**EXAMINING THE LEVEL OF AWARENESS OF HEALTH ISSUES ASSOCIATED TO THE EXPOSURE OF SAWMILL DUST AMONG SAWMILL WORKERS IN AKWA IBOM STATE, NIGERIA**

**Abstract**

The present study examines the level of awareness of health issues associated to the exposure of sawmill dust among sawmill workers in Akwa Ibom State, Nigeria. The timber sawing industry in Akwa Ibom State, Nigeria, plays a vital role in the economy by supplying raw materials for various sectors, including construction, furniture production, and paper manufacturing. However, sawmill workers face significant occupational hazards, including exposure to wood dust, noise, chemicals, and ergonomic risks, which pose serious health threats. Sustainable Development Goals (SDG 3) aims to prevent needless suffering from preventable diseases and premature death by focusing on key targets that boost the health of a country’s overall population. Regions with the highest burden of disease and neglected population groups and regions are priority areas. SDG 3 also calls for deeper investments in research and development, health financing and health risk reduction and management. This study employed a mixed-methods approach, combining quantitative and qualitative data collection techniques, to assess occupational hazards and safety management practices among sawmill workers in Akwa Ibom State. A sample of 384 workers from 12 sawmills across three senatorial districts was surveyed, with data collected through questionnaires, interviews, and on-site observations. The findings revealed that a majority of workers (73.9%) were aware of safety guidelines, but adherence to these practices was low. Workers were exposed to various hazards, including wood dust (24.5%), noise (34.4%), and chemical agents (44.3%). Additionally, ergonomic risks such as heavy lifting (24%) and repetitive movements (27.9%) were prevalent. The study highlights the urgent need for improved health education, safety training, and stricter enforcement of safety protocols to mitigate occupational risks and enhance the well-being of sawmill workers in Akwa Ibom State.

**Keywords**: Timber sawing industry, Wood dust, Health Awareness, safety protocols, health risk

**INTRODUCTION**

Rapid urbanization and industrialization have been known to cause major health problems among the population, especially when it is unplanned. The nature of the work while handling the type of equipment and material by workers in these occupations is prone to hazards (Irsath and Jayan, 2022). The demand for timber products is witnessing a significant rise, encompassing everything from household furniture to industrial goods. Globally, the sawmill market is primarily driven by rising construction demand, which accounts for roughly 73.48 percent of total downstream consumption of sawmill in the world. Softwood and hardwood are the two types of sawmill raw materials. Its downstream use is diverse, and recently, building and furniture have gained prominence in a variety of sawmill areas. Workers in sawmill industry may be exposed to allergic, carcinogenic, and immunotoxic agents, comprising wood derivatives (e.g., terpenes, resin acids) as well microorganisms that grow on timber (bacteria and fungi) and their products (endotoxins and mycotoxins) known as potential causative agents of health effects (Dias et al., 2022; Stanley et al., 2021; Akankali et al., 2022). In Akwa Ibom state, the sawmill is a crucial component among the wood-based industries, and the forest ecosystem is a valuable natural resource with a pivotal role in the economy. The timber sawing industry is critical in supplying raw materials to various sectors, including building construction, furniture production, paper manufacturing, and wood processing. This vital sector not only offers employment opportunities to numerous individuals but also improves their economic status while supporting other sectors dependent on timber raw materials. However, the industry is facing challenges due to occupational hazards that lead to discomfort during operations and disrupt efficiency and continuity in business. Worldwide, an estimated "Wood dust exposure is a common occurrence for approximately two million individuals in work environments (Olsson & Kromhout, 2021). Sawmills serve as vital sources of various wood products, such as “sawn wood, plywood, particle board, newsprint, and writing papers”, which are extensively consumed and traded within the country. However, the level of health consciousness among sawmill workers in Akwa Ibom State, Nigeria, is a significant cause for concern given the dangerous nature of their working conditions—sawmill workers are regularly exposed to a variety of occupational hazards, such as dust, noise, or chemical agents, which are serious health issues. A considerable number of sawmill workers, according to surveys, do not have a basic awareness of the health risks associated with their jobs and the safety measures that should be implemented to reduce such risks. According to Awosan et al. (2018), the only factor that may predict a sawmill worker's level of awareness of workplace dangers is their job specification. This knowledge is linked to both the worker's educational background and their job description. Given the numerous risks connected to sawmilling, such as machine-related accidents (especially when operated incorrectly or without the right protections) and excessive noise that causes irreversible noise-induced hearing loss (NIHL), this is not unexpected. Additional risks include irritation and other negative health outcomes from wood dust and chemicals used to polish items, such as hay fever, asthma, cough and other respiratory conditions, conjunctivitis, allergic skin responses, and nasal sinus adenocarcinoma. Awosan et al. (2018). Inhaling wood dust causes illness, which lowers productivity and raises morbidity. The health and safety of Nigerian workers in this business have received little attention, despite the potentially dangerous nature of the labor (Tobin et al., 2016). In addition to having a higher exposure to total suspended and inhalable dust, sawmill workers are more likely to have respiratory symptoms, including coughing and phlegm production (Tobin et al., 2016). Chronic health issues may result from the lack of knowledge of the health dangers and the degree of health consciousness among sawmill workers in Akwa Ibom State, Nigeria. Consequently, the sawmill sector must prioritize better health education and safety training.

