JIGAWA JOURNAL OF
ENVIRONMENTAL AND EARTH SCIENCES
Federal University Dutse | Department of Environmental Sciences

Volume 1 • Issue 1 • November 2026 ISSN: 3093-8852 ISSN Online: 3093-8842

ORIGINAL RESEARCH ARTICLE

Awareness and utilisation of personal protective equipment among wood-cutting workers in selected timber markets in Kano Metropolis, Nigeria

RECEIVED 18/09/2026 ACCEPTED 03/11/2026 PUBLISHED 04/11/2026

How to cite: Salisu, U. A., Rabiu, B., Kaugama, A. A., Umar, S. M., & Danturawa, H. I. (2026). Awareness and utilisation of personal protective equipment among wood-cutting workers in selected timber markets in Kano Metropolis, Nigeria. *Jigawa Journal of Environmental and Earth Sciences*, 1(1), 230-240.

Correspondence: ahmadsalisuusama@gmail.com

Copyright and licence: © 2026 https://jijees.fud.edu.ng

ABSTRACT

This study assessed the awareness and safety practices regarding the use of personal protective equipment (PPE) among the wood-cutting carpenters in Kano Metropolis. The wood-cutting carpenters are exposed to occupational hazards such as wood dust, smoke particles, ear related disease and eye irritation. The aim of this study is to assess the awareness and safety practices among the wood-cutting carpenters with a view to provide awareness on the risks faced by carpenters during wood sawing and smoothing. The sample size was 234 selected from a population of 600 within the three major wood markets (Kafar Ruwa, Rijiyar Lemo, and Na'ibawa wood markets). The stratified sampling technique and systematic selection were used in which the larger the stratum population, the larger the Sample. A total of one hundred and fourteen (114) questionnaires were administered while 120 participants were selected for focus group discussion (FGD) and interview. Cross -tabulation, tables, charts and percentage were used for data presentation and analysis. Result shows that about 65.5% of the wood-cutting carpenters are not using protective eye goggle while 34.5% are uses. 75% are not using protective garment, only 25% are. 63.5% are not using face mask only 36.5% respondents uses. Also, about 76.3% of the respondents do not wear hand glove or socks during their work due to personal negligence, and inadequate policy enforcement. The awareness on use of PPE will reduce the imminent danger among wood-cutting carpenters in Kano metropolis.

Keywords: Awareness, Wood Dust, Risk, Ear Related-diseases, Eye Irritation, PPE

Introduction

The timber workers are no exception to the occurrence of occupational injuries and illnesses. They operate in clusters of privately-owned small-scale ventures associated with apprenticeship training. Their work involves shaping, cutting, and smoothing. Processing and marketing of wood and so has a high risk of wood-dust exposure with negative health effects. It is a source of livelihood for many Nigerians, who are usually located around timber sheds with no form of organized occupational health and safety service. As a consequence, they are at an increased risk of occupational hazards and illnesses, and as such, preventing, reducing or keeping exposures within safe limits are important to the maintenance of a healthy work force. The main material for timber workers is wood, which is classified as either hardwood or softwood depending on the type of trees they are cut from (Diwe., *et al*, 2016). Report indicated that uneducated workers were twice as likely to face occupational hazards compared to their educated counterparts. Furthermore, it was determined that the majority

of the exposure took place during wood cutting; however, most of the workers were not utilizing personal protective equipment (Kevin C. et al., 2016).

In real life, the personal protective equipment (PPE) effectiveness depends on a multitude of factors including, the awareness of the wood-cutting carpenters on used of personal protective equipment, how well it used, how well it is maintained, how effectively workers are trained and aware how it fits and comfortable (Weiner S. et al, 2025). Because the economic effect is devastating, it cost the globe around 4% of its gross domestic product (GDP) per year. In high-risk sector, personal protective equipment including helmets, hand gloves, safety goggles, masks, protective garments, and footwear, is a crucial component of effort to prevent injuries because PPE serve as final line of defense against work place hazards (ILO, 2025).

