

## **Picking Waste, Discarding Health? Awotan Waste Pickers' Health Perceptions And Practices In Ibadan city.**

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### **Abstract**

Urban waste picking is assuming more visibility in the Nigerian informal economy with its waste to wealth potential. A growing body of literature identifies this activity as a viable source of income which leaves pickers vulnerable to health hazards inspite of little formal recognition by the state. Although persistent forays into this as a livelihood activity continues, more research is needed to properly understand the social dimensions of this issue. The study examined waste pickers risk perceptions, safety practices and public attitudes at work at Awotan landfill in Ibadan. Primary data was collected through questionnaires administered to 81 active pickers on site. Data was analyzed using inferential statistics. Results indicate that most pickers had at least a primary school level of education. There were twice as more males than females. More than 70% indicated the most prevalent health problem encountered at work were serious punctures and injuries from sharp objects followed by diarrhoeal and typhoid infections. 88% felt that their work type impacted on their health in hazardous ways such as snake bites and stings, falls and slips and held strong perceptions about the work-health implications for illnesses. Hospital waste was the most feared due to its association with probable blood infections from used needles, blood/body waste. Public attitudes to pickers while working was often negative. There is a very high risk of exposure to pathogens at work and study results may inform health policy on direct points of intervention for workers amidst continued interaction with waste

**Keywords:** Awotan landfill, Ibadan, Waste picker, health hazard, Perceptions

**Word Count:** 250

## **1.Introduction and Problem statement.**

Waste picking as a livelihood activity has come under increased scrutiny in recent times due to its pervasive presence in many developing countries such as Bangladesh, Philippines, China, Mozambique and even Nigeria which battle with solid waste management issues. Although many such Governments have attempted to rise to the task of efficiently dealing with waste, such efforts have been largely ineffective and inadequate to curtail the problem. Waste pickers have arisen as part of the informal systems' response to manage waste following strident international calls to reduce, reuse and recycle waste to save the environment. Waste picking involves waste harvested from garbage and rubbish heaps being salvaged or recycled into subsistence use or often sold to middlemen, merchants or organised collectors (Vasine 2020, Ogbonna et al 2008; Gutberlet et al 2020). Waste picking has become an important aspect of informal waste recycling studies in recent times (Nzeadibe et al 2019; Onesmo 2023; Morais et al 2022; Gutberlet et al 2020) yet issues surrounding waste picker health risk perceptions remain unclear. Investigations have confirmed that waste pickers are often poor people with little or no education, who make far less money from pickings than the merchants they sell them to (Hoque et al 2022; Abogye Larbi et al 2014; Nyathi 2018). Research has also deemed the challenging economic climate in many developing countries a push factor contributing to the increased entrance of many into the waste picker situation (Ali & Yusuf 2021; Araujo and Tatiana 2022). Societally, many waste pickers are treated as illegal trespassers when scavenging around at work, usually facing some form of harassment particularly from law enforcement agents (Vasine 2020; Onesmo 2023; Dias et al 2016). Being a physically exerting and dangerous job (Araujo and Tatiana 2018; Aboagye-larbi et al 2014; Afon 2012; Morais et al 2022; Hunt 2001), waste picking requires physical stamina to carry heavy pickings for hours over long distances (Zolnikov et al 2021). This necessarily affects the pickers' wellbeing (Nzeadibe et al 2020) and their health often being associated with Musculoskeletal pain, helminth infections (Ali & Yusuf, 2021, Hunt 2001) and sometimes malaria (Hoque et al 2022). Most workers lack personal protective equipment and by inference are at serious risk of contracting infectious diseases while working (Tooher et al 2005), the most common disease outcomes being dermal (Zolnikov et al 2021). As a job at risk due to contact with toxic chemicals, decomposing waste (Araujo & Tatiana 2022), pickers have been reported to suffer from injuries and common diseases more than the average population (Omosimua et al 2020) which may likely be controlled by vaccination (Schenck et al 2021; Tooher et al 2005).

