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Prevalence and injury patterns among electronic waste workers in the informal sector in Nigeria

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ABSTRACT

Background Despite the large volume of e-waste recycled informally, the prevalence of work-related injuries among e-waste workers is unknown. Therefore, this study assessed the prevalence, patterns and factors associated with occupational injuries among e-waste workers in the informal sector in Nigeria.

Methods This cross-sectional study adopted a multistage sampling method to select 279 respondents from three cities (Ibadan, Lagos and Aba) in Nigeria. A questionnaire was used to obtain information on sociodemographics, work practices and injury occurrences from the respondents in 2015. The data were analysed using descriptive statistics and standard logistic regression.

Results We found high injury prevalence of 38% and 68% in 1–2 weeks and 6 months preceding the study, respectively. The most common injuries were cuts (59%). Injuries were mainly caused by sharp objects (77%). The majority (82%) of the injuries occurred on the hands/fingers. Despite the high occurrence of injury, only 18% of the workers use personal protective equipment (PPE) and 51% of those that use PPE got at least an injury in 1–2 weeks and 88% got at least an injury in 6 months preceding the study. The factors associated with injury in 1–2 weeks were job designation and the geographical location, while the factors associated with injury in 6 months were job designation, geographical location and age.

Conclusions There is a high prevalence of injury and low use of PPE among the e-waste workers in Nigeria. Occupational injury can be reduced through health education and safety promotion programmes for e-waste workers.

INTRODUCTION

Electrical and electronic waste (e-waste), also known as Waste Electrical and Electronic Equipment, consists of electrical and electronic devices (including all its components such as batteries) that are discarded by the owner as waste without intent of reuse and are at the end of their useful life.[1–4] The contemporary advancements in technology have led to an exponential demand for electronic equipment and a rapid increase in the rate of e-waste generated in all countries.[1] e-Waste is one of the fastest growing municipal waste streams. Globally, an estimated 41.8 million metric tons of e-waste were generated in 2014, and it is estimated to increase to 50 million metric tons by 2018.[1] e-Waste contains over 1000 different substances, some of which are harmful substances such as heavy metals (lead, mercury, cadmium and arsenic beryllium) and persistent organic pollutants (like polychlorinated biphenyls and brominated flame retardants). e-Waste is chemically and physically different from other forms of general waste, and therefore requires special handling to avoid environmental contamination[4] and health problems.[5 6] About 80% of the e-waste generated are recycled informally in developing countries, and it is mostly being disposed together with the general waste stream.[7–9]

In many developing countries, the demand for contemporary technology has largely been met through the import of used electronic products from developed countries.[10] At the same time, developing countries lack the infrastructure and technology to manage the electronics in an environmentally responsible manner when they reach the end-of-life (ie, when they become e-waste). e-Waste is therefore managed/recycled informally under dangerous working conditions, putting human health at risk.[6 8 11] The term 'informal' is often characterised as lacking official governance, regulation, structure and institutionalisation and registration.[12 13] In the informal sector, most of the workers are self-employed and they work mainly for economic benefits, as e-waste recycling has become an attractive source of employment and income in developing countries,[2 12] with businesses ranging from one-man business to small family-based networks and to large and well organised trading firms.[14] Informal e-waste recycling is the recovery of valuable materials that involves labour-intensive manual dismantling, isolation of materials and open burning. These processes release hazardous substances during manual dismantling, smelting, burning and incomplete combustion of e-waste components. Labour standards are not enforced, while work practices are harmful to human health,[2 12] and there are limited or no measures to prevent environmental contamination and health problems.[2 5 12–14] However, it is recognised that informal recycling produces purer materials than formal recycling.[13]

Nigeria imports the largest volume of new and used electronic and electrical equipment in Africa.[12 14] About 50% of electronics used in Nigeria are imported as second-hand (used) electronics. About 25%–75% of the imported second-hand computers are non-functional or unrepairable.[14 15] This leads to rapid accumulation of large volumes of e-waste that are recycled informally to recover valuable materials.[4 12] Nigeria generated about 219 kt of