According to World Health Organization, there are about 250 million cases of occupational injuries and illnesses occurring annually worldwide, with prevalence studies from Botswana, Zimbabwe, Zambia, Ghana and Nigeria suggesting that there is a high occurrence of occupational disease in Africa. Though in Nigeria, there appears to be an increase in work-related injuries and illnesses, the records of occupational diseases with relevant Government agencies are poor due to inadequate reporting (WHO, 2010). Wood dust, regulated as a nuisance dust by the United States Occupational Safety and Health Administration (OSHA), is recognized as a confirmed human carcinogen and as a result, the American Conference of Governmental Industrial Hygienists (ACGIH) recommends an exposure limit of 1 milligram per cubic meter for hardwoods and 5 milligram per cubic meter for softwoods. Furthermore, other adverse health effects associated with wood dust include dermatitis, allergic and non-allergic respiratory effects (OSH, 1999). The ILO establishes general guidelines for occupational safety and health, including the importance of PPE. Although specifications may vary depending on local legislation, the ILO emphasizes the need for a systematic approach to risk assessment and the use of PPE as a control measure when risks cannot be eliminated or reduced sufficiently through engineering or administrative measures. Studying when and how PPE is used or ignored can help identify gaps in training, safety culture, or PPE availability. This can lead to the adoption of corrective measures to increase the use of PPE. Workplace health and safety management and promotion may positively impact workers and leadership and engagement at all levels are key issues in changing the workplace culture. In this context, effective Occupational Safety and Health (OSH) interventions are a leading priority, particularly for organizations struggling to manage health and safety in the workplace. OSH is a discipline focusing on the prevention of work-related injuries and diseases and the promotion of the health, safety, and wellbeing of the workers at the workplace by improving their working conditions especially among the wood-cutters in Kano Metropolis.

Research conducted on social and environmental impacts of charcoal trade in Liberia by Jones, in 2015, show that, public health implications for rural communities who engage in business especially women and young children been affected as result of fuel combustion, including respiratory illness due to inhalation of high levels of particulate matter and dust. The statistical analyses on work-related and occupational diseases that take account of the number of participating doctors in the United Kingdom reported that, each year there are an estimated 20,000 new cases of self-reported breathing problems, respiratory infection, lung

cancer, skin changes and irritation, ear infection, cough, sneezing, and eye irritation which may be caused by a range of work place exposures, dust, and air pollution and poor use of personal protective equipment (Ukrainian Biofuel Suppliers, 2008).

In developing countries despite continuous awareness and safety updates, wood-cutting carpenters are at risk of disease outbreaks, occupational accidents, as well as challenges of protection and safety equipment. A sawing machine is used to cut timber into different shapes and size. It's also used for produces straight and precise cuts and cut thick or large pieces of timber. (Wood Market Association 2026).

In the study area, there are about 177 machines operate within three markets, for example 87 engines in Rjiyar Lemo, 50 in Na'ibawa and 40 machines in Kofar Ruwa wood markets, each of one machine about two to four people working on it and majority of them are using diesel, and the sound of the engine above the normal noise level, most of the engines discharging the black smoke (Carbon). They used a planning machine (planer) to smooth and level the surface of the wood, reduces the thickness of wood to the required size. A ban saw machine is uses a continuous looped blade to cut wood and curved shapes accurately suitable for cutting irregular patterns and designs. A circular machine uses a rotating circular blade to cut woods, suitable for cutting boards, plywood and timber. These are some of the machine observe in the areas.

Material and method

The study was conducted in some selected wood markets within Kano Metropolis where the major timber markets are located the major markets include; Rijiyar Lemo, Kofar Ruwa, and Na'ibawa wood market. The others minor markets are; Rijiyar Zaki, Chalawa, Unguwa Uku, Dakata, Yankaba, Sharada, Sabon Gari, Dorayi timber area, and Fagge timber shed. Kano Metropolis is the capital city of Kano State, Nigeria. It is located between latitude 11°59'59.57''N to 12°02'39.57''N and longitude 8°31'19.69''E to 8°33'19.69''E, with a total urban land area of 137Km2 and 499km2 metropolitan area. It is made up of eight Local Government Areas Dala, Fagge, Gwale, Municipal, Nasarawa, Ungogo, Kumbotso and Tarauni (Ibrahim, 2015). Over 70% of the adult workforces draw its livelihoods off agriculture. Kano is the biggest commercial and industrial Centre in Northern Nigeria. Kano Metropolis has the population of 3,931, 300 (National population commission, national bureau statistic, 2016). The principal inhabitants of Kano Metropolis are Hausa/Fulani people and the Hausa language most widely spoken language in Kano (Nabegu, 2010). It has 43 existing market places and over 400 privately owned manufacturing industries, 'Road network play a dual role in providing both accesses to property and travel mobility, it is the major factor that stimulates the development of certain areas in terms of commercial activities, urban development, and jobs creation (Ibrahim, 2014). The climate is a hot, semi-arid type with an annual average rainfall of about 690mm (27.2 in), the majority of which falls from June through September. The temperature is generally very hot throughout the year, though from December through February, the city is relatively cool. The average nighttime temperatures in the cold months range from 11° to 14°C. The vegetation, therefore, is savanna type that composed a variety of trees scattered over an expanse of grassland. The trees are usually characterized by broad canopies and they are hardly taller than 20 meters (Olofin and Tanko,

2007). This study employed survey method using both qualitative and quantitative strategies. Qualitative approach was used to get in-depth information from respondents using close and open-ended questionnaires, observation and focus group discussion (FGD). The quantitative method of data collection allows the researcher to get numerical data of the respondents.