**METHODOLOGY**

**Research design**

The research design employed in evaluating and **examining the level of awareness of health issues among sawmill workers in Akwa Ibom State, Nigeria** was a cross-sectional study with a mixed-methods approach. The researchers utilized a combination of quantitative and qualitative surveys and interviews to assess the efficiency of safety management procedures in place as well as the occupational dangers experienced by sawmill workers. Simultaneously, qualitative interviews were conducted with key stakeholders, including workers, supervisors, and safety officers, to gain deeper insights into the contextual nuances of occupational hazards and the implementation of safety measures.

**Source of data:** A combination of quantitative and qualitative data was obtained to successfully achieve the study objectives. Quantitative data includes numerical measurements, counts, and statistical analyses, while qualitative data involves descriptions, interviews, and observations. The research also paid attention to ethical issues when collecting, storing, and analyzing sensitive data related to individuals, their health, and safety. Therefore, codes such as SMW (Sawmill Workers) with numbers such as (001-00384), were used to represent the sampled sawmill workers in each of the sampled sawmills within the three Senatorial Districts of the study area.

A thorough and multifaceted methodology was used to evaluate safety management procedures and occupational hazards among sawmill workers in the three senatorial districts of Akwa Ibom State, Nigeria. The study incorporated both primary and secondary data sources. Primary data was gathered through field surveys, on-site observations, and interviews with sawmill workers, managers, and relevant stakeholders. Surveys encompassed questions related to the nature of work, safety protocols in place, and the workers' experiences with occupational hazards. On-site observations provided valuable insights into the actual working conditions and safety measures implemented.