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e-waste in 2014,[1] which are largely recycled by the informal sector.[14] Nigeria is a signatory to international treaties (such as Basel Convention)[15] and has national legislation on e-waste management designed to reduce informal recycling of e-waste[14 16]; however, the enforcement of the legislation is at its ebb. There is generally low public awareness of the environmental and health risks associated with informal recycling of e-waste even among the e-waste workers.[2 14 17] e-Waste workers work without personal protective equipment (PPE), exposing themselves to hazardous substances and occupational injuries that could be exposure routes to hazardous substances.[2 18 19]

Despite the high volume of e-waste recycled in Nigeria, there are no publications on the injuries among e-waste workers. As far as we are aware, the only publication on occupational injuries among informal e-waste workers is one qualitative study in Ghana, which studied the health-seeking behaviour of the e-waste workers when they are sick or sustain injury at work.[19] The first step to injury prevention is knowing the magnitude of the problem. Therefore, the availability of statistical data on work-related injuries is important.[20] To provide sustainable injury prevention programmes for informal e-waste workers, there is a need to have an understanding of the exposure to hazardous substances via occupational injuries, the use of PPE and the effectiveness of PPE use. This study therefore assessed the prevalence, patterns and factors associated with occupational injury for e-waste workers in the informal sector in Nigeria.

METHODS

The study was conducted in three study locations/cities (Ibadan, Lagos and Aba) in Nigeria. Nigeria is grouped into six geopolitical zones. The three locations are among the large cities where e-waste is recycled. Ibadan (in Oyo State) and Lagos are located in the South-Western and Aba (in Abia State) is located in the South-Eastern geopolitical zones of the country, respectively.[14] Figure 1 presents a map of Nigeria showing the study locations.

A cross-sectional study design was used to gain understanding of prevalence and potential factors associated with occupational injury among informal e-waste workers in Nigeria. A multistage random sampling technique was used to select the 279 e-waste workers from the three study locations. The sample size for the study was determined by using the formula for comparison of two means [$n=2\sigma^2 (Z_{\alpha/2}+Z_{1-\beta})^2/(\mu_1 - \mu_2)^2$]. The design of the study was to compare e-waste workers to a control group for some health outcomes; one of the health outcomes considered was occupational injury, but this paper focuses only on the occupational injury among e-waste workers. The sample size calculation gave a minimum of 74 participants in each study location.

$$n = \frac{2\,\sigma^2\,(Z_{\alpha/2} + Z_{1-\beta})^2}{(\mu_1-\mu_2)^2} = 67$$

Where, n = required sample size

$Z_{\alpha/2}$ = standard normal deviation corresponding to 95% confidence level set at 1.96.

$Z_{1-\beta}$ = standard normal deviation corresponding to 80% statistical power set at 0.84.

σ^2 = SD of the outcome at 19.48.[21]

μ_1 = mean outcome of experimental group at 134.04.[21]

μ_2 = mean outcome of control group at 124.95.[21]

Adjusting for 10% non-response rate

nf = n/1 – NR

Where nf = adjusted sample size due to attrition.

NR=10% non-response rate,

nf=67/1–10%=74 (minimum sample size for each study location)

The e-waste workers were split into two job designation groups (repairers and dismantlers) because their activities are largely different. The repairers are those that repair or refurbish electronics, while the dismantlers comprise collectors/scavengers, dismantlers and burners of e-waste to recover valuable materials. Most of the dismantlers are involved in all three activities depending on available jobs. For this study, two major e-waste recycling areas were selected in each study location. In each selected study area, two sampling sites were randomly selected to ensure sufficient and inclusion of various types/groups of e-waste workers. The sampling sites comprise hundreds of units/clusters/shops where e-waste is either repaired/refurbished or dismantled/recycled. Systematic random sampling was used to select the sampling units. The participants were selected from the sampling units. These stages of selection were to ensure that the selected participants are a representative of the selected area and to reduce the likelihood of selection bias. The eligibility criteria for selection of the participants included: (1) the participant must be at least 18 years old and (2) must have worked in the informal e-waste recycling sector for at least 1 year. In Ibadan, Ogunpa and Queens Cinema areas were selected. In Lagos, Computer Village Ikeja and Alaba International Market were selected. In Aba, Cemetary and Aba shopping centre areas were selected (Aba shopping centre comprise of St Micheals/Jubilee roads area). Figures 1 and 2 present the study locations and a schematic diagram of the sample selection, respectively.