The study focused on members of the wood markets association specifically wood-cutting carpenters. The sample size was 234 selected from a population of 600 within the three major wood markets (Rijiyar Lemo, Kafar Ruwa, and Na'ibawa wood markets) in Kano Metropolis. The majors' machines used in the markets include planning machine, Sawing machine, Ban Saw machine and Circular machine. There are about 177 machines operate within three markets 87 engines in Rjiyar Lemo, 50 in Na'ibawa and 40 machines Kofar Ruwa wood markets.

The stratified sampling technique was used in which, the larger the stratum population, the larger the Sample. In addition, systematic selection was also used for selecting the respondents in which the researcher drew the sample by picking the second and picking the third continuously like manner up till reaching the sample size of the study. A total one hundred and fourteen (114) questionnaire were administered during data collection: 64 from Rijiyar Lemo wood market, 30 from Na'ibawa wood market and 20 from Kofar Ruwa wood market. Focus group discussion (FGD) and interview was conducted on 120 respondents. Observation was also used as instruments for data collection. Cross-tabulation, tables, charts and percentage were used for data presentation and data analysis.

Result and discussion

Educational status of the respondents

Table 3.1 Educational Attainments of the Wood-Cutting Carpenters

School Certificate	Respondents	Percentage
Primary	150	64.1%
Secondary	74	31.6%
Tertiary	10	4.3%
Total	234	100%

Source: Field Work, 2026

The result shows the educational attainment of the Respondents, highlighting that 64.1% attended primary schools, 31.6% attended secondary schools, and 4.3% attended tertiary institutions. This shows that all of the respondents have had some form of education. Because the education is the key factor that will help them become aware of the presence of chemicals and effects of wood dust on their health. Study in line with work of Osuchukwu et al., (2015), it was observed, that predominantly the timber workers mostly had either a primary or secondary school level of education which was also observed this could be explained by the fact that, some level of training and skill is required in the processing and marketing of wood as seen in the study area, where about 30% of the respondents were apprentices. Another study by Mitchual et al, (2015), reported that the high level of awareness was irrespective of their educational background and probably due to the length

of work experience. Also, Sabitu et al, (2009), reported other reasons for high awareness such as institutional training and institutional adaptation of safety regulatory measures.

Workplace exposure of the respondents

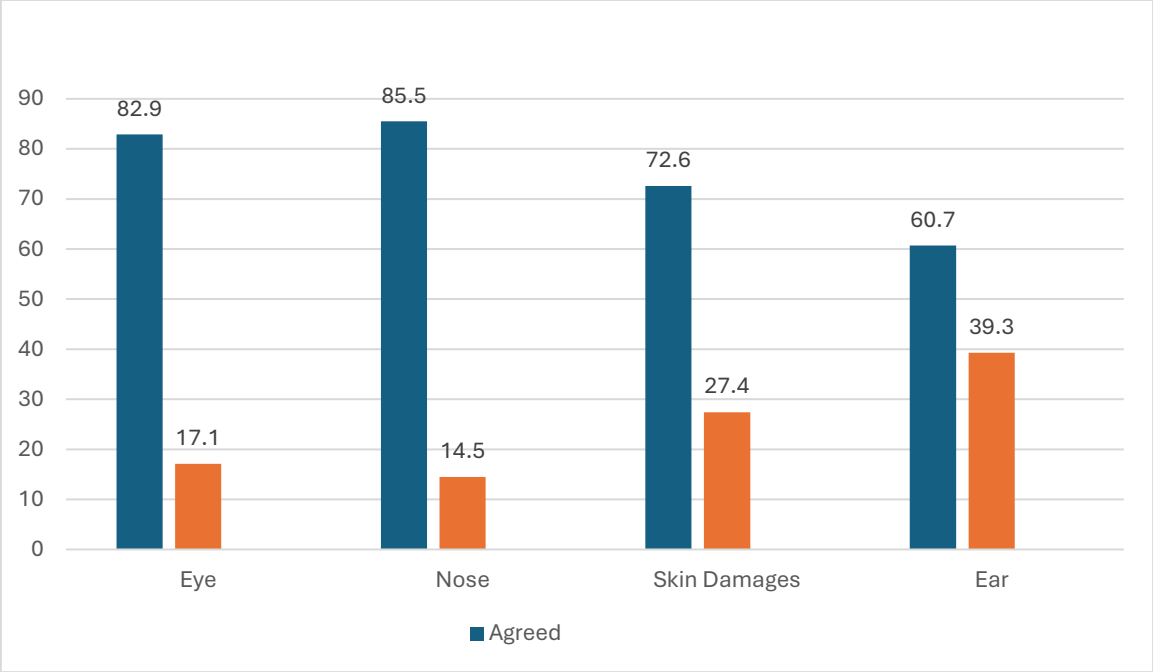


Figure 3.2.1 Workplace Exposure to Wood Dust enters Body Parts of Wood-Cutting Carpenters

