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Occupational Health Hazard and Safety Practices among Solid Waste Handlers of Damak Municipality

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Abstract

Waste handlers play a significant role in solid waste management but remains highly exposed to work-related hazards. This study aimed to gain a comprehensive understanding of the occupational safety and health hazards faced by the solid waste handlers in Damak Municipality to identify gaps and inform strategies to enhance the occupational health and safety of waste handlers. To achieve the objectives, a structured, closed-end questionnaire was developed and administrated using a purposive sampling technique. Additionally, key informant interviews were conducted to gain better insight into the field-level problems. The study revealed that the workforce, predominantly male (56%) faces significant occupational risks due to the labor-intensive nature of waste collection. Despite full access to personal protection equipment (PPE), only 60% of total workers were reported using consistently. A high prevalence of health issues was observed, including musculoskeletal disorders (66.7%), cuts and injuries (58.3%), respiratory problems (41.7%) and other related health problems. These findings are further supported by the fact that 44% of total workers had not received pre-work training. Moreover, the absence of medical facility, health services and health insurance at the work place identified through survey further exacerbated the worker's vulnerability. These findings underscore urgent need of refresher courses on occupational health and safety (OSH) guideline, enforcement OSH protocols and mandate PPE use through a strict mechanism during working hour and provision for medical facility and health services to protect the well-being of waste handlers and promote safer work environment.

Keywords: Occupational health hazards; Waste handlers, OSH; PPE

Introduction

Managing solid waste is a significant environmental challenge for cities in many developing nations, including Nepal (Subedi, Pandey, & Khanal, 2023). Most developing countries, especially urban areas, are facing trouble in adequately managing solid waste due to rising trash production, waste generation, inadequate waste management systems and inadequate waste management techniques (Srivastava, Singh, & Singh, 2015). According to Mohsin & Chinyama (2016) better waste management system not only generates jobs to waste handlers but also improves well being of public health by lowering the risk of disease and environmental degradation. From collection of waste to transporting and disposal of waste, waste handlers play crucial role in performing all the process of waste management, as noted by World Health

Organization (2002). In the process, the waste handlers come to direct contact to the waste and waste related hazards contributing to occupational hazards and accidents (Benka-Coker et al., 2018; Chi et al., 2020; International Labour Organization, 2023).

Solid waste workers mostly experience injuries from sharps including glass fragments, razor blades, scrap metal, and punctures from piercing devices like needles (Jerie, 2016). An investigation done in Kathmandu discovered that 73% of informal recyclers acknowledged to not washing their hands with soap after ending work, and 65% did not change out of their work clothing (Cointreau, 2006). Such negligence among waste workers frequently exposes them to hazardous compounds and pathogens, increasing the risk of acute and chronic health problems, including allergic reactions, chronic bronchitis, asthma, skin irritations, respiratory issues, and more serious illnesses such as cancer and neurological disorders (World Health Organization, 2002; Binion & Gutberlet, 2012; Jerie, 2016; Chikombe, 2017). Continuous physical strain from tasks like pulling, pushing, lifting and carrying waste bins or bags can cause discomfort and long-term health issues. (Mansour Ziaei, 2018) Mental health issues among waste workers are often linked to persistent physical injuries and the monotonous nature of their workload. Additionally, the absence of proper training and protective equipment increases their vulnerability to occupational hazards (Gutberlet & Baeder, 2008).