Data collection

A semistructured interviewer administered questionnaire (see online supplementary material S2) was used to obtain information from the respondents between May and October 2015. One week prior to the actual data collection period, the questionnaire was pretested at an area different from the selected sampling areas and the questions were modified based on the experiences gained during the pretest. During data collection, regular supportive supervision and discussion among research assistants and supervisors was done on the spot at the end of each day by the investigator to monitor and ensure quality data collection process. The workers were interviewed on their sociodemographic characteristics, work practices, trainings, injuries sustained at work and other health-related questions. Injury was considered as a physical harm or damage to someone's body caused intentionally or unintentionally.[22 23] We also collected information on body pains as a result of their jobs in the last 12 months before the study.

Variable description

Outcome variables: the outcome of interest considered were occupational physical and blunt injuries. We also collected information on the body pains they experienced as a result of their job. We asked the participants if they had ever sustained an occupational injury. To get an idea of the frequency of such injuries, we asked whether it had occurred and the number of injuries within the last 1–2 weeks and 6 months before the study. Injury occurrence was grouped into: has ever got injury, injury within 6 months and injury in 1–2 weeks before the study. Injury occurrence was categorised into yes=1 and no=2. We compared the 1–2 weeks period with the 6-month period, because we expected a recall bias in the 6 months' timeline compared with the 1–2 weeks' timeline.

