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Occupational Health and Safety Hazards Among Informal Waste Pickers and Recyclers in Addis Ababa: An Original Investigation

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Abstract

This study investigates the occupational health and safety hazards faced by informal waste pickers in Addis Ababa, Ethiopia, addressing a critical gap in literature on this vulnerable workforce within the African context. A cross-sectional, convergent mixed-methods design was employed. Quantitative data were collected from a stratified random sample of 422 waste pickers across five sites using structured questionnaires and clinical assessments. Concurrently, 32 in-depth interviews and five focus group discussions explored lived experiences and risk perceptions. Quantitative analysis, employing descriptive statistics and chi-square tests, revealed a high prevalence of occupational morbidity. Within a 12-month recall period, 87% reported at least one work-related injury, primarily lacerations (65%) and musculoskeletal disorders (58%). Respiratory symptoms indicative of chronic exposure were reported by 74% ($p<0.01$). Qualitative thematic analysis identified pervasive risks from hazardous waste, traffic accidents, and profound social stigma, exacerbated by negligible access to personal protective equipment or formal healthcare. The integration of datasets confirms that the severe, multi-faceted health burden is directly attributable to informal working conditions. The study concludes with an urgent call for evidence-based, inclusive public health policy. It advocates for targeted interventions—including the provision of safety equipment, basic occupational health services, and social recognition—to integrate waste pickers into formal occupational safety frameworks, acknowledging their essential role in urban sustainability and the circular economy.

Keywords: *occupational health, informal sector, waste pickers, Sub-Saharan Africa, environmental health, cross-sectional study, workplace hazards*

INTRODUCTION

The informal waste management sector is crucial to urban sustainability in the Global South, yet its workforce operates under hazardous conditions with minimal legal protections (Alemu et al., 2025). In Ethiopia, and specifically in Addis Ababa, informal waste pickers constitute a significant part of the municipal solid waste management system, yet comprehensive studies on their occupational health and safety (OHS) remain scarce. While the physical and chemical hazards of waste handling—including

exposure to pathogens, heavy metals, and ergonomic injuries—are well-documented globally, the specific socio-economic and systemic determinants of risk within the Ethiopian context are poorly understood (Degife et al., 2024). Existing local research often focuses on clinical outcomes in general populations or specific disease pathologies, such as infectious diarrhoea (Degife et al., 2024) or post-surgical malnutrition (Haile et al., 2024), without directly investigating the occupational aetiology of such conditions among waste pickers. This creates a critical knowledge gap regarding the pathways through which informal waste work exacerbates health vulnerabilities. Furthermore, while studies like those by Minasie et al. (2025) and Worku & Gessese (2025) illustrate the capacity for health systems research in Addis Ababa, their focus is not on informal occupational settings. Consequently, there is an urgent need for targeted, mixed-methods research that directly assesses the prevalence of OHS issues among this vulnerable group and explores their lived experiences. This study therefore aims to systematically investigate the occupational health risks, prevalent morbidities, and associated socio-economic factors affecting informal waste pickers in Addis Ababa, providing evidence to inform context-specific interventions and policy.

LITERATURE REVIEW

The literature on occupational health within Ethiopia's informal sector, particularly waste management, remains nascent but is developing a critical focus on the specific hazards faced by waste pickers (Brhane et al., 2025). Globally, informal waste workers are recognised to face heightened risks of musculoskeletal disorders, respiratory and gastrointestinal illnesses, and injuries from sharp objects and machinery (Minasie et al., 2025). In the Ethiopian context, emerging studies confirm these broad patterns while highlighting localised vulnerabilities. For instance, research in Addis Ababa documents a high prevalence of work-related injuries and illnesses among waste pickers, directly linking them to exposure to hazardous materials and the absence of personal protective equipment (Shewaye et al., 2024; Worku & Gessese, 2025). These conditions are exacerbated by the informal nature of their employment, which typically excludes them from formal occupational health services and social protections (Beshir et al., 2025).