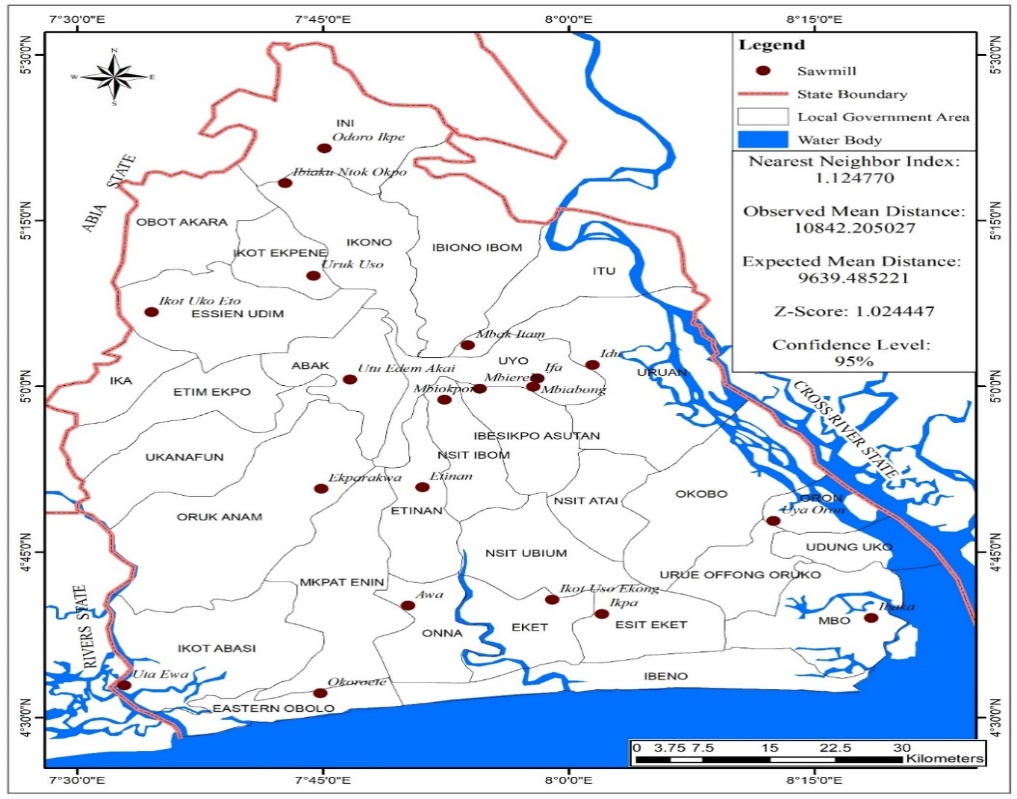
**Sample size:** The 384 sample size for the study was however distributed over the twelve (12) sawmills out of a total of twenty (20) available in the state as shown in Tables 1 and 2. Figure 1 shows the locations of the sampled sawmills.

Fig 1: Map of Akwa Ibom State showing locations of the sampled sawmills

**Method of data collection**

Data were collected using the Geographic Information System Approach, semi-structured questionnaires, checklist, Key Informant Interviews (KII), field observations, and scientific measurements which were done in situ.

**Geographic Information System Approach**

During field data collection, we collected X (longitude), Y (latitude), and Z (name and attribute) data from sampled sawmills to accomplish the first objective, which involved revealing the spatial distribution of sawmills within Akwa Ibom State's three senatorial districts. A handheld GPS device called the Garmin Etrex 10 was used to collect this data. The X, Y, and Z data were then prepared and organized using Microsoft Excel, enabling spatial analysis and mapping on a Geographic Information System (GIS) platform. Two different sets of information were obtained: the first set included twelve (12) significant sawmill branches located in the three senatorial districts. Two (2) sawmills were selected for each Akwa Ibom State local government area that was sampled. Visual representation of the spatial distribution of sawmills in the study area was made possible by plotting the collected data in the ArcGIS platform. This comprehensive method allowed us to accomplish the first goal, which was to get insight into the spatial layout of sawmills within the defined zones.

**Questionnaire and checklist**

In addition to describing the demographics, awareness, and attitude of sawmill workers towards occupational safety and health in the workplace, the study used a semi-structured questionnaire and a checklist to assess the occupational hazards and risks connected with sawmill industries. In addition to the employees, managers of the workplace also received questionnaires. It is their general duty of care to guarantee that Occupational Safety and Health (OSH) policy and practice are applied effectively in their workplace. The questionnaire evaluated the level of awareness of health issues and practices of the sawmill workers in the sawmill sector. The surveys were both open-ended and closed-ended. While the open-ended questionnaire promoted the richness and intensity of responses, the closed-ended questionnaire helped with coding and analysis. The researcher and research assistants administered the questionnaires in person. A comprehensive briefing on the topic and purpose of the study was given to the respondents. Therefore, the questionnaire's wording was analysed to make sure that respondents—sawmill operators and workers—understood it clearly.

**Interviews**

The study also employed both key informant interviews and focus group discussions. The interview was conducted with the institutions involved in Occupational Safety and Health. These institutions include: the Directorate of Occupational Safety and Health, the National Environmental Management Authority and the Nigeria Bureau of Standards.

**Direct observation**

Guided work site visits to sawmilling sites were conducted to directly observe and document the identified hazards, tasks, job site organization, work practices, equipment, and tools being used. The study sites were surveyed on foot to identify the locations of sawmill machines and operators.

