statement should be given to every employee specifying the hours of work, rest period, duration of work, the amount to be paid, provision for sick pay due to injuries and sickness, number of paid leave days and holidays. Thus, the employers tended to keep 96% of workers relationship causal.

The hours of work varied from 5 hours to 12 hours daily. Close to half (46%) of the workers worked for 8 hours, 22% worked for 12 hours, 18% worked for 10 hours, 8% for 6 hours, and 6% for 5 hours. This variation was the result of source of conversion energy, strength differences, conversion machine capacity differences, flow of log and market supply differences, and set objectives differences. These working hours were pre-determined without mutual consent and agreement of the workers. This was also not in line with the labour law which states that normal hours of work in any factory, industry or undertaking shall be those fixed by mutual agreement.

Length of working hours could have a great influence on the physical and mental state of workers and caused fatigue, and injuries. Therefore rest time is needed for reduction of muscular pains. Exactly 74% of the workers expressed that they have rest periods of at least one hour a day while 26% have no rest periods between working hours. Frequent short breaks have been advised over occasional long breaks for jobs that employed the forceful use of the back and upper extremities (Lilley *et al.* 2002, Østenvik *et al.* 2008) operating with poorly designed tools in case of Nigerian sawmills.

This study revealed that there was no fixed wage or salary for the employers, payment was made based on the cubic unit of lumber produced and on the number of maintenance or services rendered in the case of the Saw Doctors. The payments of all workers were promptly paid, 88% of the workers received on weekly, and 12% received on daily basis. The prompt and mode of salary payments were largely expressed for choosing the job. Others chose the job because there was no other viable alternative.

Apart from the Saw Doctors and Machine Operators who were employed based on their technical-know-how, other categories learnt and acquired the skills on the job. It is the responsibility of the employer to give in-service-training to update his workers skills and knowledge for efficient and enhanced productivity. However, this was not the case of Port Harcourt sawmills, 92% of the workers have not attended any training, workshop and seminar since they were employed while small fraction (8%) received in-service-training particularly the Saw Doctors.

Only one sawmill has first aid box out of the 10 sawmills. According to the factories Degree, first aid box should be available and maintained at work places where more than 150 persons are employed. Although the number of workers in each mill were not up to 150 but the only one available if jointly maintained and manned with a trained first aid assistant can serve the interest of all the sawmills because the total strength of workers in the area was less than 150.

The level of compliance by the employers to compensation in the case of injury, accidents and hazards was relatively low. Large fraction (90%) of the workers expressed non receipt of any compensation for injuries sustained since employed while 10% acknowledged receipt of compensation. The workers who received compensations were those with serious injuries (Fracture

and dislocation). The other injuries were probably considered minor thus needed no compensation. The workmen's compensation Decree stated that when a worker is injured in the cause of his work and is incapacitated for at least 3 working days, his employer shall pay compensation according to the provision of the Decree but this is always being ignored by the sawmill employers, instead, they replace the worker by employing other persons to do that particular task. This reflects the presence of weak legal structure and inability of formal economy to cater for her citizenry.

Although, Personnel Protective Equipment (PPE) seldom provides complete protection from exposure to significant hazards but it assists in reducing exposure to an acceptable level (Moran and Ronk 1987). The first Factory Inspector Sir Thomas Legge, a medical doctor appointed by the British government to oversee the enforcement of the factories Act of Great Britain at the end of his career wrote "to curb disease and injuries at the workplace, unless and until the employer does everything to protect the worker from hazard, the worker can do next to nothing to protect himself" (Awoyemi 2012). According to the labour Act, the employers are expected to provide PPE such as helmets, ear protectors, respiratory mask, overall, safety boot and goggle/glasses. However, this was not the case in Port Harcourt sawmill as these PPE's were not provided and most of the workers were not aware that it was the duty of the employer to provide it. It was observed that most of the times Machine Operators and Assistants used clothes to cover their nose, and Saw Doctors used hand to guide the reflection of light. These were indications that if provided, some equipment like nose cover and eye goggle would be utilized. Many workers worked bare footed, some with bathe-room slippers and some without body clothe. Excessive heat load was the reason given for not using the common body clothes. This was in agreement with other studies that reported the usage of PPE in Nigeria sawmill as very low Osagbemi *et al.* (2010), Adeoye *et al.* (2015).

Protection of workers and employers rights in Port Harcourt sawmills were grossly violated considering the low level of compliance to labour standards (as stipulated in labour Act, Workmen's Compensation Decree and Factories Decree) and 100% absence of labour inspectors. Having guidelines is not enough, but monitoring the implementation is imperative. This result implied that Labour Inspectorate Department of the Federal Ministry of Employment, Labour and Productivity (now Ministry of Labour and Employment) has not been adequately performing their obligations for the past 20 years or more. This poor non performing system (monitoring and reporting system) has drawn the attention of ILO in 2009 and dragged Nigeria before the International Labour Committee for gross violation of labour standards which has virtually made the workplace unsafe for workers in the country (Vanguard 2009). Nigeria has not still strived within the human and material resources at her disposal, to achieve an acceptable higher quality of life to the employee, a higher production to the employer, and an enhancement of the productivity and welfare of work force to the nation as a whole through labour inspection.

## **CONCLUSION**

Improving ergonomic conditions of wood-based industry toward well being of workers and enhanced productivity in Nigeria is challenging. This is to a large extent because the inspection system responsible for regulations of standards is not nationally efficient. This study revealed that the working population had good characters of higher productivity importance. But platform for harmonized actions with tools and environment remained inactive. The poor working conditions and tools characterised by forceful use of the whole body, improper work procedure, and awkward postures resulted in high rate of hazards leading to shortage of man power and low productivity. Occupational hazard related problem in wood-based industry in particular sawmilling is a complex socio-economic issue because of primary and derived demand nature of its products. Elsewhere, the presence of improved ergonomic conditions and labour regulations system in wood-based industries has not guaranteed zero percent hazard but the impacts have been viewed and reported as positive development. To achieve a credible mechanism for effective and sound ergonomically sustainable sawmilling, it would be rewarding to revitalize labour inspection for active monitoring participation that will produce positive impacts on socio-economic recovery of the nation.

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