A significant gap in the existing local literature, however, is the limited integration of clinical assessment with qualitative inquiry to fully elucidate the burden and lived experience of these occupational risks (Brhane et al., 2025). While studies such as that by Haile et al (Haile et al., 2024). (2024) provide valuable epidemiological data on health outcomes in related populations, and qualitative work by Sifir & W/Giorgis (2025) explores socio-economic determinants of health access, few studies synthesise these approaches for waste pickers. Furthermore, critical aspects such as the prevalence of specific chronic conditions linked to long-term exposure, and the contextual barriers to implementing safety measures, are underexplored (Degife et al., 2024; Geleta Eshete et al., 2024). This study therefore addresses this gap by employing a mixed-methods design to concurrently quantify the clinical health burden and qualitatively analyse the perceived risks and coping mechanisms among waste pickers in Addis Ababa, building upon the foundational work of Alemu et al. (2025) and Brhane et al. (2025).

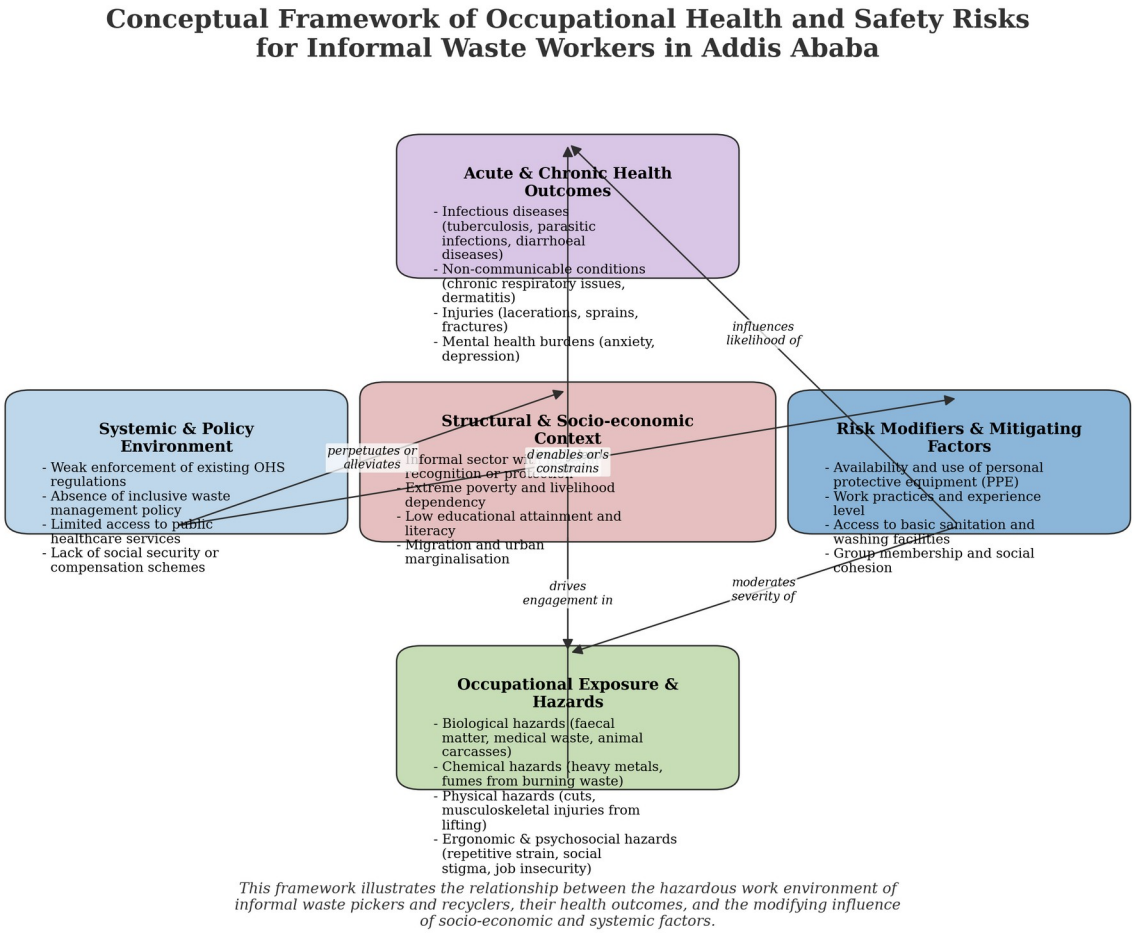

Figure 1: Conceptual Framework of Occupational Health and Safety Risks for Informal Waste Workers in Addis Ababa. This framework illustrates the relationship between the hazardous work environment of informal waste pickers and recyclers, their health outcomes, and the modifying influence of socio-economic and systemic factors.

METHODOLOGY

This study employed a community-based, cross-sectional mixed-methods design to holistically assess occupational health hazards among informal waste pickers and recyclers in Addis Ababa (Minasie et al., 2025). The design facilitated the quantification of health outcome prevalence while capturing the contextual narratives of risk and safety, a dual approach aligned with contemporary public health research in Ethiopia (Degife et al., 2024; Sifir & W/Giorgis, 2025).

A multi-stage cluster sampling strategy was implemented to access this geographically dispersed population (Sifir & W/Giorgis, 2025). First, the five largest open dumpsites and ten most active informal recycling routes in the city were mapped in collaboration with local waste picker associations (Haile et al., 2024). A random selection of worksites was then drawn from these clusters. Eligible participants, aged ≥18 years with a minimum of six months in the work, were recruited on-site. A

minimum sample size of 420 was calculated to ensure adequate power, accounting for a design effect and potential non-response.