Although some few researches have attempted to focus on the negative implications of this occupation on waste pickers' health (Morais et al 2022, Hoque et al 2022, Gutberlet 2016) it remains unclear what the health risk perceptions and health habits of these waste picker are (Vrijheid et al 2000). Current research is beginning to look closely at more behavioural analysis in seeking to uncover new insights on this population. The study contributes further insight into waste picker socio-economic characteristics, demographics, perception and health practices particularly with reference to Ibadan. The Awotan landfill is listed as one of the world's 50 largest dumpsites (World Atlas 2014), with a reputation of receiving more than 78,000 tonnes of waste annually (OYOWMA 2017) and is a likely source of pollution for nearby ground waterbodies (Osinowo et al 2017). An exploratory 2014 study on Awotan landfill waste pickers was an eye opening assessment of the social conditions of waste pickers traversing the dumpsite (Awopetu 2014). While the findings indicated that pickers rarely used any personal protective materials and earned higher than the Government approved minimum wage, the last 17years has witnessed several social, economic and political changes that warrant a review of waste picker behaviour in Awotan to derive new insights that can inform policy decisions that will strengthen their livelihood and wellbeing. The study utilizes the Health Belief Model as its conceptual framework. The research questions for this study are as follows: What are the socioeconomic characteristics, perceptions and health promoting habits waste pickers have? What changes have occurred in waste picker behaviour over the last 17 years?

The study is aimed at assessing the current working conditions, health risk perceptions and health promoting habits of waste pickers at Awotan landfill. Given the urgent need to address the potential health impacts of waste picking (Cruvinel et al 2019), this research will help generate local data on picker behaviour that will aid in making data from Awotan landfill more useful for comparative occupational health studies. It will also supply data that can help raise awareness on health risk perceptions.

#### **4. Materials and Methods**

##### **4.1. Study Area and Sampling Procedure**

Ibadan, the capital of Oyo state is one of the largest indigenous cities in tropical Africa. Located between longitude 7<sup>o</sup>20'1E and 7<sup>o</sup>40'1E and latitude 3<sup>o</sup>35'1 and 4<sup>o</sup>10'1, Ibadan is a city that has witnessed significant increase in areal size and population since its establishment in 1829. Population estimates hovers around 4 million (Ola and Suleiman 2022). Ibadan is made up of 11 local government areas (LGAs) out of which five are designated as urban and the

remaining six rural. The State run statutory body Oyo State Solid Waste Management Authority (OYOWMA 2017) handles waste collection, processing and disposal in the city (Wahab and Ola 2017). As it occurs in many developing countries, the most typical waste management method is disposal into landfills (OYOWMA 2017).