Occupational health risks are becoming increasingly widespread around the world (International Labour Organization [ILO], 2019). Among all occupations, collecting municipal solid waste is one of the riskiest ones (Melaku & Tadesse, 2020). Yet, the situation for these workers is even reported to be overlooked in many developing countries, according to Melaku & Tadesse (2020). Low level of mechanism, inadequate PPE, limited training, and lack of health monitoring further increases the seriousness of occupational risks. To ensure the well being of workers health and safety, OSH, a holistic approach to worker health, has been recognized as essential. (Joshi & Kumar, 2011). Using OSH instruments, such as PPE, is essential in reducing exposure to occupational risks and health hazards among waste handlers. Studies have shown that trained waste workers are more likely to follow OSH protocols during work, thereby minimizing occupational health risks and reducing environmental impacts (Acharya et al., 2021; Kabanda & Mwesigye, 2020). However, despite the international commitment to OSH work-related accidents and diseases remain prevalent. According to the International Labour Organization (ILO), nearly 3 million workers die every year due to work-related accidents and diseases, with 2.6 million deaths resulting from work-related diseases and 330,000 from work accidents. This highlights the ongoing difficulties in ensuring the protection of workers' health and safety worldwide (International Labour Organization, 2023). The scale of the problem is further highlighted by the fact that, despite more than three decades of extensive need assessment and prioritization, over 80% of the world's workforce lacks adequate access to OSH services (Rantanen, 2005). According to Alli (2008), ensuring effective OSH system requires a wide range of structure, workforce skills, and planning abilities to establish the foundational elements of national OSH programs.

Nepal has taken significant steps to enhance OSH framework, including incorporating comprehensive OSH provisions into the Labour Act of 2017, enacting Solid Waste

Management Act in 2011, and developing the National OSH Policy in 2019 (Joshi, 2022). Despite the effort, their implementation remains in emergent phase, particularly among waste workers. This is evidenced by the fact that these workers mainly include marginalized migrants with limited understanding on personal hygiene and OSH practices. Consequently, the knowledge and importance of occupational safety and health remain unfamiliar adversely impacting their health and increasing occupational risk and safety among them (Baral, 2019).

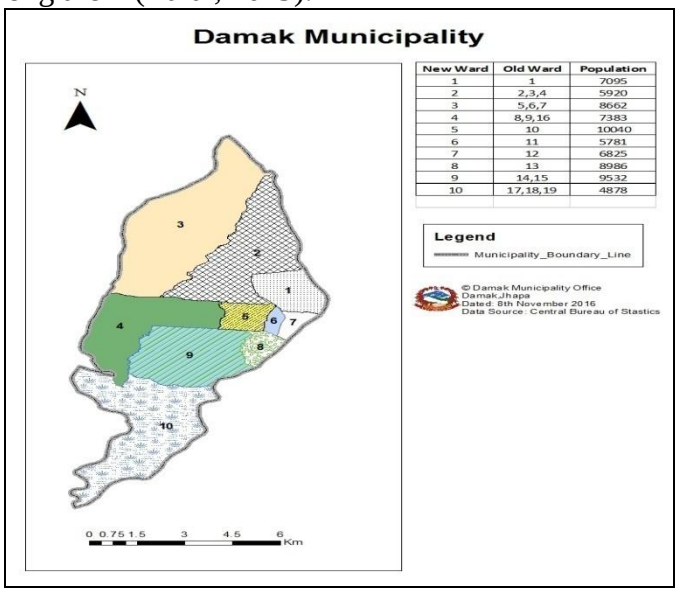

Fig: Damak Municipality (Damak Municipality Office, 2016, Central Bureau of Statistics.)

A similar scenario can be observed in the study area, where workers manually handle wastes without adequate protective gears. This condition may stem from either lack of awareness or negligence regarding occupational health risk. Furthermore, prevailing waste management techniques permits unregulated dumping of wastes from household refuse to hazardous medical waste from health care facilities, therefore increasing exposure to health hazard. Thus, the purpose of this study is to understanding the current safety protocols; assess the safety practices adopted by municipal waste handlers and examine the occupational health hazard among solid waste. The finding of this study will assist local authority in identifying existing gaps in knowledge, behavior, and resource availability, thereby supporting evidence-based policymaking

Material and methods

According to the information collected during a pre-visit, prior to the start of study, solid waste management in Damak Municipality is handled by private company named NEXT ERA under a Public-Private Partnership (PPP) contract for duration of 20 years. The operation of waste management involves 7 tractors, 4 safari vehicles and 1 excavator. Each vehicle is staffed by three workers for waste collection. After the collection, the waste is transported to designated processing and disposal sites managed by the private company (Field observation, June 2024).