Source: Field Work 2026

The result shows body parts exposures to wood dust. and from responses gathered, 82.9% agreed that wood dust entered their eye during wood sawing, smoothing as well as loading and offloading of wood from lorry while 17.1% of the respondents disagreed wood dust entered their body parts. About 85.5% of the respondents also say that wood dust enters their nose, while 14.5% of the wood-cutters disagreed on wood dust entering their nose during their work activities. The result also indicates that about 72.6% agreed they experienced skin dirty during wood sawing and smoothing the wood but27.4% of the respondents disagreed to experience skin dirty during the work activities. Furthermore, about 60.7% of the respondents agreed that, wood dust entering their ear but 39.3% of the wood-cutters disagreed wood dust enter their ear during work activities. This indicated that for the majority, wood dust entered their eye, nose, and ear during their work this is because as observed by the researcher majority of the wood-cutters do not use personal protective equipment (PPE) during their work. It also shows that dust have effects on their body parts which constitute the work exposure could trigger inflammation, immunological reactions and cases of dark sputum and damage their skin. Some particles gain access to the systemic circulation and travel to distant organs where they produce cough and respiratory infection/irritation. This study in line with work of Omoakin, *et al* (2015), who found that ranging from wood logging, transportation, and wood residue carbonization in the kiln, to cooling, sieving, packaging and storage of bio char which reported that charcoal dust enter and damage their body part. The most deleterious impact emanates from the carbonization stage which is the stage where most gaseous emission takes place. Long term exposure of humans to gaseous emission

during burning leads cough, Respiratory Infection, Otitis media (middle ear infection), breathlessness, sneezing and not exhale normally.

