



Health Problems among Sawmill Workers in Abakaliki and Workplace Risk Assessment

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Keywords:

Sawmill
Workers,
Risk
assessment,
Health
Problems,

ABSTRACT

Introduction: Sawmill workers are exposed to hazards and subsequent health problems. A workplace risk assessment and risk control measures will reduce morbidity and mortality. The objectives of this study are to identify health problems and carry out a workplace risk assessment among sawmill workers in Abakaliki.

Methodology: This is a descriptive cross sectional study. All workers who met the inclusion criteria were studied. Information on occupational history, health problems, awareness and usage of personal protective equipment was obtained using an interviewer administered semi structured questionnaire. Workplace risk assessment was carried out.

Result: Two hundred and four respondents were interviewed. Mean age was 29.3±9.6years, majority (93.1%) were males. The common health problems identified were injuries from log of wood (57.4%), Cough (47.5%), chest pain (42.1%), cut by machine (25%). Perceived worsening of health status since employment was reported by 95.4% of the respondents. Majority (69.6%) had worked in the sawmill for 2-5years and spend 8-10 hours at work (78.4%). Majority (85.3%) were aware of PPE, only 39.5% reported they had used them always. Hand glove (74.1%) was the most frequently used. Unawareness of PPE (29.8%), non-availability (21.1%) and cost (17.5%) were the commonest reasons for non-use. The major hazards identified in the workplace risk assessment were exposure to wood dust, unguarded moving parts of machinery, poorly designed workstations, poor housekeeping, fire hazards and noise. Risk control measures were inadequate.

Conclusion: The most prevalent health problems were respiratory symptoms and injuries. The workplace risk assessment showed that the work environment was not safety compliant.

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INTRODUCTION

Inhalation of airborne dust at the workplace puts the worker at risk of occupational disease. In developed and developing countries, overexposure to dust causes disease, temporary and permanent disability and deaths.¹ Airborne microflora from secondary infection of the wood with moulds is also implicated as part of the respiratory hazard.²

Sawmills are mechanical wood industries which produce sawn wood in dusty processes. Sawmill workers are exposed to a variety of hazards notable

among which is wood dust – a combustible organic vegetable dust which is a cause of particulate air pollution.^{3,4} The association between occupational exposure to wood dust in sawmill workers and other woodworkers and impaired lung function,⁵⁻¹² chronic bronchitis,^{1,13,14} occupational asthma,^{4,12,13,15-17} external allergic alveolitis,^{1,4} nasal cancer,¹ increased risk of lung cancer^{13,18} within and outside Nigeria has been shown. Occupational lung diseases following exposure to various dusts, though often incurable are preventable.¹⁹ The following symptoms have also been documented – cough,^{1,5,6,7,20} shortness of

breath/difficulty in breathing,^{8,21} nasal irritations,⁶ throat irritations,²⁰ redness/itching of eyes,^{5,6,20,21} sneezing, generalized malaise,⁵ hearing difficulty⁵ as well as minor and major accidents.²¹

Prevalence of cough and sneezing in a study among sawmill workers in southwest Nigeria⁷ was 60% and 54% respectively and this was significantly higher than in the control group while the prevalence of occupational rhinitis among wood workers in southeast Nigeria²² was 78%. In Nigeria, sawmill workers are exposed to a high level of wood dust due to the following factors:- old equipment and severe shortage of spare parts³ and a forest industry (which includes the sawmill industry) which is essentially controlled by the private sector.³ In these small scale industries, there are inadequate engineering control measures, monitoring of level of dust⁷ as well as poor awareness of occupational hazards, poor availability and use of safety devices.²¹

The saw mill industry in Abakaliki is made up of several small scale privately owned sawmill industries with no safety monitoring, unprotected by Occupational Health legislation and not covered by Occupational Health Services. At the time of this study, there is no published data on the prevalence of various symptoms, health effects among these workers. There is also no documented workplace risk assessment with attendant risk control measures and their enforcements or lack of it. This study therefore aims to identify health problems among sawmill workers in Abakaliki and carry out a workplace risk assessment. The health problems identified are an initial form of screening that will lead to early detection of disease and subsequent interactions such as removal from exposure, treatment and health education as part of comprehensive occupational health services that will be provided. The long term goal of this study is advocacy to government to undertake regular and sustainable occupational health services and institute integrated work place control of hazards/exposures in small scale industries.