For the collection of primary data, the study employed purposive sampling to select participants who were directly involved in solid waste handling and could provide the

most relevant insight into the prevailing OSH practices and health hazards. A total of 25 were selected from 45 employees, ensuring representation across different occupational roles, level of experience, and degree of exposure to health risks. A mixed-methods approach was employed, integrating qualitative and quantitative methods to provide a comprehensive understanding of the subject. This included a questionnaire survey followed by key informant interviews and field observations. Qualitative data were gathered through open-ended, semi-structured questionnaires to provide detailed insights into the experiences and practices of the waste handlers. Quantitative data were collected using closed-ended, structured questionnaires to measure the frequency and impact of various health hazards faced by the workers. Secondary data were obtained from both published and unpublished relevant sources, including official documents, research reports, academic journals, scholarly articles, and credible websites.
The collected data were consistently reviewed to ensure that they aligned with the objectives of the study. Collected data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS), version 27. Descriptive statistics such as frequencies and percentages along with statistical tools like bar diagrams and pie charts were used based on the nature of the variables.

Result and Discussion

Socio-demographic characteristics of waste handlers

Education, marital status, residency status and income can influence workers' knowledge and attitudes toward occupational safety, while gender, job role, and employment type may determine their exposure to risks (International Labour Organization, 2023). Therefore, to better interpret the awareness and practice of occupational health and safety, socio-demographic characteristics among the solid waste handlers were analyzed. From the total respondents (25) majority of respondents were male (56%) while female respondents constituted 44%. Regarding residency and employment status, 48% were permanent residents while, 52% were temporary residents, 76% were fulltime worker and 24% worked part time. Education background revealed that 40% of the respondents were illiterate, 52 % had completed primary education and remaining 8% had attended secondary level education. Majority of respondents (88%) had monthly income NRP 10,000-20,000 and only 12% earned between NRP 20,000-30,000. Based on their occupational role, 69% of respondents were waste collectors, 24% were street sweepers and 16% were vehicle drivers with working experience ranged from one year minimum to maximum of four years.

This gender disparity, although slight, is likely due to the physically demanding nature of the job, which reflects broader trends in occupational roles where physically intensive jobs are often dominated by males. (Dongre, 2020). The high percentage of married workers supported by majority of full-time workers indicated preference for stable employment and greater sense of responsibility, while the near equal split in residency status suggested a level of instability in the workforce, potentially affecting job security and overall worker satisfaction. The educational status underscore potential

barriers to accessing more advanced training and effectively understanding the implementation of OSH practices. Additionally, the majority of workers found earning below or near the living wage suggested by Anker Research Institute (2024), further may influence their attitudes towards OSH measures, often leading them to prioritize daily earnings over long-term occupational safety concerns. The majority of workers were waste collectors and street sweepers suggest higher direct exposure to occupational hazards. This highlights the need of continuous health support system and regular training on comprehensive use of PPE, particularly given the relatively new workforce observed in the study area.

Knowledge on occupational health hazard and safety practices

Evaluating waste handlers' perception of occupational hazards and safety practices is essential for reducing health risks, improving workplace safety, and promoting well-being (International Labour Organization, 2023). Therefore, to assess the knowledge of waste handlers on OSH practices, the study examined their awareness of occupational health hazards, knowledge and use of PPE, provision of training, and availability of PPE. Among the total respondents, majority of respondents (80%) were aware on occupational health hazards, while 20% lacked such awareness. Similarly, 80% of employees displayed knowledge on PPE and 20% did not. Regarding training, 56% of waste handlers were reported receiving trainings prior to employment while 44% did not receive any formal training before employment. Although, PPE was provided to the entire employees, only the 60% were observed using PPE consistently during working hours.