**Techniques of data analysis**

The data collected from the field was analyzed using both descriptive and inferential statistical techniques, and the following procedures and methods were employed to produce conclusions pertinent to the study's goals. Whereas, descriptive analysis which included simple averages, percentages, tables, maps, and charts was used to show the summary of details from attribute data. Conventional and geo-statistical inferential statistical techniques were adopted to test the formulated hypothesis. Further, the photo-elucidation technique was also employed to show the medical examination processes carried out with sawmill workers during the fieldwork exercise.

**RESULTS**

**Table 1: Population of Sawmills and Workers in Akwa Ibom State**

|  |  |
| --- | --- |
| **Sawmills in Akwa Ibom State** | **The population of sawmill workers** |
| Abak Sawmill | 1,250 |
| Ikot Ekpene Timber Market | 900 |
| Ikono Sawmill | 750 |
| Essien Udim Timber Market | 1,300 |
| Oruk Anam Timber Market | 620 |
| In Timber Market | 1,150 |
| Ibiaku Ntuk Okpo Sawmill | 800 |
| Ibesikpo Timber Market | 985 |
| Idu Uruan Timber | 1770 |
| Itam Timber Market | 1510 |
| Mbiabong Sawmill | 720 |
| Mbiokporo Sawmill | 690 |
| Etinan Sawmill | 450 |
| Eket Timber Market | 575 |
| Uya Oron Sawmill | 400 |
| Ikot Abasi Timber Market | 430 |
| Ibaka Mbo Sawmill | 500 |
| Awa Sawmill | 700 |
| Mkpat Enin Sawmil | 1,200 |
| Ikpa Sawmill Esit Eket | 1412 |
| **Total** | **18,112** |

In this study, a thorough inventory of operational sawmills spread across the three senatorial districts of Akwa Ibom State was undertaken, systematically classifying them into three size-based groups: large, medium, and small sawmills, totaling 20 in count. The research comprehensively encompassed all registered personnel, including chain saw operators log transporters drivers, mechanics, sawmill machine operators, and employer managers, representing the entirety of the registered sawmill workforce., with a specific count of 18,112 sawmill workers included in the research sample shown in Table 1.

**Table 2: Ages of sawmill workers.**

|  |  |  |
| --- | --- | --- |
| **Ages of sawmill workers** | **Frequency** | **Percentage (percent)** |
| 18-30 years | 84 | 21.9 |
| 31-45 years | 176 | 45.8 |
| 46-60 years | 108 | 28 |
| 60 years and above | 16 | 4.2 |
| **Total** | **384** | **100** |

Furthermore, the study primarily centered on medium- and large-scale sawmills due to their heightened operational activities in comparison to their smaller counterparts. The target population included both male and female workers aged eighteen (18) years and older as shown in Table 2 above.

**Table 3: Monthly income of sawmill workers.**

|  |  |  |
| --- | --- | --- |
| **Average monthly income** | **Frequency** | **Percentage (percent)** |
| Less than 100.000 | 41 | 10.7 |
| 100.000-200.000 | 125 | 32.6 |
| 201.000-300.000 | 149 | 38.8 |
| 301.000-400.000 | 38 | 9.9 |
| Above 401.000 | 31 | 8 |
| **Total** | **384** | **100** |

In this context, a sample size of 384 is shown in Table 3 which shows the ranges of salary earned by the sawmill workers as it was recorded at 100%.

**Table 4: Educational profile of sawmill workers.**

|  |  |  |
| --- | --- | --- |
| Educational profile | Frequency | Percentage (percent) |
| No Education | 12 | 3 |
| FSLC/JSS/SSCE | 118 | 30.7 |
| OND/NCE | 166 | 4.3 |
| Degree | 62 | 16 |
| Postgraduate | 26 | 6.8 |
| Total | **384** | **100** |

Table 4 shows the level of education of the sawmill workers. Listing the number in their respective qualifications such as no level of education, secondary school, ordinary national diploma, degree, and postgraduate level. it also indicated that the majority of the sawmill workers have attained some level of education with 30.7 % attaining at least Secondary Education, 3% had no education, while OND/NCE qualification of 4.3%., Degree 16%, Postgraduates 6.8%