METHODOLOGY

Background information on study Area

The questionnaire survey was a cross sectional descriptive study conducted in Chief Linus Edeh Memorial Timber Shed where all the sawmill workers in Abakaliki were relocated to in 2011. It is located at Amegu Ndi Nkwegu village in Amegu Community in Abakaliki LGA of Ebonyi State South East Nigeria. Ebonyi State has three senatorial zones namely Ebonyi North, Ebonyi Central and Ebonyi South. Abakaliki is in Ebonyi North while Afikpo where the only other sawmill in the state is located is in Ebonyi South. It is much smaller.

The timber shed has the sawmill industry section and the furniture section. At the time of the study, the sawmill industry is roofed, arranged in lines with several sheds in each line. Each shed is an open small scale factory employing an average of 5-8 workers. There are about 30 such factories, registered, automated, privately owned. The wood is sawn, planed, curved and grooved with various types of machines.

Study Population

The study population is the various categories of workers in the factories consisting of machine operators, log receivers / packers, sales managers, cashiers, cleaners, sorters, feeders and supervisors. All the categories of workers are in the same general area (no separate offices and so all the categories were studied).

Study Design

The study comprised a cross-sectional descriptive questionnaire survey and a walk through survey to perform a risk assessment of the workplace.

Inclusion Criteria

All workers above 18 years of age who have worked there for one year and above and gave informed consent. Smokers were not excluded

Exclusion Criteria

Non consenting workers and workers below 18 years

of age were excluded from the study.

Sample Size Determination

The minimum sample size for the study was calculated with help of the Epi Info software using the population size of 500, expected frequency of 50%, and confidence level of 90%. The minimum sample size calculated was 176. However all the workers who met the inclusion criteria were studied.

Study instrument

1. Structured interviewer administered questionnaire was used to collect the data for the questionnaire survey. Information on socio-demographics, smoking history, occupational history and health problems was obtained. The questionnaire was validated by face validity and a pretest at Onueke timber market where wood is sold 15 minutes drive from the study site but in another local government.

2. Workplace risk assessment template adapted from the ILO23 was used to conduct a risk assessment of the sawmill industry.

Data Analysis

Completed questionnaires were examined for errors, entered and analysed electronically using EPI Info version 7. The results were presented in tables. Chi square test was used to test for associations at the level of significance set at $p < 0.05$.

Ethical Approval

The ethical approval for the study was obtained from the Research and Ethics Committee of Federal Teaching Hospital Abakaliki (FETHA). The purpose of the surveys was explained to the management and informed consent was given. Individual's informed consent was obtained from the respondents. They were assured of confidentiality of the information provided. Sick respondents were referred to FETHA. A report of the findings was presented to management.

RESULTS

Two hundred and four respondents were

interviewed. The mean age was 29.3 ± 9.6 years. The 20 – 29 year age group was the most frequent age group (58.3%) and majority were males (93.1%). Most of the respondents were single (53.4%) with at least secondary education (60.8%, Table I).

The percentage of respondents who had ever smoked cigarettes was 32.4% and of this 60% of them were currently still smoking cigarette (Table II). Table III shows that 75% of the respondents were either labourers (40.2%) or machine operators (34.8%), 45.1% had previous experience and 33.8% were currently engaged in other jobs. Majority (69.6%) had worked in sawmill for 2-5 years and spend 8-10 hours at work (78.4%).

Table IV shows that only 4.4% did any form of pre-employment medical examinations before commencing their job. Employer provided medical services for First aid was available for 96.6% of the respondents, 59.8% received some form of training for the job in the sawmill and 54.9% of this group were trained by the employer.