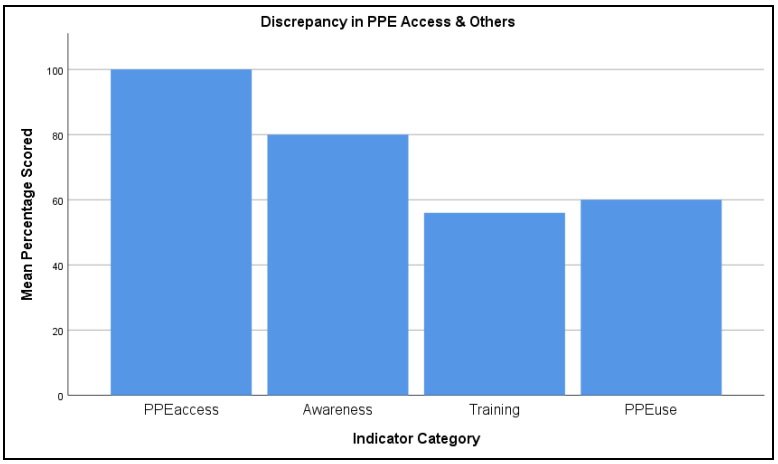

Figure 1: Discrepancy in PPE Access, Awareness, Training and Use,

The finding on awareness on PPE was much higher compared to the finding of Kathmandu where only 51.5% of waste collectors were reported being aware on occupational health hazard. (Marahatta, Katwal, Adhikari, & Rijal, 2017) Although research published in the *International Journal of Medical Science and Public Health Research* demonstrated a positive correlation between waste handlers' knowledge of waste management and their consistent use of personal protective equipment (PPE), findings from the current study show a discrepancy between awareness and practice. While 80% of waste workers reported having knowledge of potential occupational

health hazards and PPE, only 60% were observed consistently using PPE during waste handling. This gap is comparable with findings from a study conducted at the Sisdol landfill site in Nuwakot district by Tamang et al. (2021), where 92% of waste workers had received training related to PPE use, yet only 60% were observed using basic protective gear. Furthermore, in the current study, only 56% of employees had received training prior to employment; highlighting that the safety training provided may be inadequate to ensure consistent safety practices, as evidenced by the low PPE use rate. Importantly, sufficient PPE gear was reported to be available in the workplace, suggesting that the low implementation is not solely accredited to lack of resources. This inconsistency in awareness and practice reveals possible negligence among waste handlers regarding occupational health risk, gaps in training effectiveness, weak enforcement of safety protocols, and lack of supervision. These findings underscore the need for improved and ongoing training, stricter enforcement of PPE usage through regular monitoring mechanism, and the promotion of a safety-oriented work environment.

Occupational health hazard among solid waste handlers

Understanding the nature and extent of occupational hazards are essential to developing evidence-based interventions that improve workers' health, ensure workplace safety, and improve overall quality of life (Sapkota et al., 2020). Among all respondents, a majority of 96% waste handlers were reported experiencing at least one form of occupational health hazard during their work tenure. Of those affected, 66.7% experienced musculoskeletal disorder, 58.3% reported cuts and injuries, 41.7% suffered from respiratory problems, 20.8% experienced heat stress, 12.5% reported dermatological problems, and 8.3% experienced gastro-intestinal problems.

A significant proportion of waste handlers were reported experiencing at least one form of occupational health hazard during their work tenure, with musculoskeletal disorder being the most commonly reported issue. This finding aligns closely with a study conducted among municipal waste workers in **Lalitpur Metropolitan City**, where 95.2% of respondents reported facing physical hazards, including musculoskeletal problems (Shrestha et al., 2023). Similarly, a study carried out in **Kathmandu Metropolitan City** by Bhatta (2019) attributed the prevalence of such disorder to the physically demanding nature of work, which often involves manual handling of heavy loads, poor ergonomic conditions, and inadequate enforcement of OSH regulations.