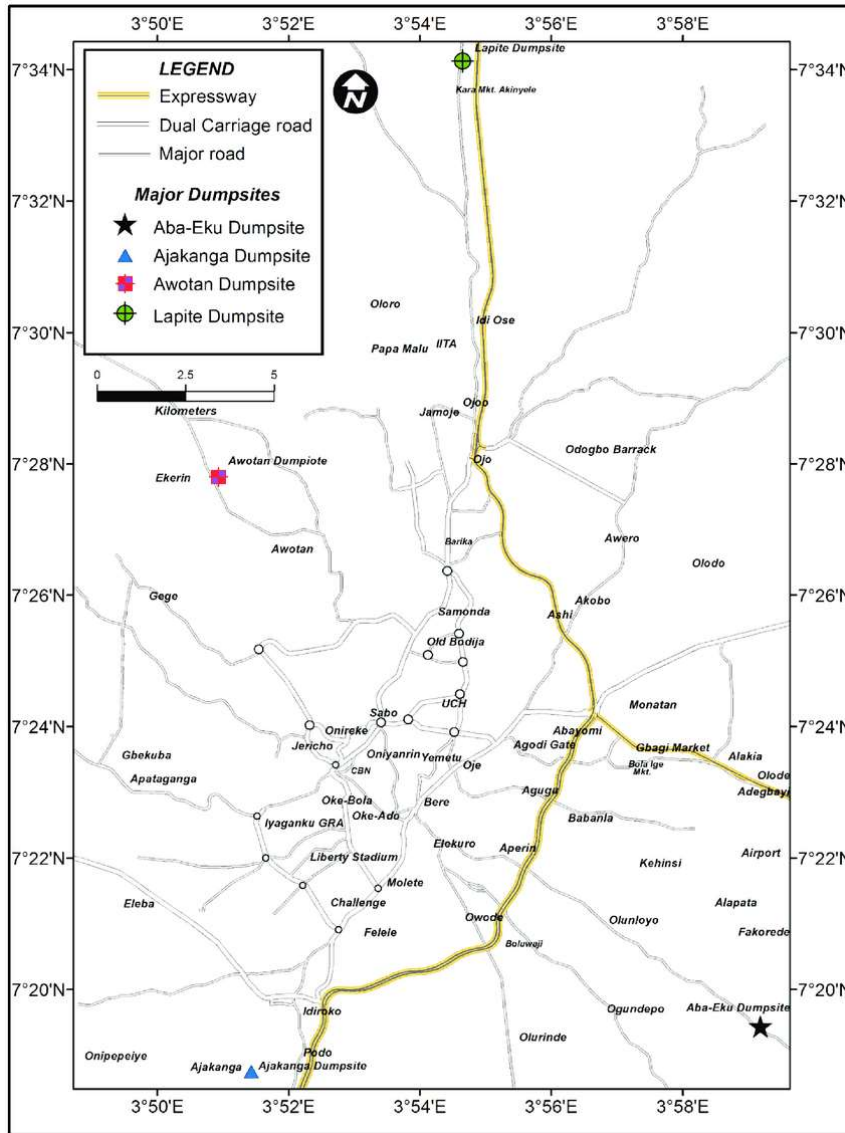


Figure 1 - Topographical Map of Part of Ibadan Showing Awotan Landfill (Extracted from Nigeria Geological Survey Agency, Ibadan Sheet No.59, 1980)

Figure 1 shows the map of Ibadan metropolis indicating the location of the four Government approved suburban dumpsites: Aba-Eku, Ajakanga, Awotan and Lapite landfills. The landfill of concern, Awotan is located on latitude 7.463N and longitude 3.849E, along the Awotan-Akufo Road in Ido Local Government Area of Oyo State, Nigeria. Established in 1998, it is the second largest landfill (20.26 hectares) in the Ibadan metropolis and has been referenced as one of the World's 50 Biggest Dumpsites (Waste Atlas 2014). As a state waste facility, at least 78,000 tonnes of different kinds of domestic, industrial, hospital and agricultural waste are received annually (OYOWMA 2017). Observed daily ocular counts waste trucks in 2014 sometimes averaged as many as 67 (Awopetu et al 2014 ) and estimated daily deposits were often as high as 500 tonnes of waste (Osinowo et al 2017 ). Awotan community is home to several institutions, commercial establishments and its residents primarily engage in trading as their main occupation and source of livelihood.

A mixed method research design was adopted for the study involving a quantitative survey complemented with the qualitative method of interviews of waste pickers (Sarantakos 2005). From the total population of 217 waste pickers registered at Awotan Landfill, 140 random samples were picked for use following the Taro Yarmani's sample size formula shown below. The sample size is determined at 0.05 level of significance

$$n = \frac{N}{1 + N(e)^2}$$

- n = Sample size
- N = Population size
- E = Error terms

Therefore,

$$N = 217$$

$$e = 0.1$$

$$n = \frac{217}{1 + 217(0.05)^2} = \frac{217}{1 + 0.55} = \frac{217}{1.55} = 140$$

Therefore n = 140 being the sample size.

However only 81 agreed to participate in the study and correctly filled the questionnaire which is more than 58% of the total population available.

A structured questionnaire was administered consisting of three (3) sections as follows: Section A captured the demographic information of the respondents, Section B explored their levels of awareness about waste picking as it related to their health and the last section C focused on occupational health hazards and safety. The reliability of the instrument was determined by using the test- retest method of testing reliability. This was done by administering the test twice on 20 waste pickers who were not part of the sample within an interval of two weeks. The scores obtained from the two successive administrations was subjected to Cronbach Alpha Reliability Estimate at 0.05 level of significance. A reliability coefficient of 0.87 was obtained.

Each respondents consent was sought before the exercise started after careful explanations of their right to withdraw at any time. Prior permission to administer the questionnaire on site was obtained from the dumpsite manager. More interviews with some waste pickers were done to supplement data from survey. It was noticed that the respondents were conscious of their identities being protected and would not even allow their pictures taken. As such, participants' identities were protected using just labels without their real names to encourage free interaction and minimize bias.

The data from the survey was coded and run through Microsoft Excel and further transferred to Statistical Package for Social Scientists (SPSS) version 21.0 for analysis. The statistical analysis involved descriptive statistics such as mean, frequency distributions, percentages and inferential statistics as PPMC using the Statistical Package for Social Science (SPSS) 20.0 software. Perception was measured using a Likert10-point rating scale. Positive statements were represented by 1 and negative statements by zero 1. When scores are summed per respondent, scores less than 5 were counted as low awareness while  $\geq 5$  scores meant a high awareness of the issue at hand.