Occupational experience of the respondent

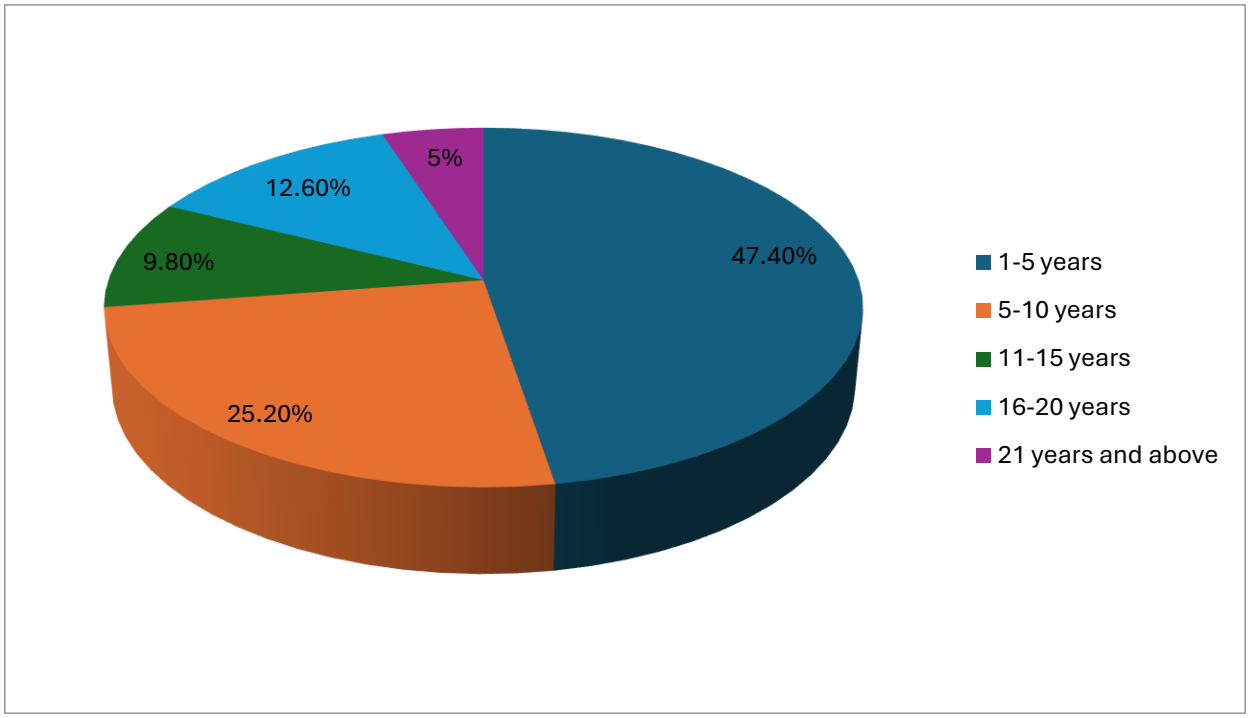


Figure 3.3.2 Occupational Experiences of the Wood-Cutting Carpenters

Source: Field Work, 2026

The result shows the occupational experience of the respondents, indicating that 47.4% of the respondents had of 1-5 years of working experience, 25.2% have 5-10 years of experience, 9.8% have 11-15 years of experience, 12.6% have 16-20 years of experience, and 5% have 21 years and above of experience in smoothing and wood-cutting. This shows that majority of the respondents are in their early years of work experience, having 1-5 years of working experience with few of them having over 10 years of experience in the work. This may be majority of the youth seeking job. The is in line with work of Osuchukwu et al.,(2015), reported the majority timber workers were predominantly within the age group of 20 - 49 years although a majority appeared to be below 40 years which is not unusual, as the work requires a high degree of physical manual labour more effectively carried out by younger adults. Majority of the respondents who were aware of the hazardous nature of wood dust (95.9%) reported that their sources of awareness were mainly by workplace experience, (54.6%) during training (34%), and health education programs (3.9%).

Awareness and safety practices on use of personal protective equipment and allergy symptoms experience by wood-cutting carpenters

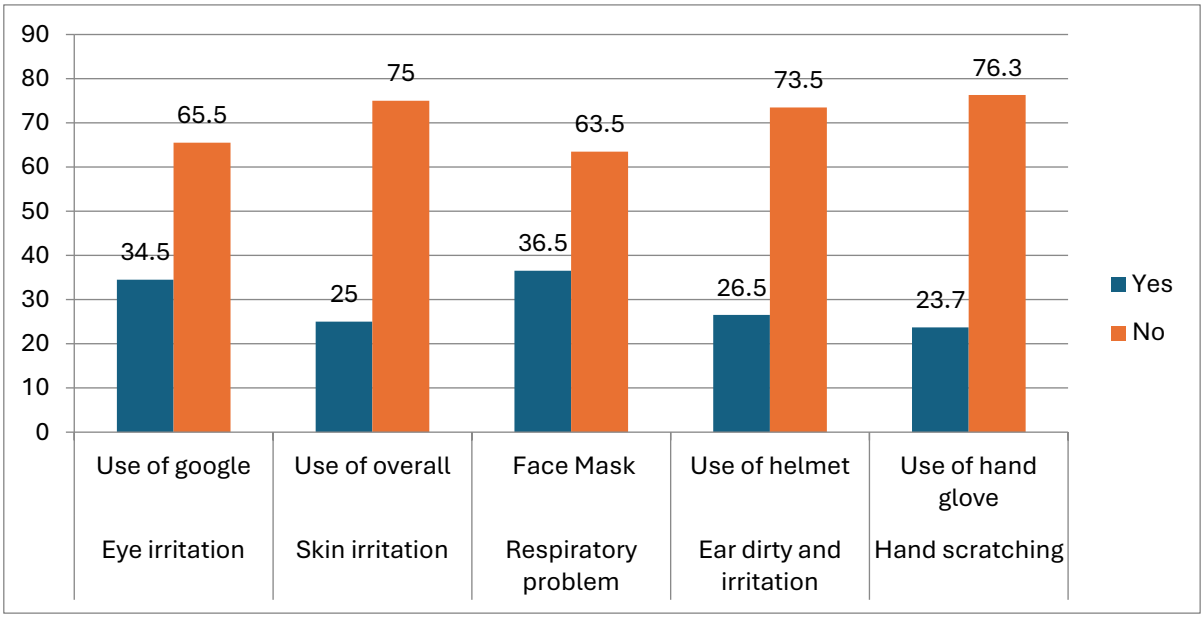


Figure 3.4.3 Influence uses of Personal Protective Equipment for Allergy Symptoms Experience by wood-cutting carpenters