Cuts and injuries, particularly from sharps, appeared as the second most common occupational health hazard among the waste handlers in the study area. This may be attributed to lack of safe work practices, and insufficient training as highlighted by Black et al. (2019). Additionally, a high prevalence of respiratory problems among waste handler is attributed to prolonged exposure to dust due to infrequent use of PPE (Pradhan et al., 2025). Dermatological problem was lower compared to the study conducted in Kathmandu, which reported a rate of 32.9% (Maheshor Kaphle, 2023). Heat stress was reported by a notable proportion of waste handlers indicating exposure to elevated temperatures during their work. Such exposure can adversely affect workers' health and productivity, particularly in physically demanding roles.

Supporting this, Black et al. (2019) emphasized that availability of PPE alone is not sufficient to ensure protection unless it is adjunct by appropriate usage and comprehensive trainings.

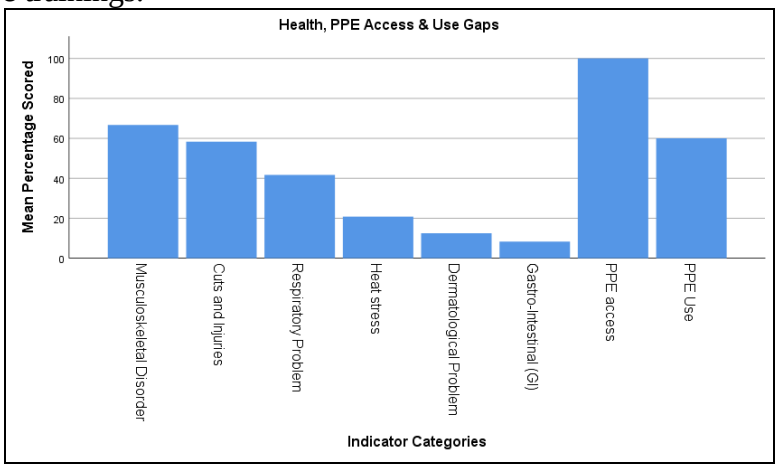

Figure 2: Discrepancy in Occupational Health Issues, PPE Access and use

Gastro-Intestinal (GI) problem although reported at a lower prevalence, was also present. According to Pradhan et al. (2025), such problems are commonly associated with exposure to biological hazards and inadequate health check-ups. These factors may also contribute to similar health issues observed in the current study area. Furthermore, the absence of Pre medical immunizations, regular health check-up and health insurance coverage, as reported by waste workers in survey, may further exacerbate the vulnerability to occupational health hazards.

Conclusion

This study aimed to assess the status of occupational health hazards among solid waste handlers of Damak Municipality by examining their awareness of OSH, availability and use of PPE and prevalence and nature of occupational health issues, in order to propose appropriate recommendations.

The findings on socio-demographic status reveal a slight gender disparity, with a high proportion of male workers, likely due to the physically demanding nature of the work. The predominance of full time, married workers suggests a preference for stable employment and a greater sense of responsibility. However, the diversity in age group and near equal split in residency status reflects a degree of workforce instability, which may potentially impact job security and overall worker satisfaction. Low levels of education and earning below or near the living wage suggest significant barriers to access health facility, receiving advanced training and understanding OSH practices. This may also lead waste workers to prioritize daily earnings over long-term occupational safety. Additionally, the higher proportion of workers exposure to waste further escalates their vulnerability to occupational risks. Similarly, Findings on perception and practices of OSH reveal a notable discrepancy between awareness on OSH and its practical implementation, despite the reported availability of sufficient PPE gear. This inconsistency suggests that the limited use of PPE cannot be solely accredited to lack of resources. Instead, it may reflect possible negligence among waste handlers

regarding occupational hazard, deficiency in training effectiveness, weak enforcement of safety protocols, and inadequate supervision. The findings on prevalence of occupational health issues indicate a significant proportion of waste handlers experienced at least one form of occupational health hazard, with musculoskeletal disorder being the most prevalent. This was followed by cuts and injuries, respiratory problems, heat stress, dermatological problems and gastrointestinal problems.