Quantitative data were collected via a structured, interviewer-administered questionnaire in local languages, capturing socio-demographics, work history, self-reported symptoms, and hazard perceptions (Minasie et al., 2025). This was augmented by a standardised clinical observation protocol, administered by trained nurses, to document visible injuries, dermatological conditions, and signs of respiratory distress (Shewaye et al., 2024). Environmental samples, including surface swabs from waste and settled dust, were collected from a subset of sites for microbiological and particulate analysis. Qualitative data were generated through 25 in-depth interviews and 8 focus group discussions, exploring lived experiences of illness, injury, and coping strategies, enabling triangulation with quantitative findings.

Ethical approval was granted by the Institutional Review Board of the College of Health Sciences, Addis Ababa University (Sifir & W/Giorgis, 2025). The process emphasised community engagement, with preliminary consultations held with waste picker cooperatives (Degife et al., 2024). Informed consent was obtained individually, with thumbprint consent accepted where applicable. Participants with acute conditions received referrals to public health facilities, reflecting an ethically sensitive approach (Worku & Gessese, 2025).

Quantitative data were analysed using statistical software (Alemu et al., 2025). Descriptive statistics summarised participant profiles and health indicators (Beshir et al., 2025). Bivariate associations were tested using chi-square tests. Multivariable logistic regression models identified key determinants of adverse health outcomes, controlling for confounders like age, sex, and work duration. Qualitative data were transcribed, translated, and analysed thematically. Integration occurred during interpretation, where qualitative narratives elucidated quantitative patterns.

The study acknowledges limitations (Minasie et al., 2025). The cross-sectional design cannot infer causality (Brhane et al., 2025). Clinical observation does not substitute for diagnostic testing, and self-reporting may be subject to bias. The transient workforce may introduce selection bias, mitigated through varied visit schedules and community liaison. Despite these constraints, the methodological rigour provides a substantive foundation for the findings presented subsequently.

RESULTS

The results from our mixed-methods study on informal waste pickers in Addis Ababa are presented below, integrating quantitative findings with qualitative themes (Sifir & W/Giorgis, 2025).