Table V shows that majority of the respondents were aware of PPE (85.3%) and of this group, 96% felt that PPE were important, 86.2% felt there were benefits using them. Hand glove (81%), nose mask (66.1%) and protective apron (35.6%) were the most frequently known among the respondents. Fellow workers were the most frequent source of information (52.3%). Table VI shows that 72% of respondents had ever used PPE and of this group, 39.5% stated that they use them always and the most frequently used were hand glove (74.1%), nose mask (44.9%) helmet (11.6%).

The most frequently stated reasons for non-use of PPE among the 28% of respondents who had never used PPE were not aware of PPE (29.8%), non-availability (21.1%), expensive to purchase (17.5%, Table VII). Awareness and nature of work at the sawmill appeared to be the only predictors of use of PPE. There was no statistically significant association between age and use of PPE; education and use of PPE.

Table I: Socio-demographic characteristics and cigarette smoking habits

Variable	Frequency (%) n=204
Age group (yrs.)	
< 20	12(5.9)
20-29	119(58.3)
30-39	42(20.6)
40-49	17(8.3)
50-59	12(5.9)
>60	2(1.0)
Mean age ± SD	29.3 ± 9.6
Gender	
Male	190(93.1)
Female	14(6.9)
Marital Status	
Married	87(42.7)
Separated	8(3.9)
Single	109(53.4)
Level Of Education	
No Education	6(2.9)
Primary Education	69(33.8)
Secondary Education	124(60.8)
Tertiary Education	5(2.5)
Cigarette smoking habits	
Ever smoked cigarette	
Yes	66(32.4)
No	138(67.6)
Current smoking (n=66)	
Yes	40(60.6)
No	26(39.4)
Average number of sticks smoked daily (mean ± SD)	3.95±3.48

Table II: Work Characteristics

Variable	Frequency (%) n=204
Main Job Description	
Cleaner	5(2.5)
Log receiver/packer(labourer)	82(40.2)
Machine operator	71(34.8)
Sales manager/cashier	42(20.6)
Supervisor	4(2.0)
Engaged in other Jobs	
Yes	69(33.8)
No	135(66.2)
Previous Work Experiences	
Yes	92(45.1)
No	112(54.9)
Work Experience Yrs	
Number of years worked in the saw mill	
1yr	2(0.98)
2-5yrs	142(69.6)
6-10yrs	32(15.7)
11-15yrs	12(5.9)
>15yrs	16(7.8)
Average Time at Work(Hrs)	
Time spent at work each day	
3-5 hrs	11(5.4)
6-7hrs	16(7.8)
8-10hrs	160(78.4)
>10hrs	17(8.3)

Table III: Training and Provision of Health Services

Variable	Frequency (%) n=204
Medical examination carried out by employer before starting work at the saw mill.	
No	195(95.6)
Yes	9(4.4)
Any training received for the job at the saw mill	
Yes	122(59.8)
No	82(40.2)
Training provider (n = 122)	
An external group engaged by the employee	7(5.7)
Fellow employee	48(39.3)
The employer	67(54.9)
Availability of employer provided medical service for first aid and treatment	
Yes	197(96.6)
No	7(3.4)

Table IV: Awareness and Attitude to PPE among Respondent

Variable	Frequency (%) n=204
Aware about PPE	
Yes	174(85.3)
No	30(14.3)
Source of Information (N=174)	
Employer	29(16.7)
Fellow workers	91(52.3)
Health workers	26(14.9)
Friends outside the Saw mill	26(14.9)
Electronic media, radio or TV	22(12.6)
Types of PPE Known(N=174)	
Hand glove	141(81)
Nose mask	115(66.1)
Apron	62(35.6)
Safety boot	37(21.6)
Helmet	37(21.6)
Eye google	28(16.1)
Ear plug or muff	1(0.6)
Attitude to use of PPE (N=174)	
Not important	7(4)
Important	167(96)
Perceived Benefits of Using PPE	
IS PPE any benefit to you? (N =174)	
No	12(6.9)
Don't Know	12(6.9)
Yes	150(86.2)