## **5. Results**

This study aimed to comprehensively analyse the socioeconomic characteristics, perceptions and health promoting habits waste pickers have. Pickers have been widely studied in some developing countries but of the few studies that exist on Nigerian pickers working on landfills,

this study presents findings detailing some of the current waste picker thinking and attitudinal changes that may have occurred overtime

### 5.1 Pickers' Occupational and Demographic Characteristics.

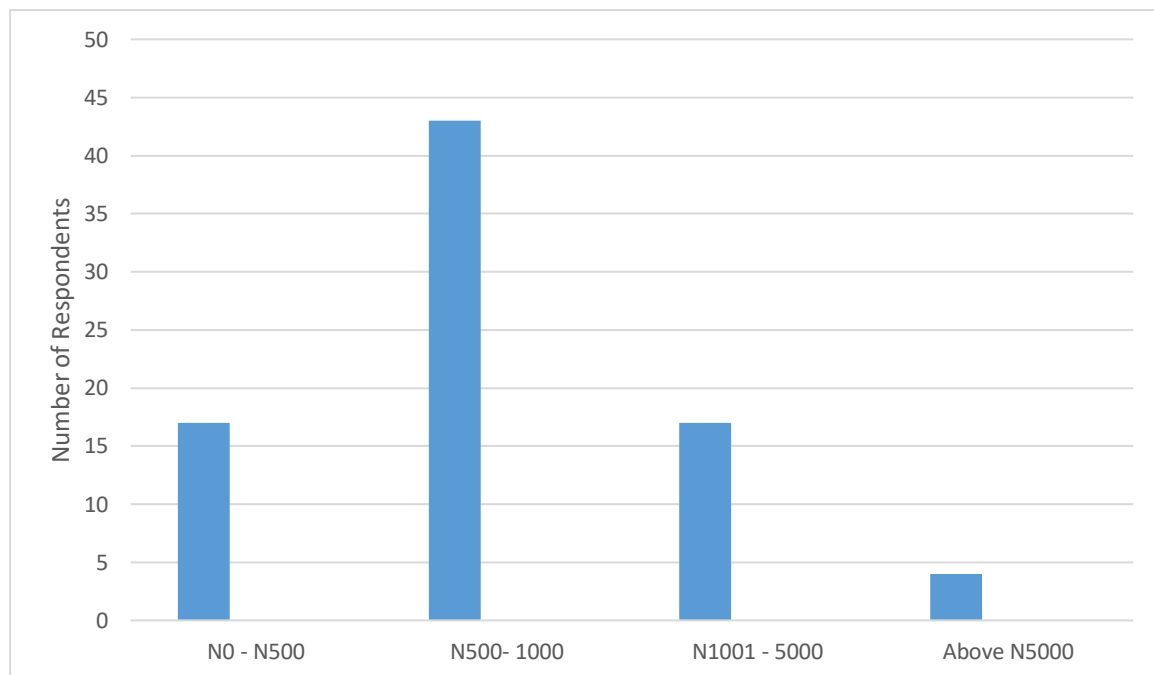
**Table 1: Analysis of Awotan waste pickers demographic characteristics**

<b>Characteristic</b>	<b>Frequency (n=81)</b>	<b>Percentage (%)</b>
<b>Gender</b>		
Male	53	65.4
Female	28	34.6
<b>Total</b>	81	100
<b>Marital Status</b>		
Single	5	6.2
Married	72	88.9
Divorced	0	0
Widowed	4	4
<b>Spouse is employed</b>		
Yes	48	59.3
No	33	40.7
<b>Education</b>		
Primary	34	42.0
Secondary	30	37.0
Tertiary	6	7.4
No education	11	13.6
<b>Age</b>		
14 – 20	1	1.2
21 – 30	36	44.4
31 – 40	38	46.9
41 – 50 years	6	7.5
<b>Waste picking Work Experience (in years)</b>		
1-10years	78	96.3
10-20years	3	3.7
21 years and above	0	0
<b>Waste picking working days in a week</b>		
1-3 days	19	23.5
3-6 days	61	75.3
Everyday	1	1.2
<b>Waste picking working hours in a day</b>		
0-3 hours	26	32.1
4-6 hours	37	45.7
7 hours and above	18	22.2
<b>Housing proximity to dumpsite</b>		
Yes	13	16.0
No	68	84.0