Source: Field Work 2026

The result shows the wood-cutting carpenters' level of awareness on use of personal protective equipment (PPE) during wood sawing and smoothing. The result shows that about 34.5% are using protective eye goggle but 65.5% do not use protective eye goggle because of the low level of awareness on use of PPE and lacked law/policy enforcement on use of personal protective equipment PPE by wood-cutting carpenters' association. For skin dirty and irritation about 25% of the respondents wear protective clothing at work but 75% do not use protective garment. For respiratory problem, cough, throat and chest discomfort about 36.5% of the respondents are using face mask but 63.5% do not use face mask during their work. For ear dirty and irritation about 26.5% of the respondents are using helmet but 73.5% do not use helmet during their work. For hand scratches 23.7% of the respondents are using hand glove/socks but 76.3% do not use hand glove/socks. This lead exposure of their eyes, nose, ears, fingers/hands, and skin and affects their health, well-being, and their productivity. For example, eye irritation at some time with reddish when wood dust particles get into their eyes, noses and ears. The study is in line with findings of Emmanuel *et al,* (2016), who found that, in most situations more than one PPE is required for protection like facemask, hand gloves, eye goggle and coveralls may be necessary at same time for standard precaution. Availability of PPE when working in a place with obvious hazards is the commonest conditions that enable respondents comply with use of PPE (58.9% and 57.9% respectively). Fewer people (12.1%) comply with PPE when punishment is attached to non-compliance or forgetfulness among the workers. The work also in line with work of Annah, (2016) who found occupational injuries and illnesses are caused by inhalation of toxic dust and chemicals and that precautionary measure against exposures to hazards at the workplace by using PPE are still generally poor or nonexistent. other studies by Mitchual et al, (2015), observed that high level of awareness was irrespective of their educational background and probably due to the length of work experience. The effects of the

occupational hazards encountered were mainly nose, throat irritation and cough (32.9%), eye irritation and itching (21.9%), and the least was skin infection (2.9%). Although the majority of respondents were of the opinion that it was necessary to always protect oneself while working (85.6%); and that the hand glove (38.2%), protective garment (24.8%). the most important PPE to use, only about 3.8% of the respondents and none of the respondents mentioned face mask and respirators respectively as the most important PPE. The majority of the respondents reported the reasons for not using PPE were either due to forgetfulness (38%), affordability (34.3%), inconvenience (30.6%) and not being a necessity (28.9%). Close to half of the respondents (47%) did not sprinkle water on wood before sawing in order to reduce dust. In the event of fire or injury, none of the workshops had a fire extinguisher and most of them did not have or use first aid box (99.1%) but receive treatment when injured or ill from the chemist (70.2%). With respect to hygiene, all the respondents indiscriminately disposed of wood waste and most of them (88.4%) ate inside the workshop while work was going on. Though a majority washed their hands before eating (75.6%), they did not use their hands to eat at work (82.8%).

Overviews among wood-cutting carpenters on use personal protective equipment during wood sawing and smoothing

Table 3.5.2 Perception of Wood-Cutting Carpenters about the Use of Personal Protective Equipment

Items	Agree	Disagree	Total
Inadequate of Personal protective equipment	144(61.5%)	90(38.5%)	234(100%)
Personal Negligence and Misperception	155(66.2%)	79(33.8%)	234(100%)
Inadequate of law/Policy Enforcement	144(61.5%)	90(38.5%)	234(100%)
Inadequate of Awareness from Public, Media and use of Specialist advice	114(48.7%)	120(51.3%)	234(100%)

Source: Field Work 2026

The result shows the perceptions of wood-cutting carpenters why do not make use of personal protective equipment in which 61.5% of the respondents said that, inadequate of personal protective equipment is the reason behind of their lack of using the personal protective equipment when wood sawing, smoothing, as well as lording and off lording of woods from lorry but 38.8% disagree that inadequate of personal protective equipment was their reason for poor use of PPE during their work. Result also revealed that about 66.2% of the respondents agreed that their personal negligence and misperceptions on use of personal protective equipment was their reason for poor use of PPE during their work but 33.8% of the respondents were their reason for poor using personal protective equipment. Result also shows that 61.5% of the respondents agreed that, inadequate of law/policy enforcement by wood-cutting carpenters association on use of personal protective equipment is their reason for poor use of PPE during their work, but 38.5% of the respondents disagreed that inadequate of law/policy enforcement is the reason behind of their lack of using PPE during their work. In addition, about 48.7% of the respondents agreed that, lack of awareness by wood-cutting carpenters association and use of specialist advice on use of personal protective equipment were the reason for poor use of PPE among the wood-cutting carpenters in Kano metropolis, while 51.3% of the respondents disagreed that, were the reason for poor use of PPE during their work. This shows that inadequate personal protective

equipment, personal negligence and misperceptions on use of personal protective equipment, lack of law/policy enforcement on use personal protective equipment, and the lack of awareness from public, media, and use of specialists' advice on use of personal protective equipment were contribute to poor use of personal protective equipment among the wood-cutting carpenters in Kano metropolis. This study is contrast with findings of Emmanuel *et al,* (2016), who found that, in most situations more than one PPE is required for protection like facemask, hand gloves, eye goggle and coveralls may be necessary at same time for standard precaution. Availability of PPE and when working in a place with obvious hazards are the commonest conditions that enable respondents comply with use of PPE (58.9% and 57.9% respectively). Fewer people (12.1%) comply with PPE when punishment is attached to non-compliance or forgetfulness among the workers.