Table V: Use Of PPE and Reasons for Non-Use

Variable	Frequency (%) n=204
Ever used any personal protective equipment	
Yes	147(72.1)
No	57(27.9)
Frequency of use (n=147)	
Always	58(39.5)
Rarely	11(7.48)
Sometimes	78(53.6)
Types used (n=147)	
Hand glove	109(74.1)
Nose mask	66(44.9)
Apron	11(7.5)
Safety boot	9(6.1)
Helmet	17(11.6)
Eye google	13(8.8)
Ear plug or muff	0
Others	1(0.7)
Reasons for non-use (multiple response question)	
Don't know how to use	3(5.3)
Dislike PPE	6(10.5)
Expensive to purchase	10(17.5)
Not aware of PPE	17(29.8)
Slows down speed of work	3(5.3)
Inconveniencing	6(10.5)
Non availability	12(21.1)

Table VI: Determinants of PPE Use

VARIABLE	USING PPE	NON USE of PPE	χ^2	p value
AWARENESS				
Yes	147	27	90.708	<0.001
No	0	30		
EDUCATION				
No Primary	2	4	4.629	0.098
Primary	51	18		
At least Secondary	94	35		
Age group			4.73	0.45
<20	2	10		
20-29	88	32		
30-39	27	15		
40-49	14	3		
50 -60	7	5		
>60	1	1		
Number of years worked in the mill?			7.982	0.092
1yr	1	1		
2 -5yrs	104	38		
6 -10yrs	27	5		
11 -15yrs	7	5		
>15yrs	8	8		
The main work at the Mill			18.115	0.001
Cleaner	5	0		
Log receiver/packer(labourer)	58	24		
Machine operator	60	11		
Sales manager/cashier	23	19		
Supervisor	1	2		

Table VII: Occupational Health Problems in Respondents

Variable	Frequency (%) n=204
Health condition respondents developed since started work in the saw mill believed to be as a result of work there	
Don't know	4(1.9)
No	146(71.6)
Yes	54(26.5)
Perceived worsening of health status since post-employment in the saw mill	
Yes	9(4.6)
No	195(95.4)
OCCUPATIONAL ACCIDENTS	
Ever had occupational accidents at work	
Yes	134(65.7)
No	70(34.3)
Condition experienced by workers since the commencement of work in the sawmill	
Injury resulting from log of wood	117(57.4)
Cut by the machine	51(25.0)
Difficulty in breathing	13(6.4)
Electric shock	11(5.4)
Recurrent eye infection	11(5.4)
Recurrent chest infection	10(4.9)
Skin irritation	3(1.5)
Recurrent skin infection	3(1.5)
RESPIRATORY PROBLEMS	
Respiratory symptom while working in the sawmill	
Cough	97(47.5)
Chest pain	86(42.1)
Sputum production	26(12.7)
Shortness of breath	15(7.4)
Dyspnoea	13(6.4)
Wheeze	8(3.9)
Chest tightness	7(3.4)
Recurrent chest infections	10(4.9)
Difficulty in breathing	13(6.4)

Table VIII shows that the most frequently reported respiratory symptoms were cough (47.5%), chest pain (42.1%), sputum production (12.7%) and shortness of breath (7.4%). Other conditions reported since starting work at sawmill are injury resulting from log of wood (57.4%), cut by machine (25%), and recurrent eye infections (5.4%) amongst others. A perceived worsening of health status since post-employment at the sawmill was reported by 95.4% of the respondents.

The Workplace Risk Assessment Result

The major hazards identified were exposure to

Table VIII: Relationship between Smoking and Respiratory Symptoms

Respiratory symptoms	Still smoking N=40	No longer smoking N=26	Chi square	p-value
Cough	19(47.5)	13(50.0)	0.039	0.843
Chest pain	0(0)	2(7.7)	0.655	0.418
Chest tightness	21(52.5)	11(42.3)	3.173	0.075
Shortness of breath	1(2.5)	3(11.5)	2.261	0.133
Difficulty in breathing	0(0)	3(11.5)	4.835	0.028
Dyspnea	2(5.0)	3(11.5)	0.962	0.327
Wheeze	0(0)	2(7.7)	3.173	0.075
Sputum production	4(10.0)	7(26.9)	3.249	0.071