Prominently, a contradiction was observed between the reported use of safety masks and respiratory illness. This may be attributed to improper or repeated use of PPE without proper sanitation, as well as a lack of training on effective PPE usage and its importance. Although OSH provisions are included in Nepal's Labour Act, this study highlights their weak implementation. Strengthened enforcement and increased awareness are crucial to improving occupational safety in the waste management sector. Additionally, the absence of Premedical immunizations, routine health check-up and absence of health insurance provision, as outlined in Social Security Act, 2017, was found to exacerbate the vulnerability of waste workers in Damak Municipality to occupational health hazards.

These findings underscore comprehensive interventions to strengthen occupational health and safety in the waste management sector. Key recommendations includes the institutionalization of annual health monitoring for waste workers; mandatory enrollment of workers in health insurance schemes; the establishment of municipal OSH monitoring unit to conduct regular inspections, supported by penalty mechanism; and the implementation of structured PPE training programs with the development of targeted OSH learning modules. Furthermore, municipal waste management guidelines should be aligned more effectively with the provision of the Nepal's Labour Act and the Social Security Act to ensure consistent enforcement and sustainable workers protection.

References

Acharya, S., Chalise, H. N., & Dhungana, B. M. (2021). Knowledge and use of personal protective equipment among waste workers at Sisdol landfill site, Nepal. *International Journal of Occupational Safety and Health, 11*(2), 95–100. https://doi.org/10.3126/ijosh.v11i2.39768

Alli, B. O. (2008). *Fundamental principles of occupational health and safety* (2nd ed.). International Labour Organization. https://www.ilo.org/global/publications/ilo-bookstore/order-online/books/WCMS_093550/lang--en/index.htm

Baral, Y. R. (2018). Waste workers and occupational health risks. *International Journal of Occupational Safety and Health, 8*(2), 1–3. https://doi.org/10.3126/ijosh.v8i2.23328

Benka-Coker, M. O., Sarpong, K. A., Pappoe, A. N. M., & Adu, K. (2018). Occupational health and safety status of medical waste handlers in three hospitals in Ghana. *Safety and Health at Work, 9*(2), 204–209. https://doi.org/10.1016/j.shaw.2017.09.008

Bhatta, S. D. (2019). Health risks of solid waste workers in Kathmandu, Nepal. *Journal of Occupational Health and Safety*, *12*(2), 45–53.

Black, M., Karki, J., Lee, A. C. K., Makai, P., Baral, Y. R., Kritsotakis, E. I., Bernier, A., & Fossier Heckmann, A. (2019). The health risks of informal waste workers in the Kathmandu Valley: A cross-sectional survey. *Public Health, 166*, 10–18. https://doi.org/10.1016/j.puhe.2018.09.026

Chi, X., Yu, T., Zeng, D., & Huang, Y. (2020). Health risks and occupational hazards associated with municipal solid waste management: A review. *Environmental Science and Pollution Research*, 27(34), 43215–43230. https://doi.org/10.1007/s11356-020-10590-6

Chikombe, S. (2017). Occupational safety and health hazards associated with solid waste management in Bindura, Zimbabwe. Midlands State University.

Cointreau, S. (2006). *Occupational and environmental health issues of solid waste management: Special emphasis on middle and lower income countries*. The World Bank Group.

Damak Municipality Office. (2016, November 8). *Damak Municipality ward map and population statistics*. Central Bureau of Statistics

Government of Nepal. (2017). *Labour Act, 2074 (2017)*. Ministry of Labour, Employment and Social Security.

Government of Nepal. (2017). *Social Security Act, 2074 (2017)*. Ministry of Law, Justice and Parliamentary Affairs.