Studies by Ochire-Boadu et al, (2014), reported inadequate supply and discomfort as reasons for the low use of PPE, Mitchual et al, also reported the unwillingness to wear face shields probably due to discomfort and on the other hand, a willingness to wear hand gloves and protective garment probably influenced by their awareness of the need to wear them in order to protect themselves during wood processing. Study by Faremi et al, (2014), reported forgetfulness, inconvenience and not being a necessity as reasons for not using PPE; also, Osagbemi et al, (2010), reported nonavailability, not being a necessity, forgetfulness and inconvenience as reasons for non-use of PPE.

The hygienic practices of the timber workers appeared to be generally poor, where majority the respondents ate inside their workshops and did not wash hands before eating, indiscriminately disposed of waste wood. These practices further increase the risk of diseases and accidents in the workplace. The proper disposal of waste wood and the maintenance of proper hygienic and sanitary conditions are very importance.

Conclusion

The study concludes based on the research findings that, the wood-cutting carpenters are associated with risk and hazard due to exposure to pollution resulted from low level of awareness and safety practices on use of personal protective equipment (PPE) during wood sawing and smoothing. The allergic symptoms experienced include; respiratory infection, ear related disease, eye irritation, skin changes and irritation, chest discomfort, cough, back pain and headache. This is because of their exposure to wood dust. Other reasons includes their personal negligence in using personal protective equipment during wood sawing and smoothing, as well as lording and offloading of woods from lorry.

Recommendations

With regard to the result findings, the researcher makes the following recommendations:

1. Provision of awareness by the government on the effects of wood dust and their health risk, will helps the wood-cutting carpenters become aware of the effects of wood dust on their health risk. Expert advice from environmentalists, stakeholders, and medical doctors' prescriptions; can help the wood-cutting carpenters to be aware of the

occupational risk. Social media, print and electronic media can be used to broadcast the information to the wood-cutting carpenters and others members of community.

2. There is a need for empowerment by the Government and the wood-cutting carpenters association in providing adequate personal protective equipment (PPE), for the wood-cutting carpenters because of health hazards involved in the activities for example protective goggles, face masks, helmets, protective garment and hand gloves or sacks.
3. Government, nongovernmental organizations, or agencies, experts, medical doctors, environmentalists, and the wood-cutting carpenters association to create the massive awareness on impacts of use or misuse of personal protective equipment during their work. for example, the use of goggles can also reduce wood dust that enter their eye and cause eye irritation and redness. The use of face marks, also reduce inhaling of wood dust particles directly to their lung or throat. The use of helmets during loading and offloading can reduce wood dust that enters their ear during their work. Furthermore, the use of hand socks/glove can reduce hand scratching.
4. Law and Policy enforcement along with the involvements of Government and nongovernmental organizations/agencies, and taking actions or imposing penalty on any person (wood-cutting carpenters) who does not comply with law and policy of using personal protective equipment during their work. This can increase the level of using PPE among the wood-cutting carpenters during their work.
5. The wood-cutting carpenters association should encourage their members to undergo regular medical checkup on regular basis to enable them know their health status.

Declarations

Author contributions (CRediT): *Not applicable*

Funding: *Not applicable*

Conflict of interest: *Not applicable*

Ethics approval and consent (where applicable): *Not applicable*

Data availability: *Not applicable*

Use of AI tools (where applicable): *Not applicable*

Acknowledgements: *Not applicable*

References

Annah, M. K. (2016). *Level of Utilization of Personal Protective Equipment among Workers in Grain and Oil Seed Milling Industries in Nairobi City Country,* Department of Community Health.