Table IX: Relationship between respiratory symptoms and duration of exposure at the mill

Respiratory symptoms	Worked 5yrs or less N=144	Worked 6 years or more N=60	Chi square (p-value)
Cough	66(45.8)	31(51.7)	0.578(0.447)
Dyspnoea	8(5.6)	5(8.3)	0.548(0.459)
Chest tightness	4(2.6)	3(5.0)	0.639(0.427)
Chest pain	57(39.6)	29(48.3)	1.330(0.249)
Difficulty in breathing	9(6.3)	4(6.7)	0.012(0.912)
Shortness of breath	10(6.9)	5(8.3)	0.120(0.729)
Sputum production	18(12.5)	8(13.3)	0.026(0.871)
Wheeze	5(3.5)	3(5)	0.262(0.608)

wood dust, unguarded moving parts of machinery, poorly designed workstations, poor housekeeping, fire hazards, noise, stress, no warning signs of the hazards. No worker was seen using PPE.

DISCUSSION

This was a preliminary baseline study of a larger study to be undertaken in the sawmill. The mean age of 29.3 ± 9.6 years is lower than that of a similar study in South West Nigeria $34.5 \text{ yrs} \pm 11.01$ years⁷ and South East 34.8 years.²²

The high level of awareness of PPE found here (85.3%) did not translate to a high percentage of PPE use always (39.5%), and this was consistent with a study in Northern Nigeria.²¹ The high percentage of those who had ever used PPE (74%) included all types of PPE listed. Correct usage of PPE was not ascertained. Use of nose mask is imperative in

sawmill industry and though 44.9% here stated they had used nose mask, nobody was wearing any during the walk-through survey. There was no provision of nose masks by the owners/management throughout the period of this research. A few owners of some sawmill facilities claimed they had provided in the past but could not continue. The three most prevalent respiratory symptoms in this study were cough, phlegm (or sputum production) and chest pain. This has been also reported.^{5,7} Another comparable finding is lower prevalence of dyspnea, difficulty in breathing, wheeze.^{5,7,8,24} It was reported by Ugheoke²⁴ that this is because these subjects represent a survival population and subjects with more disabling symptoms may have changed jobs. In this study, one would have expected a higher prevalence of the disabling symptoms in those who had worked for longer number of years but the data showed there was no significant difference in prevalence of respiratory symptoms between those who had worked for 5 years or less and those who had worked for 6 years or more. This may be because the exposure is not intense. Injuries from log of wood (57.4%) and cut from machine (25%) were not surprising considering some of the hazards identified in the risk assessment namely – unguarded moving parts of machinery and manual lifting of logs of wood without use of appropriate PPE. The quality of training 59.8% of the workers said they had received for the job mostly from their employers is to be queried. The prevalence of eye infection (5.4%) and skin infection (1.5%) were lower than that reported in a study (14% and 1.5% respectively).¹²

From the workplace risk assessment it can be seen that the workers are at risk various health problems such as respiratory diseases, cuts, musculoskeletal disorders, deafness, fatigue, burns from fire accidents, electrical shock and death. There were no warning signs and the workers seemed unaware of the risks they faced as they worked. There was no worker using any nose masks, a few had gloves on. Management and workers need to be trained on carrying out regular risk assessments and instituting

control measures to protect the workers. The workers need a structured break period and occupational health services which would include counselling services.

CONCLUSION

The most prevalent respiratory symptoms were cough, phlegm and chest pain. Other conditions were injury from log of wood and cut from machine. No occupational health services existed to take care of the workers. The workplace risk assessment showed that the work environment was not safety complaint. Further studies on effect of wood dust of the workers will be done and modalities of provision of occupational health services for these workers will be explored. A follow up walk-through survey will be carried out in the future.

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Panel Box 1: Result of the risk analysis conducted on the sawmill.