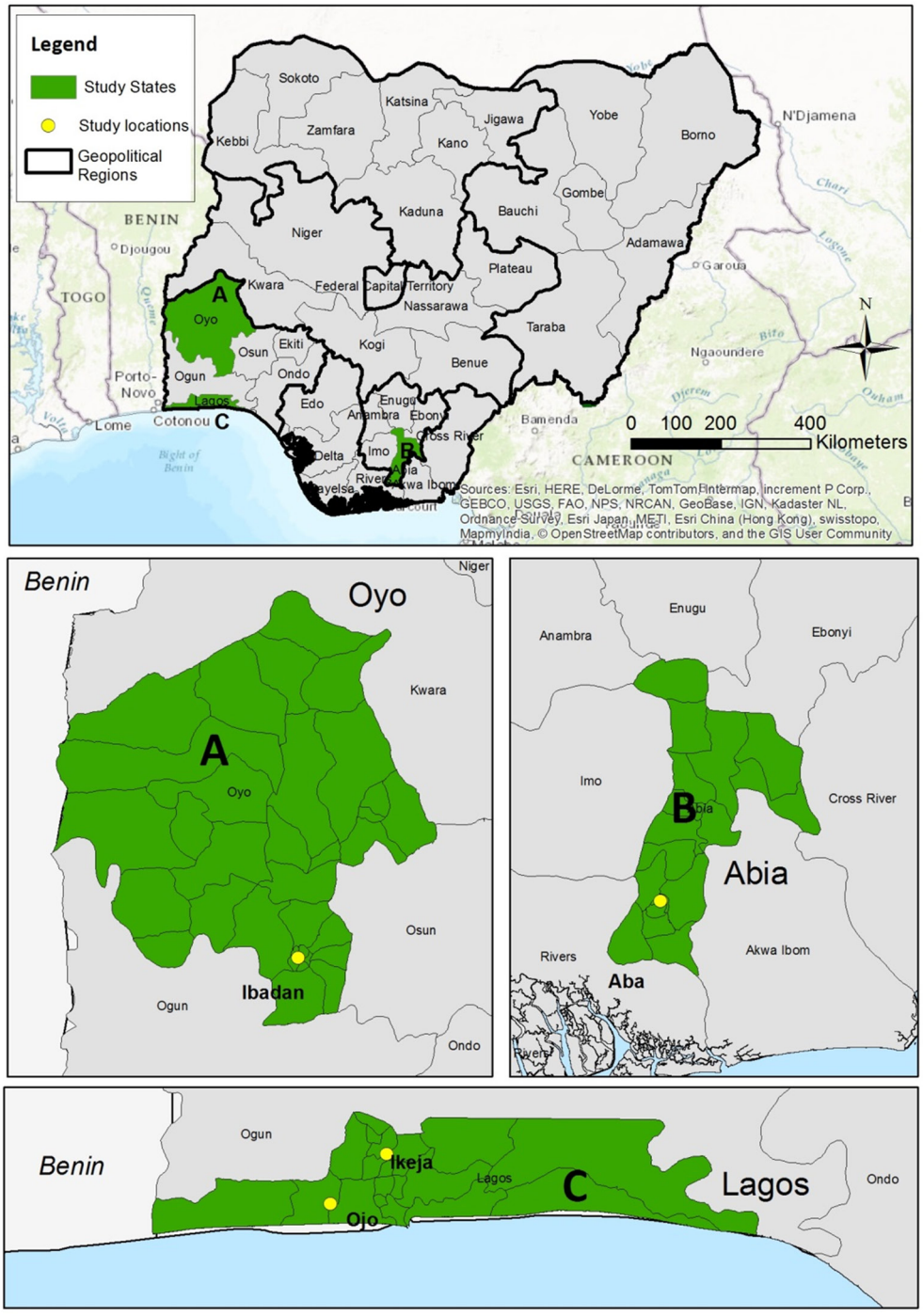

Figure 1 Map of Nigeria showing the three study locations.

Explanatory variables selected were: job designation, location, education, age, position in business, number of work-hours per day, number of work-years (work experience), income and use of PPE. For this study, gloves, work shoes/boots, nose mask (or cloth handkerchief improvised as nose mask), safety glasses/eye protection, ear plugs and coverall/protective work clothes were considered as PPE.[24]

Data analysis

Prior to data analysis, all questionnaires were reviewed for completion and accuracy and compiled in a database. Incomplete questionnaires were removed. Descriptive statistics (frequencies and percentages) were used to summarise the results. χ^2 tests were used to determine associations between injury occurrence and explanatory/independent variables for injuries (the online supplementary tables present the results of the cross tabulations). However, independent of the χ^2 test being statistically significant or not, all the explanatory variables were tested for multicollinearity. The data were further analysed using standard logistic regression using the forward (Wald) selection method based on Wald statistics to select the best minimal model. All analyses were performed using SPSS V.23.0.

Ethical considerations

Ethical approval was obtained from the University of Ibadan/University College Hospital Ethical Review Board. Verbal and

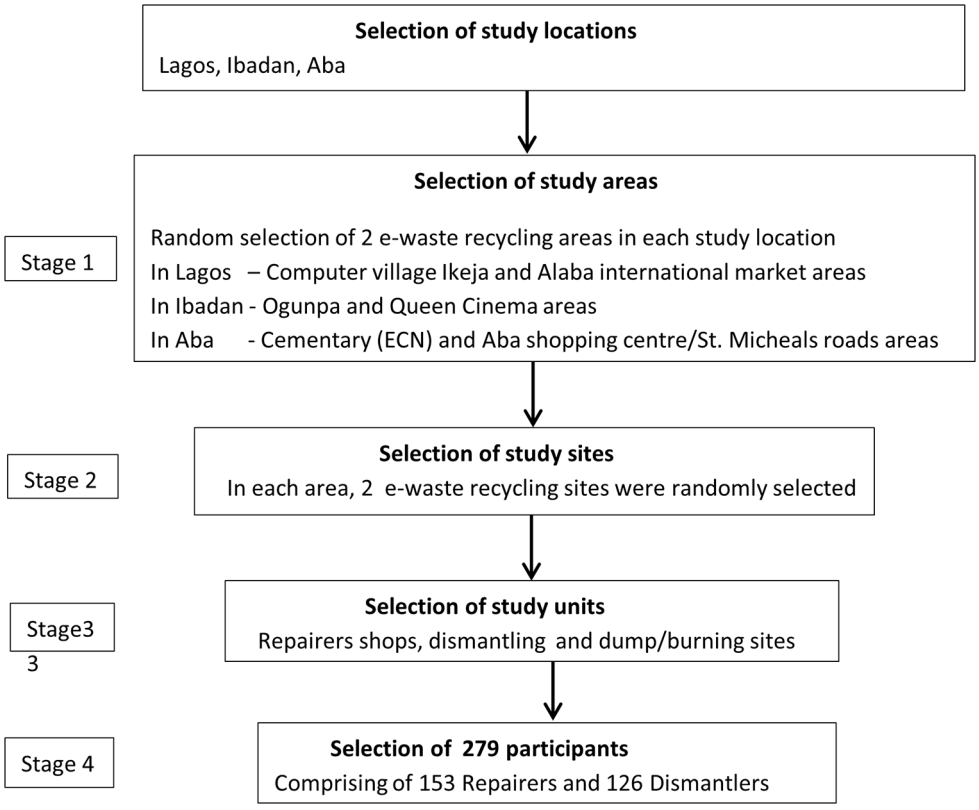

Figure 2 Flow diagram for sample selection.