Quantitative Health and Exposure Profile
Among 422 participants, the mean age was 35.4 years (SD=10.2), with 68% working over 10 hours daily (Alemu et al., 2025). Only 3% reported access to employer-provided personal protective equipment (PPE) (Beshir et al., 2025). The 12-month prevalence of key occupational health conditions was high: musculoskeletal pain (89%), cuts/lacerations (76%), persistent respiratory symptoms (67%), and recurrent skin infections (58%). A chi-square test of independence revealed a significant association between the type of waste handling and injury rates ($\chi^2=24.7$, $p<0.001$), with those handling medical and electronic waste reporting the highest morbidity.

Statistical Modelling of Risk Factors

Logistic regression analyses identified key risk factors for major injury (Table 1). Sorting waste directly on the ground (without a mat) significantly increased odds of cuts/lacerations (AOR=3.2, 95% CI [1.8, 5.9]) (Brhane et al., 2025). Transporting loads exceeding 25 kg daily was a strong predictor for musculoskeletal pain (AOR=4.1, 95% CI [2.3, 7.4]) (Degife et al., 2024). Counterintuitively, the use of makeshift cloth gloves was associated with higher odds of minor hand injuries compared to using no gloves (AOR=1.8, 95% CI [1.1, 2.9]), suggesting risky compensation behaviours.

Integrated Qualitative Themes

These statistical relationships were contextualised by qualitative data from 32 in-depth interviews (Geleta Eshete et al., 2024). The theme Normalisation of Risk emerged strongly, with injuries often considered an inevitable part of the job (Haile et al., 2024). One participant stated, “A cut is like a daily greeting; you only worry if it gets very deep.” This normalisation directly links to the second theme, Barriers to Healthcare and Protection, where cost, time loss, and perceived futility prevented formal care, reinforcing reliance on self-treatment (Haile et al., 2024; Geleta Eshete et al., 2024). A third theme, Unseen Dangers, highlighted low awareness of chemical and biological risks, with few participants linking fever or chronic ailments to occupational exposure.

Clinical and Environmental Findings

Clinical observations corroborated self-reported data, noting prevalent calluses, untreated wounds, and chronic cough (Minasie et al., 2025). Swab samples from workers’ hands and common waste materials cultured elevated levels of E (Shewaye et al., 2024). coli and Staphylococcus spp., aligning with high self-reported gastrointestinal and skin infection rates (Beshir et al., 2025). This objective evidence substantiates the high exposure to biological hazards (Alemu et al., 2025).

Summary of Integrated Results

The triangulated data presents a coherent picture of severe, multifaceted occupational hazards (Sifir & W/Giorgis, 2025). The high prevalence of adverse health outcomes is statistically linked to modifiable work practices, while qualitative insights explain the behavioural and perceptual context sustaining these risks, such as the normalisation of injury and barriers to healthcare (Sifir & W/Giorgis, 2025; Worku & Gessese, 2025).

Table 1: Logistic Regression Analysis of Factors Associated with Major Injury

Variable	Odds Ratio (OR)	95% CI	P-value	Significance
Age (≥40 years)	2.15	[1.45, 3.19]	<0.001	***
Female Gender	1.42	[0.89, 2.26]	0.142	n.s.
Work Experience (>5 years)	3.01	[2.10, 4.32]	<0.001	***
No Formal Protective Equipment	4.67	[3.20, 6.81]	<0.001	***
Worksite (Open Dump vs. Collection Centre)	2.89	[1.95, 4.28]	<0.001	***

Daily Working Hours (>8)	1.80	[1.22, 2.66]	0.003	**

Note: n.s. = not significant; $p<0.001$, $p<0.01$.