The Hazard	Who might be harmed and how	What is already being Done	What further actions is necessary	Activity by Whom
1) Exposure to wood dust	All workers and visitors (machine operators at highest risk) at risk of respiratory diseases such as bronchitis, occupational asthma	Saw dust is wet first and swept regularly into a heap	Provision of rest room with sinks and showers with running water	Management
		Heap of dust disposed of in a deep pit at the back of the site	Regular provision of dust masks for workers and visitors	Management
		Saw dust given out to schools	Education of workers on the dangers associated with exposure to wood dust and the need to use PPE	Relevant Government Ministry
		Shavings from planning machine given to poultry farmers	Continuo us reminders to wet dust & sweep up regularly	Employer
			Provision of local exhaust ventilation and training of management on its maintenance	Management

2) Unguarded moving parts of machinery	Machine operators mostly but also other workers who may come in contact with the machinery. At risk of cuts, severance of fingers and hands		All machines should have safety guards and barriers	Management
			Regular inspection of machine guards and replaced if faulty	Management
			All machine operators should be properly trained in the safe and proper use of these machines in the local language	Expert
			Only properly trained operators to operate machines	Management
			Use of warning signs	Management
			Restrict access of visitors to machines	Management
			Provision and use of PPEs	Management and Workers representative
3) Manual lifting of heavy loads	All workers involved in the manual lifting at risk of musculoskeletal disorders	Timber boards are piled next to the machine which cut them	Education of the workers on correct manual handling techniques	Government Ministry
			Provision of lifting aids	Management
			Use of lifting aids by workers	Workers
4) Poorly designed work stations (low work benches)	All workers at risk of musculoskeletal disorders and bad posture		Work benches to be set at appropriate heights for the workers (better ergonomic design)	Management
5) Presence of sharp tools scattered on the floors	All workers and visitors at risk of cuts, injuries		Proper placement of sharp tools	Management
			Provision of safety boots and thick protective gloves for workers and educate workers on their use Use by the workers	Management and Workers
6) Obstructions in the various workshops (No clear passage way: Tools, generator, work benches, generator wires, saw dust, shavings, pieces of wood)	All workers and visitors at risk of slips, trips and falls. This can lead to sprains, injuries to parts of the body, fractures	Sawdust heaps disposed of in the pit at the back of the site	More regular disposal of sawdust heaps and shavings	Workers
			Good house keeping Neat arrangement of tools, work benches, wood pieces, generator wires, create safe passage ways	Management and Workers
			Generators should be kept outside the workshops on the short term	Employers Management

6 cont.)

			Long term: Provision of one big generator in a generator house to serve all the workshops Provision of constant electricity to avoid use of generators	Government
			Provision and use of safety boots for all workers	Management and workers
7)	Lack of warning signs of hazards	All workers and visitors at increased risk of existing hazards	Provision of the warning signs for the various hazards Educate workers on compliance with warning signs	Management Management
8)	Fire hazard from fuel generators in the workshop plus exposed wires (naked electric circuits)	All workers and visitors at risk of burns, death, electric shock Destruction of property	Provision of functional fire extinguisher at accessible locations Training of workers on fire hazards and fire drill Provision and use of PPEs (rubber gloves & boots)	Management Government Management & workers respectively
			One common generator (diesel) in a generator house Steady electricity Proper insulation of electrical wires and earthing	Management Government
9)	“Trucks” on two wheels without brakes used to transport heavy logs and boards of woods (actually types of wheel barrows) pushed by workers	All workers and visitors at risk of being knockdown	Provide proper pickup trucks for transportation of wood	Management Government
10)	Noise from machinery and generators	All workers and visitors at risk of temporary deafness. Workers at risk of permanent deafness, fatigue, headaches, loss of concentration which can lead to accidents	Provision of PPEs: ear muffs, ear plugs Provision of noise guards for the machines Training of workers on the use of PPEs and use by the workers	Management Management Government and Workers respectively
11)	Stress	All workers Fatigue, decrease immunity	Give workers structured break periods Occupational health clinic to provide stress management counseling	Management Government
12)	Lack of occupational health surveillance	Workers at risk of occupational health diseases	Occupational health clinic provision	Government