written consent was obtained at the start of the interview, after explaining to the e-waste workers their full rights to refuse and to withdraw at any time during the interview. To ensure that the participant remains anonymous each questionnaire was coded with number identifiers. They were also assured that the data will not be used for other purposes than science and the development of safety promotion programmes for the sector.

Results

Sociodemographic and occupational characteristics of the respondents

A total of 279 (99% males and 1% females) e-waste workers were interviewed, comprising 55% of repairers and 45% of dismantlers. The mean age of the workers was 30±9 years (repairers: 32±8 and dismantlers: 29±9). Years spent on the job ranged from 1 to 32 years, and most (98%) of them work 6 days a week. The mean number of working hours per day was 9±2 hours, which is longer than the normal eight working hours in Nigeria. More than half (55%) of the respondents worked for themselves, 39% were employees/apprentices and 5% worked in the family business. A majority (89%) of the respondents worked full-time. Regarding their educational status, about 68% had secondary, 16% had postsecondary, 11% had only primary and 4% had no formal education. However, 81% of the workers had some training on e-waste handling before starting the work, although most (98%) of the training was on-the-job training. Table 1 presents more information on the sociodemographic characteristics of the participants.

Use of PPE

About 35% of participants in Aba, 17% in Ibadan and 7% in Lagos used PPE. Only 18% used PPE always, or most-of-the-time or occasionally. Among those that used PPE, only 6% used PPE always. About 82% of the workers do not use any PPE. Reasons for not using PPE ranged from 'it is not important/I do not need PPE' (57%), 'uncomfortable' (12%), 'expensive' (11.7%), 'not available' (11.4%) and 'no particular reason' (7.6%). Among those that used PPE, 13% used gloves, 7% used nose masks and 8% used boots. None of the participant used ear plugs, safety goggles and coverall/protective wears. Figure 3 contains information on use of PPE among the workers and reasons for not using PPE.

Occupational injuries

Figure 4 presents information on injury occurrence among the workers in the timelines studied. We found a high injury prevalence of 38% (dismantlers 25% and repairers 13%) and 68% (dismantlers 37% and repairers 31%) in the last 1–2 weeks and 6 months and preceding the study, respectively, and 89% of the respondents (dismantlers 99% and repairer 80%) reported that they had sustained an injury at least once. The mean number of injuries sustained in 1–2 weeks was 1±1.5. More (56% and 81%) of the dismantlers compared with repairers (23% and 57%) had been injured in 1–2 weeks and 6 months, respectively. Common types of injuries sustained were cuts (59.5%), blunt injury/contusions (16%), electric shocks (14%), burns (10%) and falls (0.5%). Injuries were mainly caused by sharp objects (77%) and hammer hits (23%) during dismantling. Also 29% of the participants complained of lower back pain, shoulder pain (14%), neck pain (10%) and chest pain (5%) in the last 12 months before the study; however, 59% reported not having any pain as a result of their jobs in the last 12 months. The majority of injuries (73%) occurred on the hand/finger, 7% on the leg/foot, 5% on the chest/cough, 4% on the neck/shoulder and about 11% reported