Source: Fieldwork, 2021

Data from the survey indicated that about 65% of the respondents who worked on the landfill were male, and more than 90% were between the ages 21 and 40 years. Only 7% were educated beyond the Secondary school level as the majority were either uneducated (3.6%) or had primary school level education (42%). Almost all of the workers surveyed belonged to a waste pickers association (90.1%). More than 75% used between 3 -6 days and about 4 -6 hours daily picking waste. More than 96% of the waste-pickers had worked between 1-10 years picking waste (see Table 1).

**Figure 2: Reported daily earnings of Waste pickers at Awotan landfill.**



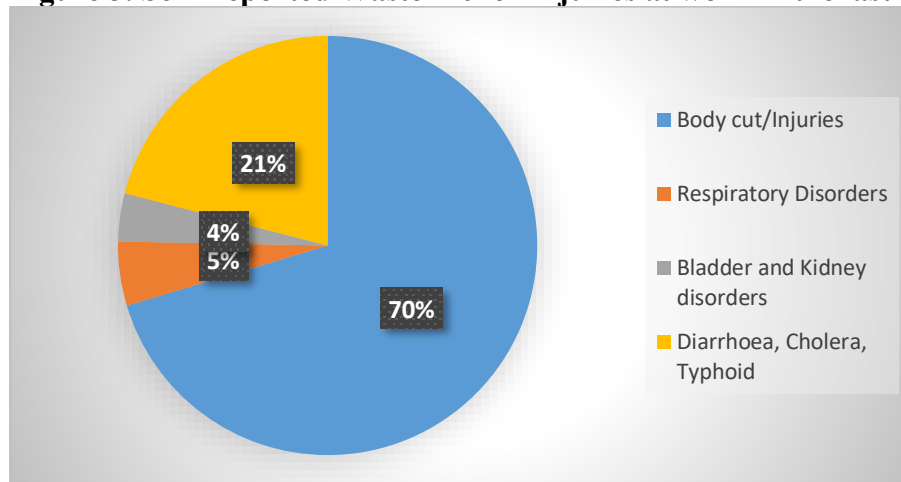
Source: Fieldwork, 2021

Findings on the respondents' income indicated that more than 90% picked waste to sell and not reuse, earnings were variable and more than 70% earned above 500 naira daily. This indicates that on the average, most pickers earned between 500 to 1000 naira daily (Figure 2). Less than 4 people earned above 5000naira indicating the narrow margins for pickers to generate a living comfortably. The most easily acquired /sold and therefore most prized waste was pet bottles as it was easy to recycle. A surprising note was that more than 90% of them belonged to a waste picker organisation which usually gave them benefits such as protecting their collective rights to work on a particular site and visibility within the society.

## 5.2 Waste pickers Health Perceptions and Practices

It is interesting to note that the most reported health challenge in the last six months were mainly bodily harm and injuries as punctures and cuts (70%) (Figure 3). The next important health issue reported were diarrhoeal and typhoid infections (often transmittable through low attention to hygiene or close proximity with infective agents). Fewer pickers reported having respiratory problems inspite of exposure to landfill. Almost all spoke of experiencing body pain specifically low back pain, painful neck and shoulders, thigh and elbow joints pain after work. This was also mentioned when a pregnant female picker was sighted being assigned to sort recovered waste while others did the picking. More than 40% indicated the use of alcohol or drugs as energisers to perform their chores.