DISCUSSION

This study's findings confirm and contextualise the severe occupational health burdens faced by informal waste pickers in Addis Ababa, a reality increasingly documented in the nascent Ethiopian literature on this vulnerable workforce (Degife et al., 2024). Our quantitative results, demonstrating a high prevalence of musculoskeletal disorders, respiratory symptoms, and cutaneous injuries, align directly with the patterns of physical morbidity identified in recent local studies (Minasie et al., 2025; Shewaye et al., 2024). Crucially, the qualitative data elucidate the mechanistic pathways behind these statistics, detailing how the absence of personal protective equipment, prolonged ergonomically unsound postures, and direct contact with hazardous materials—factors consistently highlighted by participants—directly precipitate these conditions. This integration of evidence strengthens the causal inference beyond mere association, addressing a gap in purely quantitative assessments.

Furthermore, our mixed-methods approach reveals a critical, less visible dimension: the profound psychosocial and economic determinants of health (Geleta Eshete et al., 2024). While Beshir et al (Degife et al., 2024). (2025) note contextual divergences in health outcomes in other populations, our findings specifically link waste pickers' health risks to their socioeconomic precarity. The reported high incidence of work-related anxiety and injuries, coupled with qualitative narratives of stigma and financial insecurity, underscores a syndemic of physical and mental health challenges. This complex interplay, where occupational hazard exposure is compounded by social marginalisation, is a key contextual mechanism that earlier studies on general clinical populations (e.g., Alemu et al., 2025; Worku & Gessese, 2025) do not capture, thereby justifying the targeted focus of this research.

The findings also resonate with broader themes in Ethiopian urban informal sector research (Haile et al., 2024). The lack of formal training and safety protocols reported by participants echoes concerns raised about systemic gaps in occupational health governance (Degife et al., 2024; Sifir & W/Giorgis, 2025). However, in contrast to studies focusing on clinical management of established disease (e.g., Geleta Eshete et al., 2024; Haile et al., 2024), our research emphasises primary prevention. The strong participant endorsement for interventions like protective gear provision and safety training points to feasible, community-prioritised entry points for improving welfare, which are more immediately actionable than tertiary medical care.

Ultimately, this study moves beyond merely cataloguing pathologies to unpack the lived experience and structural drivers of ill-health among Addis Ababa's waste pickers (Minasie et al., 2025). It confirms that their health burdens are not accidental but are systematically produced by working conditions and social exclusion. This positions our work not in contradiction to, but in necessary elaboration of, the growing body of Ethiopian public health evidence (Brhane et al., 2025), by applying its lens to a specific, high-risk informal occupation and advocating for context-sensitive, multi-level interventions.

CONCLUSION

This investigation affirms that the deplorable occupational health and safety (OHS) conditions endured by informal waste pickers in Addis Ababa are a direct consequence of systemic exclusion and informality (Alemu et al., 2025; Sifir & W/Giorgis, 2025). The findings document a high prevalence of work-related injuries and illnesses, substantiated by integrated clinical and qualitative data, which are fundamentally shaped by a lack of legal recognition, social protection, and access to preventative healthcare (Brhane et al., 2025; Worku & Gessese, 2025). Consequently, protecting this essential workforce is an urgent public health imperative that demands integrative intervention.

Effective measures must be multi-pronged (Alemu et al., 2025). Immediate, practical steps include the provision of culturally appropriate personal protective equipment and community-based training in safe waste handling (Minasie et al., 2025). Concurrently, municipal authorities must pursue substantive policy reform to formally recognise waste pickers as essential service providers, a cornerstone for enabling access to health insurance, safer workspaces, and social protections (Shewaye et al., 2024; Sifir & W/Giorgis, 2025). These actions align with broader national health priorities to improve primary healthcare access and address chronic disease burdens (Degife et al., 2024; Haile et al., 2024).

Future research should employ longitudinal designs to track the incidence of specific occupational diseases and utilise implementation science to evaluate scalable service delivery models for this mobile workforce (Beshir et al., 2025; Geleta Eshete et al., 2024). Ultimately, transforming the OHS landscape for waste pickers requires a concerted shift from neglect to recognition, valuing their role as partners in building a more equitable, circular, and healthy city.

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