Table 1 Sociodemographic characteristics of all the e-waste workers

Demographic characteristics		Job designation		
		Repairers=153 (54.8) n (%)	Dismantlers=126 (45.2) n (%)	Total=279 (100) N (%)
Location	Lagos	67 (43.8)	44 (34.9)	111 (40)
	Ibadan	48 (31.4)	42 (33.3)	90 (32)
	Aba	38 (24.8)	40 (31.7)	78 (28)
Age	30 years or less	79 (51.6)	81 (64.3)	160 (57.3)
	More than 30 years	74 (48.4)	45 (35.7)	119 (42.7)
Education	No formal education	0 (0)	12 (9.5)	12 (4.3)
	Primary	8 (5.2)	23 (18.3)	31 (11.1)
	Secondary	105 (68.6)	85 (67.5)	190 (68.1)
	Postsecondary	40 (26.1)	6 (4.8)	46 (16.5)
Training	Yes	125 (81.7)	101 (80.2)	226 (81)
	No	28 (18.3)	25 (19.8)	53 (19)
Type of training received	On-the-job training	148 (96.7)	126 (100)	274 (98.2)
	Training by an expert	5 (3.3)	0 (0)	5 (1.8)
Kind of employment	Permanent	136 (88.9)	112 (88.9)	248 (88.9)
	Temporary	17 (11.1)	14 (11.1)	31 (11.1)
Position in business	Business owner	98 (64.1)	56 (44.4)	154 (55.2)
	Employee/apprentice	50 (32.7)	60 (47.6)	110 (39.4)
	Family business	5 (3.3)	10 (7.9)	15 (5.5)
Years of work experience	1–10 years	115 (75.2)	101 (80.2)	216 (77)
	More than 10 years	38 (24.8)	25 (19.8)	63 (23)
Work-hours/day	8 hours or less	48 (31.4)	26 (20.6)	74 (26.5)
	More than 8 hours	105 (68.6)	100 (79.4)	205 (73.5)
Income	N2000 or less	86 (30.8)	84 (30.1)	170 (60.9)
	N2001–N5000	36 (12.9)	27 (9.7)	63 (22.6)
	More than N5000	31 (11.1)	15 (5.4)	46 (16.5)

that they never got injury at work. The majority (90%) of the workers perceived injuries from e-waste as mild/moderate. The majority (72%) of the workers reported that most of the injuries can occur at any time, while 18% indicated injuries to occur in the afternoon, 6% at night and 4% in the morning. Fifty per cent of the participants in Aba, 39% in Lagos, and 26% in Ibadan reported getting injured in 1–2 weeks before the study. More of the dismantlers (56% and 81%) compared with repairers (23% and 57%) got injured in 1–2 weeks and 6 months, respectively; 51% of those that used PPE got injured within 1–2 weeks and 88% got injured within 6 months preceding the study. More information on the prevalence of injury among the workers are in online supplementary tables.

The multicollinearity test revealed a correlation between job designation and educational status, position in business, income and use of PPE. There were also correlations between location and educational status and between years of work experience and age. Table 2 presents the OR estimates based on models of sustaining injury in 1–2 weeks and 6 months preceding the study. Bivariate logistic regression analyses indicated that job designation (type of job performed) and location were associated with sustaining injury in 1–2 weeks before the study. Notably, repairers are more likely to report injuries compared with dismantlers, and e-waste workers in Ibadan and Lagos are more likely to report injuries compared with those in Aba. The last two columns of table 2 present risk factors associated with injury within 6 months. The risk factors were job designation, location and age, indicating likewise that repairers are more likely to report injuries than the dismantlers and e-waste workers in Lagos and in Ibadan are more likely to report injuries than those in Aba. Younger people are at higher risk of sustaining injury compared with older people.

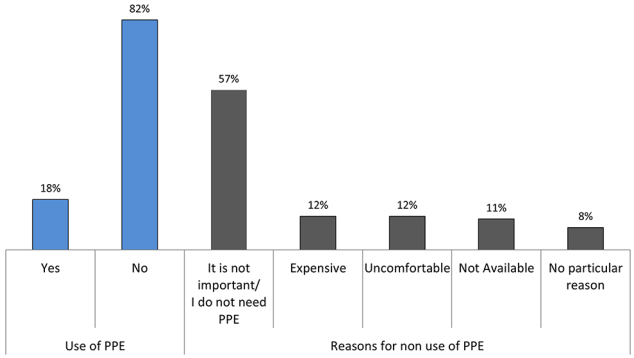

Figure 3 Use of PPE and reasons for non-use of PPE.