**Table 5: Total sample sawmills in Akwa Ibom State**

|  |  |  |
| --- | --- | --- |
| **Sample sawmills** | **The population of sawmill workers** | **Sample size** |
| Itam Timber | 1,250 | 32 |
| Idu Uruan Sawmill | 900 | 32 |
| Ibesikpo Timber Market | 750 | 32 |
| Mbia-Obong Sawmill | 1,300 | 32 |
| Ikot Ekpene Timber Market | 620 | 32 |
| Ikono Sawmill | 1,150 | 32 |
| Essien Udim Timber Market | 800 | 32 |
| Abak Sawmill/Wood Market | 520 | 32 |
| Eket Timber | 770 | 32 |
| Ikot Abasi Sawmill | 510 | 32 |
| Oron Timber Market | 720 | 32 |
| Mkpat Enin Sawmill | 690 | 32 |
| **Total** | **10,040** | **384** |

The study sawmills were purposively selected, and the research adopted a stratified random sampling method to select 32 sawmill workers (respondents) from the target population (sawmill workers) within the 12 sawmills across the twelve (12) LGAs within the three (3) senatorial districts of Akwa Ibom State shown in table 5. The list of sawmill workers was obtained from the workers registered at the Akwa Ibom State Sawmill Association Secretariat at Itam Sawmill and respondents were chosen based on the different sections that they worked in.

**Table 6: Health issues related to sawmill activities in Akwa Ibom State**

|  |  |  |  |
| --- | --- | --- | --- |
| S/N | Prevalent lung function examination | Long-term Risk | Remark |
| 1 | Cough (Asthma, allergies, gastroesophageal, reflux disease (GERD), or bronchitis.) | Sleeplessness, dizziness, backache, headaches, urinary inconvenience, vomiting, broken ribs, chest pressure sneezing, nasal congestion. | Avoid wood dust, take prescribed medication |
| 2 | Sputum Production | Sputum will lead to the spread of bacterial pneumonia or bronchitis, respiratory infection, lung cancer, pulmonary atelectasis, and respiratory failure. | Avoid wood dust and chemicals used in spraying wood, and ensure the use of a face mask. |
| 3 | Chest pain | Blockage of blood flow to the heart muscle, pain in the left arm, chest pressure, fast heart rate, shortness of breath, cardiovascular problem, hypertension, discomfort. | Avoid wood dust, use face mask, take another occupation to avoid reduced blood flow to the heart. |
| 4 | Wheezing | Airway and lung damage, uncontrolled inflammation, irreversible scaring of the lungs, shortness of breath, chest tightness, narrowing of bronchial tubes, depression. | Take medication as prescribed, avoid wood dust, and use of safety kits (face mask) |
| 5 | Breathlessness | Shortness of breath, obesity or being unfit, poorly controlled asthma, Chronic Obstructive Pulmonary Disease (COPD) damage to the lungs, Heart Disease, Stress, Anxiety, Allergies, Irregular heartbeat, heart attacks, stroke, and other cardiovascular issues. | Avoid wood dust and take medications |

**Table 7: Awareness of safety guidelines by sawmill workers**

|  |  |  |
| --- | --- | --- |
| Awareness of safety guidelines | Frequency | Percent |
| Yes  No  **Total** | 284  100  384 | 73.9  26.0  100.0 |

**Table 8: Types of occupational hazards associated with sawmill operations**

|  |  |  |
| --- | --- | --- |
| Types of Occupational Hazards | Frequency | Percent |
| Physical hazards |  |  |
| Exposure to vibration from the sawing machine | 53 | 13.8 |
| Exposure to noise from sawing machines | 132 | 34.4 |
| Exposure to flying and falling objects | 67 | 17 |
| Exposure to wood dust | 94 | 24.5 |
| Exposure to heat from the machine | 38 | 9.9 |
| **Total** | 384 | 100 |
| Chemical hazards |  |  |
| Exposure to pesticide/insecticide | 170 | 44.3 |
| Exposure to fumes from machines | 146 | 38 |
| Exposure to fungicides | 47 | 12 |
| Exposure to smoke from burning sawdust and unused woods | 21 | 5.6 |
| **Total** | 384 | 100 |
| Biological hazards |  |  |
| Exposure to fungi/mould | 89 | 23 |
| Exposure to parasitic organism | 68 | 17.7 |
| Exposure to airborne diseases | 151 | 39 |
| Exposure to vectors (Mosquito bite) | 78 | 20 |
| **Total** | 384 | 100 |
| Mechanical/Ergonomic hazards |  |  |
| Heavy lifting and pulling movements of logs | 92 | 24 |
| Poor body position or awkward position | 104 | 27.1 |
| Repetitive work or movement | 107 | 27.9 |
| Trap/struck by operating machine | 37 | 9.6 |
| Cutting or severing | 44 | 11.5 |
| **Total** | 384 | 100 |