Diwe, K.C., Duru, C.B., Iwu, A.C., Merenu, I.A., Uwakwe, K.A., Oluoha, U.R., Ogunniyan, T.B., Madubueze, U.C. and Ohale, I. (2016) Occupational Hazards, Safety and Hygienic Practices among Timber Workers in a South Eastern State, Nigeria. Occupational Diseases and Environmental Medicine, 4, 63-71

Emmaneal N. Aguwa,Sussan U.Arinze Onyia, Anne Ndu (2016). *Use of Personal Protective Equipment among Health Workers in a Tertiary Health Institution, South East Nigeria:* Pre-Ebola Period International Journal of Health and Sciences and Research

Faremi, F.A., Ogunfowokan, A.A., Mbada, C., Olatubi, M.I. and Ogungbemi, A.V. (2014) Occupational Hazard Awareness and Safety Practices among Nigerian Sawmill Workers. International Journal of Medical Science and Public Health, 3, 1244-124

Ibrahim, M, A. (2015). Road Network: *The Silent Treasure of Kano Metropolis*, 4(1), 1-8

International Labour Organization (2025). Safety and Health at work: Available at online at: http//www.Ilo.org.com

Jones, B. (2012). *Social and Environmental Impact of Charcoal Production*: Laberia University of Michigan Journal of Occupational Environmental Medicine 338;

Kevin C. Diwe, Chukwuma B. Duru, Anthony C. Iwu, Irene A. Merenu, Kenechi A. Uwakwe, Uche R. Oluoha, Tope B. Ogunniyan, Ugochukwu C. Madubueze, Ikechi Ohale(2016). Occupational Hazards, Safety and Hygienic Practices among Timber Workers in a South Eastern State; Nigeria Occupational Diseases and Environmental Medicine, 463-71http://www.scirp.org/journal/odem http://dx.doi.org/10.4236/odem.2016.43008

Mitchual, S.J., Donkoh, M. and Bih, F. (2015) Awareness and Willingness to Utilize Health and Safety Measures among Woodworkers of a Timber Processing Firm in Ghana. Journal of Scientific Research & Reports, 6, 178-188.

National Population Commission NPC (2016). P*opulation distribution by population distribution by sex, state, local government areas and senatorial district priority* volume 3 ,2006 population and housing census of Federal Republic of Nigeria Abuja, Nigeria.National Population Commission, National Bureau Statistics (web) Thomas Brinklioff 2020-07-25

Nabegu, A.B. (2010)' *An analysis of municipal solid waste in Kano Metropolis, Nigeria* A journal of human ecology,31(2);111-119 Olofin and Tanko, (2007). *Aspect of physical geography of Kano region and related human responses.* Hand book for students field trip, geography department Bayero University Kano.

Omoakin M. Jelili, Ismail S. Falaye Abiola(2015). *Charcoal Production in Oriire Local Government Area, Oyo State Environmental and Socio-Economic Questions*, Ladoke Akintola University of Technology Ogbomoso Nigeria, Civil and Environmental Research ISSN 2224-5790 Vol.7 no 12

Ochire-Boadu, K., Kusi, E. and Lawer, E.A. (2014) Occupational Hazards and Safety Practices: A Concern among Small Scale Sawmilling Industries in Tamale Metropolis, Ghana. International Journal of Scientific &Technology Research, 3, 234-236.

Osagbemi, G.K., La-Kadri, R.T. and Aderibigbe, S.A. (2010) In a Study on the "Awareness of Occupational Hazards, Health Problems and Safety Measures among Sawmill Workers in North Central Nigeria. TAF Preventive Medicine Bulletin, 9, 325-328.

Osuchukwu, N.C., Osuchukwu, E.C., Eko, J.E. and Otareh, O. (2015) Occupational Exposure to Wood Dust in Calabar Municipality, Cross River State, Nigeria. International Journal of Science and Research (IJSR), 4, 1414-1420.

OSH, (1999) Guide for Protecting Workers from Woodworking Hazards, Small Business Safety Management Series U.S Department of Labor Occupational Safety and Health Administration OSHA 315

Sabitu, K., Iliyasu, Z. and Dauda, M. (2009) Awareness of Occupational Hazards and Utilization of Safety Measures among Welders in Kaduna Metropolis, Northern Nigeria. Annals of African Medicine, 8, 46-51.

Ukrainian Biofuel Suppliers (2008). Cchemical Properties of Charcoal, http/ukrfuel.com/news-chemical- properties-of charcoal-23htpml World Health Organization (2011). Tackling the Global Clean Air Challenge 26 September 2011. Geneva, Switzerland.

World Health Organization (WHO) (2010). *Effects of activated charcoal: International agency research on cancer* https:/www.supper foodly.com/activated-charcoal-uses-effect

Weiner S. Alejandro L. Carmen R. Gonzolo M and Rafael L (2025). Impact of Personal Protective Equipment in Preventing Occupational Injuries: a systematic Review and Meta Analysis, Andrea Trevisan University of Italy

Wood Market Association (2026). Wood-Cutting Carpenters Kano Metropolis, Kano Nigeria