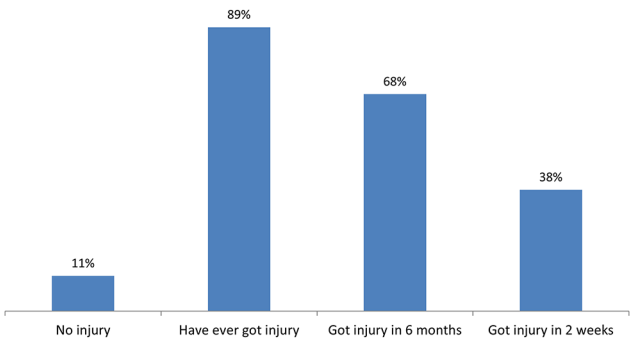

Figure 4 Prevalence of injury.

Table 2 Predictors of injury in 1–2 weeks and 6 months

Predictors		Injury in 1–2 weeks OR (95% CI)	p Value	Injury in 6 months OR (95% CI)	p Value
Job designation	Dismantlers				
	Repairers	4.214 (2.517 to 7.057)	0.000		
Location	Aba				
	Ibadan	3.110 (1.557 to 6.212)	0.001		
	Lagos	1.394 (0.745 to 2.610)	0.298		
Job designation	Dismantlers				
	Repairers	–		2.968 (1.652 to 5.334)	0.000
Location	Aba				
	Ibadan	–		8.071 (3.068 to 21.234)	0.000
	Lagos	–		11.773 (4.549 to 30.466)	0.000
Age	Age			1.041 (1.006 to 1.076)	0.020

DISCUSSION

As far as we are aware, this is the first study to quantify occupational injuries among e-waste workers in the informal sector in Africa. Literature on health-related issues among e-waste workers[5 6 18] tends to provide general overviews but provides no quantitative data that can be monitored over time to measure progress or regress in health and safety issues. The strengths of this study are its focus on the informal e-waste recycling sector that is not commonly studied, large sample size and distribution of respondents across three major cities in two different geopolitical zones in Nigeria, quantification of injury prevalence in 1–2 weeks in this sector and comparison of injury prevalence in difference timelines. However, accuracy of the data is dependent on the ability of the respondents to recall frequency of injuries.

This study revealed a high injury prevalence of 38% and 68% in the last 1–2 weeks and 6 months before the study respectively, and only 18% of the workers used PPE. These findings are in line with the findings of a qualitative study in Ghana where the e-waste workers reported high frequency of injuries and no use of PPE.[19 25] Despite the high prevalence of injury among the dismantlers, the real proportion of dismantlers that got an injury in the timelines studied is expected to be higher than what they actually reported, because most of the dismantlers regarded only deep cuts with blood gushing as injuries, whereas minor and blunt injuries seem normal and are even unnoticed. The repairers are more educated than the dismantlers; they are therefore able to better and more accurately recognise and report both minor and major injuries than the dismantlers, although dismantlers do more dangerous job than repairers. This observation reveals a gross under-reporting of work-related injuries among informal recyclers as supported by Gutberlet and Baeder.[26] In addition, 29% of the participants complained of lower back pain, which is in accordance with studies that reported lower back pain as one of the most common occupational injuries.[27] The pains complained about by the participants could be a result of lack of proper physical ergonomics at work caused by working postures, repetitive movements, heavy lifting, workplace layout and other forceful manual exertions. Despite the high prevalence of injuries, the e-waste workers do not consider injury at the work place as being problematic. This shows that common everyday risks are under-rated.[28]

We consider open wound injury as an additional exposure route to hazardous substances, which implies that injuries enhances the exposure to hazardous substances. The injury prevalence in this study is higher compared with studies conducted in a similar settings among waste pickers in Nigeria within a 6-month period[29] and in Ethiopia within a 12-month period among small and medium scale industry workers.[30 31] This suggests that e-waste workers may be more at risk than workers in other fields of the same informal sector. The difference in injury occurrence between the two timelines is certainly not linear because the same workers may have got injured multiple times over the study period. Alternatively, we assumed that some of the injuries sustained in the 6 months preceding the study may not have been captured because there could be recall bias as some workers may forget some minor injuries sustained within a 6-month period and better remember those injuries that they sustained in a 1–2 weeks recall period.