**Figure 3. Self -reported Waste Picker Injuries at work in the last 6 months**

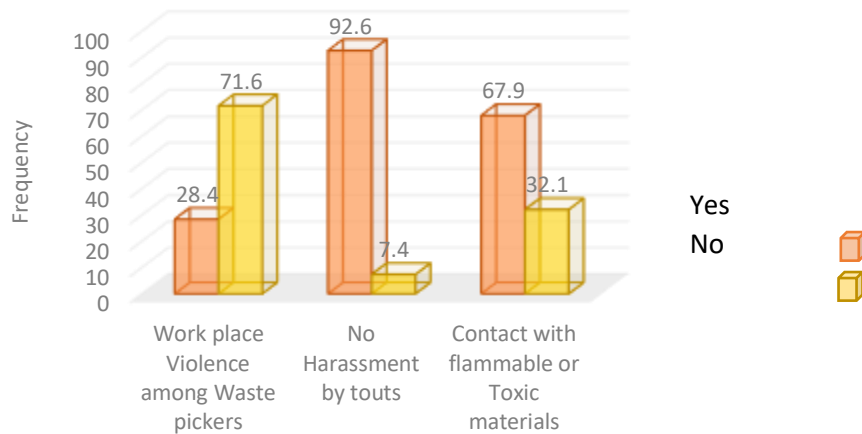


### 5.3 Picker Perception on Occupational risk and safety

An important thought held by pickers was that of their relative safety while at work free from harassment from touts within the confines of the dump due in part to the presence of uniformed army personnel guarding the site (Figure 4). A majority (67.9%) appeared unbothered by the possibility of toxic chemicals on site but were more concerned with more physically disturbing sights as decomposing waste, hospital waste such as blood or fetal matter. Conversely, a few identified the risk from work place violence among co-workers as an important safety issue (28.4%). All were bothered by the stigma attached to the job and very few would allow their pictures taken or names identified. They spoke of basic trainings received from the state Government (public health personnel from Oyo State Ministry of Health and Oyo State Ministry of Health & Environment) through infrequent but enlightening information on first aid care, treating snake bites and handling bleeding from injuries while at work before reaching

a hospital. However more than (90%) of the respondents admitted that they had limited access to health care facilities as waste collectors due to cost.

**Figure 4: Waste Picker Perceptions on Safety at Work**



Many pickers had a clear understanding of the link between their work and the potential health hazards they may be exposed to particularly infection of open wounds (87%), Bites(snakes) and stings (88%), respiratory illness (84%), as well as illnesses as typhoid, cholera and Diarrhoea (79%). (Table 2). A clear danger for many pickers was being punctured or pricked by used syringe needles, nails or other sharp objects (82%) while at work on the dumpsite (Table 3)

Falling or slipping on the dump was a rather common occurrence for more than a half of the respondents while more than half did not see smoke inhalation to be so much of a problem to their wellbeing while working. An interesting point some interviewees made was on the heat intensity effect of the sun on their bodies which impacted on the time duration for work. Foul odours oozing from the dump too was a strong deterrent to work. All these were pointers to why nearly all pickers would prefer to change jobs if opportunity arose (95%).

**Table 2: Waste Picker Perception on Exposure to Health Hazards at Work**

<i>Health Hazard</i>	Frequency ( %)		Frequency ( %)		Mean	S.D
	Strongly Agree	Agree	Disagree	Strongly Disagree		
<b>Hepatitis</b>	49(60.5)	0	4 (4.9)	28(34.6)	2.14	1.430
<b>Cough &amp; lung infection</b>	36(44.4)	0	3 (3.7)	42(51.9)	2.63	1.47
<b>Eye irritation</b>	49(60.5)	7(8.6)	0	25(30.9)	2.01	1.365

<b>Skin &amp; open body injuries exposed to pathogens</b>	71(87.7)	1(1.2)	0	9(11.1)	1.35	0.651
<b>Respiratory illness</b>	68(84.0)	1 (1.2)	0	12(14.8)	1.48	1.026
<b>Diarrhoea, Cholera &amp; Typhoid</b>	64(79.0)	5(6.2)	2(2.5)	10(12.3)	2.58	1.474
<b>Bites &amp; Stings</b>	72(88.9)	6 (7.4)	0	3(3.7)	1.19	0.615
<b>Nausea</b>	38(46.9)	8(9.9)	2(2.5)	33(40.7)	2.37	1.48

Source: Fieldwork, 2021

**Table 3: Waste Picker Perception on Exposure to Physical Hazards at Work**

<i>Physical Hazard</i>	Frequency (%)		Frequency (%)		Mean	S.D
	Strongly Agree	Agree	Disagree	Strongly Disagree		
<b>Hit by falling objects</b>	23(28.4)	12(14.8)	0	46(56.8)	2.85	1.361
<b>Cuts from Sharp objects</b>	65(80.2)	5(6.2)	0	11(13.6)	1.47	1.038
<b>Slipping/Falling from Heights</b>	41(50.6)	12(14.8)	0	28(34.6)	2.19	1.370
<b>Pricks/Punctures</b>	67(82.7)	7(8.6)	1(1.2)	6(7.4)	1.33	0.837
<b>Hit by Car/Vehicle</b>	16(19.8)	0	3(3.7)	62(76.5)	3.37	23(28.4)
<b>Smoke Inhalation</b>	36(44.4)	3(3.7)	1(1.2)	41(50.6)	2.58	1.474
<b>Chemical Burns</b>	12(14.8)	7(8.6)	0	62(76.6)	3.38	1.146