**DISCUSSION**

In terms of education, 47.7% of sawmill employees had earned a Senior Secondary Certificate and a Junior Secondary School diploma. The majority of sawmill workers (38.8%), according to the income level assessment, made an average salary of between 201,000 and 300,000 naira. These results offer a thorough summary of the salary levels, educational backgrounds, and demographic traits of sawmill employees at the studied sawmills in Akwa Ibom State. The effectiveness of preventative measures was demonstrated in large part by the sawmill workers' knowledge. The findings of this study, which examined workers' knowledge and safety procedures, are shown in Table 7. The workers' awareness of the negative health effects of sawmill noise was also examined in the study. Of the 384 respondents, 73.9 percent are aware of safety requirements, but 26.0 percent are not. These precautions greatly lower the possibility of accidents and establish a safe working environment in the sawmill. Interestingly, the field observation revealed that even with a high degree of acquaintance with the safety recommendations, there is still very little application and adherence. The analysis from the same table shows the level at which the sawmill workers are exposed to chemical hazards. According to the research, 44.3% of the sampled sawmill workers were exposed to pesticide/insecticide in the sampled sawmills. While 38 percent of the sawmill workers sampled were exposed to fumes from machines. However, 12 percent of the sampled sawmill workers were exposed to fungicides, and 5.6 percent of sawmill workers were exposed to smoke from burning sawdust and unused wood. The majority of the studied sawmill workers were exposed to machine fumes, according to the study's research. The study findings revealed that sawmill workers were also exposed to biological hazards, it was observed that 23 percent of the sampled sawmill workers were exposed to fungi/mold, while 17.7 percent were exposed to parasitic organisms within sawmills sampled within the study area. Meanwhile, 39 percent of the sampled sawmill workers were exposed to airborne diseases and 20 percent of the sawmill workers sampled for the study agreed that they were exposed to vectors (Mosquito bites). From the overall analysis, it was observed that most of the sampled sawmill workers were exposed to airborne pathogens as seen from the table analysis. Lastly, the information from the table analysis also shows the Mechanical/Ergonomic hazards within the sawmill sampled. The result revealed that 24 percent of the sawmill workers sampled for that study suffered exposure from Heavy lifting and pulling movements of logs, while 27.1 percent of the sawmill workers sampled for the study were exposed to awkward body positions. Furthermore, the study found that 27.9 percent of sawmill workers were exposed to repetitive tasks or movements, with 9.6 percent facing risks of being trapped or struck by operating machinery, and 11.5 percent exposed to cutting or severing hazards during sawmill operations. The analysis underscores that a significant portion of the sampled sawmill workers is predominantly exposed to repetitive work or movement.

**CONCLUSION**

The study examines the level of awareness of health issues among sawmill workers in Akwa Ibom State, and the inadequate implementation of safety measures despite a relatively high awareness of safety guidelines. The findings reveal that workers are exposed to a range of physical, chemical, biological, and ergonomic risks, including wood dust, noise, machine fumes, and repetitive movements, which contribute to various health issues such as respiratory problems, cardiovascular conditions, and musculoskeletal disorders. While the majority of workers are aware of safety protocols, the lack of adherence and enforcement of these measures remains a significant challenge. To address these issues, the study recommends the implementation of comprehensive health education programs, regular safety training, and the provision of personal protective equipment (PPE) to workers. Additionally, there is a need for stricter regulatory oversight and the establishment of robust safety management systems within sawmills to ensure a safer working environment. By prioritizing the health and safety of sawmill workers, the industry can enhance productivity, reduce morbidity, and contribute to the sustainable development of the timber sector in Akwa Ibom State.

**COMPETING INTERESTS DISCLAIMER**:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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