Regarding use of PPE, the main reasons for not using PPE were 'it is not important', 'discomfort', 'cost' and 'unavailability'. It is important to state that if a worker does not consider PPE as important, the worker consequently considers the costs of PPE as expensive; as a result, PPE is not available for use. A worker's perception of the importance of the use of PPE, determines the possession, availability and actual use of PPE. The benefits of using PPE cannot be overemphasised considering the health effects of exposure to e-waste harmful substances.[5 6] Surprisingly, the use of PPE was not predicted as a factor associated with risk of injury. This finding contradicted the qualitative study by Yu *et al*,[32] which state that use of PPE will reduce risk of injury among informal e-waste workers in Ghana. It also contradicted a study among miners where use of PPE was associated with risk of injury.[33] In our study, use of PPE was associated with a higher reported occurrence of injuries. This finding suggests that use PPE helps to create some awareness of potential risks of injuries among those that use PPE.

The findings of our study suggested job designation as a risk factor for injuries among e-waste workers. This is in line with a study among Mexican workers that predicted job designation as a risk factor for injury.[34] Location as a factor may be attributed to the fact that different locations may have differing work practices. This is in accordance with the study by Gonzalez-Delgado *et al,* which found work environment and workplace conditions as risks factor for injury.[34] Furthermore, our study revealed age as a risk factor for work injuries; this was in accordance with the study by Concha-Barrientos *et al*,[28] as this study showed that younger people (≤30 years) and those who had worked for less than 10 years in the recycling business seemed to have more injuries compared with those who had worked for more than 10 years or who were older than 30 years. This could be because younger people are mostly new in the business or are apprentices/new employees, and they do the more dangerous jobs. However, Breslin and Smith[35] stated that the reasons for higher work-related injuries among younger workers could include

What is already known on the subject

- E-waste contains hazardous substances.
- E-waste is recycled informally in an unsafe manner without caution to health and environment in developing countries.

What this study adds

- This is the first study that quantified occupational injuries among e-waste workers in the informal sector in Nigeria and beyond.
- The study reveals the prevalence, patterns and factors associated with occupational injury in informal e-waste recycling sector.
- The presentation of quantitative data on work-related injuries among e-waste workers will contribute to planning for health and safety programmes for e-waste workers in the informal sector, which can be extended to other informal sectors.

Policy implication

- There is need for work-place policy development to recognise the informal sector considering that the informal sector employs more than 50% of the working population in Nigeria.

shorter/lack of work experience and skill, lack of use of PPE, lack of supervision and lack of training. If these factors are taken care of, age may not be a predicting factor. About 74% of the participants worked more than 8 hours per day, which is more than the normal working hours in Nigeria.[36] However, our study did not predict duration of work-years and work-hours per day as risk factors of work injuries. This contradicts the findings of Berecki-Gisolf *et al*[37] and Dembe *et al*,[38] as these authors stated that long work hours contribute to risk of work injury.

LIMITATION

The accuracy of the data is dependent on the ability of the respondents to recall frequency of injuries.

CONCLUSIONS

The findings of this study are a wake-up call on the need for safety promotion programmes in the e-waste recycling sector in Nigeria. The high prevalence of injury among the e-waste workers and low use of PPE give an insight into the high risk of exposure to hazardous e-waste chemicals and the magnitude of the health problems the e-waste workers are likely to suffer in the future considering the fact that the majority of them do not use any form of PPE. There is a need for educational campaign on the health and environmental effects of informal e-waste recycling among the workers. Free PPE could be provided to the workers since the use of PPE will increase the safety awareness among the workers. Furthermore, there is a need for further research on e-waste workers' knowledge, practice and other health outcomes they experience. Similarly, a research on the environmental risk assessment would give a deeper understanding of how many Nigerians are exposed to the harmful e-waste chemicals and to which extent they are exposed. Our study highlights the importance of occupational safety intervention in all informal sectors in Nigeria.

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Contributors This study is part of the PhD research of OCM. OCM conceived the study, carried out the literature review, developed the data collection and analysis plan, collected data, analysed the data, drafted the manuscript and provided a critical revision to the manuscript. WJGMP, MGV and OO are the supervisors and were involved in the study design, the development of the data collection plan, the revision of the various versions of the manuscript and made contributions to the manuscript. PMvB was involved in all stages of the write-up and the revision of the manuscript contributed to the data analysis and advanced statistical procedures. AOO contributed to the conceptualisation, design and revision of the manuscript. All authors approved the final manuscript.

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