Source: Fieldwork, 2021

**Table 4: Relationship between the educational level of waste pickers and their perception of occupational hazards.**

Variables	N	Mean	S Dev	Df	r	p	Remark
<b>Educational Level</b>	81	23.78	14.608				Sig.
<b>Pickers' Perception</b>		25.71	12.711	80	0.347	0.002	

The correlation result (Table 4) shows a significant positive relationship ( $r = 0.347$ ;  $df = 80$ ;  $p = 0.002 < 0.05$ ) between waste pickers educational level and their awareness of the health hazards of their occupation. Table 5 indicates a comparison of waste picker characteristics in the year 2004 and 2021 highlighting the observable changes.

**Table 5: Occupational descriptives of Awotan Waste pickers compared between 2004 and 2021**

Characteristic	2004	2021
Average Daily income	N3000	1000
Average working hours in a day	10 -12 hours	3 – 6 hours

Personal Protective Equipment	Not commonly used	Frequently used
Most common collectible	Iron scraps	Pet bottles
Waste Picker Organisation	No	Yes

Source: Authors analysis, 2023

Summarily, the results show more personal cognition in the work health relationship for observed waste pickers and this reflects in the stronger desire for more governmental support for increased protective measures. Income is still an important factor in determining the entry and continued engagement with the job although 95% would leave the work if they have better opportunities.

#### 5.4 Discussion

The study explored 81 Awotan waste pickers' socio-economic characteristics and practices, and findings indicate pickers are better attuned to the realities of their work environment and had desires for a healthier lifestyle regardless of their working condition.

#### Perceptions on Occupational Health and Safety

From the analysis of the pickers' health related perceptions and behaviour, a key finding has emerged that waste pickers have clear personal cognition of their work health relationship. This is an important finding in the understanding of occupational health and safety and the potential health risk devolving from interaction with the dumpsite. This is contrary to previous studies that revealed a low picker awareness of the health jeopardizing nature of their work (Amosu and Tella 2021; Ola and Wahab 2022; Vasine 2020; Omosimua et al 2020; Medina 2019). Pickers also reported their desire for interventions along the lines of health smart tools that can improve their work efficiency in a non-invasive manner. In addition, the finding on the notable use of personal protective equipment(PPE) more than reported before (Omosimua et al 2020; Ali & Yusuf 2021; Awopetu 2004; Amosu &Tella 2022) speaks to an increased understanding of how personal health is compromised through its non-use at work. This increased cognition of work-health interactions seems significant with respect to the association of pickers' knowledge of work hazards and how literate or informed a picker is, ( $r = 0.40$ ,  $P = 0.001$ ) (Nyathi et al 2018). It is likely that this may also be associated with the short duration pickers work for before drifting off to do other jobs (<10 years, 96%, Table 1). Altogether, cognition may be an outworking of the few government-led educational initiatives to train waste pickers on treatments as first aid, snake bite treatment and staunching bleeding while at work. It seems plausible that this may be due to the increasing national awareness on the need to drive SDG goals particularly on health to address the needs of vulnerable populations. A proper analysis

of all these may give insight into the design of health campaigns for behaviour modification that may likely lead to reduction in incidence of diseases associated with pickers.

### **Waste Picker perceptions on their livelihood**

The characterization of waste picker health habits indicates that the most prevalent injury reported were pricks from needles, nails and punctures from sharp objects and the commonest hazard they are exposed to are snake bites and stings. This result is in accordance with findings from Cruvinel et al 2019, Vasine 2020 and Ali & Yusuf 2021, which clearly show the precarity of the waste picker occupational safety as their physical wellbeing is often compromised with no secure means of hospital care. The results beyond previous studies are consistent with the view that waste picker perceptions about their own work were those of compulsion due to economic factors and not a mere wish to recycle waste. It is important to highlight the issue of the social stigma faced from the public as a serious challenge since they are often looked at harbingers of grime and disease. There are still many questions unanswered about their relationship with the public but it is plausible that their occupational proclivity to wounds and injuries predispose pickers to higher risks of long-term bacterial and fungal illnesses (Uhunamure et al 2021) that may increase the chances of drug resistant pathogen strains circulating among pickers and their households. Interestingly, the use of drugs and alcohol was captured in this study as a stimulant to overcome nausea, body weakness and probably increase emotional stamina needed to run daily chores. Very few studies have noted use of stimulants as an important support for engaging in picking work (Omosimua et al 2020; Ali & Yusuf 2021).

### **Gender and Social Dimensions of waste picking**

An unanticipated finding regarding demographics was the inclusion of female waste pickers even though more males by count were recorded. The fact that a substantial number of respondents interviewed were women, highlights the point that little is known about gender participation in waste picking which contrasts with previous reports of only males engaged in the activity (Nzeadibe et al 2019; Onesmo 2023). This may be due to the need to augment household subsistence needs since many of the respondents also indicated a high level of spousal unemployment in their household (40.1%, Table 1). This is significant because they form part of the active working class of ages 20 – 50 who often have little or no saleable skills (Schenk & Blaauw 2011), yet are motivated to engage in waste picking for financial

reasons(Medina 2019). Most did not have a second income source to augment the waste picking.

They are the only group who can help raise the family income since child pickers are rarely seen as corroborated by previous studies in Southwest Nigeria (Awopetu 2004; Omosimua et al 2020). This probably speaks more of cultural mores and inhibitions regarding exposing children to such activities as they are considered vulnerable and are high priority in these areas and would be naturally forbidden to beg or pick waste from landfills publicly. This is a contrast to findings from Northern Nigeria that have reported a significant child waste picker population (Ali &Yusuf 2022); India(Hunt 2001). These basic findings indicate the need for more research into picker family structure and motivations so interventions may be designed tailored to support these livelihoods. It is important to highlight the fact that there are still unanswered questions about them that further enquiries may proffer answers to, such as the existence of informal waste picker organizations which serve to protect collective interests on the landfill and may engender the capacity to bargain for higher profit in transactions with middlemen and merchants.

### **Limitations**

It is important to recognise the large variability that exists across the various parts of the country as certain findings may not be generalizable to other areas due to some unexplored cultural insights such as the issue of child pickers clearly reflected in other parts of Northern Nigeria. As the current study was focused on waste workers on a single landfill in Ibadan, Southwest Nigeria, further research may also look at health seeking behaviour of waste pickers in Ibadan across several dumpsites to generate comparative insights. As at the time of this writing, the management and physical layout of the dumpsite had been revamped significantly by the Oyo State Government with better facilities and structure put in place. More research could be done to ascertain the impact on picker livelihoods.

### **Conclusions**

Summarily, the study gives further insights into reported prevalence of injuries and diseases associated with waste pickers and suggests an increased picker awareness of health risks and more positive behaviour regarding personal protection at work. It also highlights the existence of an informal waste picker organisation in Awotan landfill.

Waste pickers are known to be useful key players in the informal recycling waste chain as they are needed to help salvage a huge portion of recyclables from landfills before burying is done.

There seems to be a lack of a clear policy on waste picking as there is still a lot of stigma attached to them in society. repercussion of ignoring them long term partnerships with these people through their organisations may help build up capacity, strengthen livelihood and not jeopardizing health. More exposures to health information are likely to engender more responsible picker behaviour in terms of health considerations.

### **Implications for future policy and research**

While personal risk awareness seems to have improved as evidenced by the results, there is still a need for continued health risk education to reduce the possible long term effects of exposures to toxic materials and biological hazards as use of PPE may not adequately combat these. Government interventions and policy needs to accommodate this vulnerable population in their waste management strategies and plans with more sensitization and waste picker education campaigns mounted to minimize long term waste worker health risks and develop plausible protective measures. Periodic health screening and subsidized medical treatment may also be viable interventions to improve workers' health status in the community.

### **Recommendations**

- There is a need for policymakers to collaborate and strengthen existing waste picker organisations
- The government or local authorities can also establish mobile clinics accessible to waste pickers to receive subsidized health care.

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Appendix - Plates



Plate A and B: Unsorted and hand sorted waste on site at Awotan landfill. Source: Authors' fieldwork, 2021.