Gutberlet, J., & Baeder, A. (2008). Informal recycling and occupational health in Santo André, Brazil. *International Journal of Occupational and Environmental Health*, *14*(1), 1–15. https://doi.org/10.1179/oeh.2008.14.1.1

International Labour Organization. (2019). *Safety and health at work*. https://www.ilo.org/global/topics/safety-and-health-at-work/lang--en/index.htm

International Labour Organization. (2023, September 1). *Nearly 3 million people die each year due to work-related accidents and diseases*. https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_894944/lang--en/index.htm

Jerie, S. (2016). Occupational risks associated with solid waste management in the informal sector of Gweru, Zimbabwe. *Journal of Environmental and Public Health*, Article ID 9024160, 14 pages. https://doi.org/10.1155/2016/9024160

Joshi, S. K., & Kumar, D. (2011). Occupational safety and health in Nepal. *International Journal of Occupational Safety and Health*, *1*(1), 1–2. https://doi.org/10.3126/ijosh.v1i1.6035

Joshi, S. K. (2022). *National occupational safety and health (OSH) profile for Nepal*. International Labour Organization. https://www.ilo.org/publications/WCMS_866976/lang--en/index.htm

Kabanda, T., & Mwesigye, G. (2020). Utilization of personal protective equipment and associated factors among solid waste collectors in Kampala, Uganda. *Scientific Journal of Human Research in Africa*, *5*(1), 45–53. https://sjhresearchafrica.org/index.php/public-html/article/view/98

Kavouras, S., Vardopoulos, I., Mitoula, R., Zorpas, A. A., & Kaldis, P. (2022). Occupational health and safety scope significance in achieving sustainability. *Sustainability, 14*(4), 2424. https://doi.org/10.3390/su14042424

Khattri, J. K. (2023). Association between knowledge on waste handling and use of personal protective equipment among waste handlers. *International Journal of Medical Science and Public Health Research, 4*(7), 5–9.

Mansour Ziaei, A., & Esfandiari, A. (2018). Individual, physical, and organizational risk factors for musculoskeletal disorders among municipality solid waste collectors in Shiraz, Iran. *Industrial Health, 56*(4), 355–366. https://doi.org/10.2486/indhealth.2017-0178

Melaku, H. S., & Tiruneh, M. A. (2020). Occupational health conditions and associated factors among municipal solid waste collectors in Addis Ababa, Ethiopia. *Risk Management and Healthcare Policy, 13*, 2415–2423. https://doi.org/10.2147/RMHP.S276790

Mohsin, M., & Chinyama, A. (2016). Impacts of solid waste management practices on environment and public health: A case of Bahawalpur City, Pakistan. *Journal of Environmental & Agricultural Sciences*, 9, 69–79.

Pradhan, A., Thapa, A., Karki, R., & Kaphle, M. (2025). Self-reported occupational hazards among waste management staff in Lalitpur Metropolitan City: A pilot study from Nepal. *International Journal of Occupational Safety and Health, 15*(1). https://doi.org/10.3126/ijosh.v15i1.59722

Rantanen, J. (2005). *Basic occupational health services: Strategy, structures, activities, resources*. WHO Collaborating Centre for Occupational Health. https://www.who.int/occupational_health/publications/basic_oh_services.pdf

Sapkota, S., Lee, A.C. K., Karki, J., Makal, P., & Fossier-Heckmann, A. (2020). *Risks and risk mitigation in waste-work: A qualitative study of informal waste workers in Nepal***.** Public Health in Practice, 1, 100028. https://doi.org/10.1016/j.puhip.2020.100028

Shrestha, P., Adhikari, A., & Khatri, R. (2023). Self-reported occupational hazards among waste management staff in Lalitpur Metropolitan City: A pilot study from Nepal. *International Journal of Occupational Safety and Health, 15*(1), 108–117. https://doi.org/10.3126/ijosh.v15i1.59722

Srivastava, V., Singh, P., & Singh, R. P. (2015). Urban solid waste management in the developing world with emphasis on India: challenges and opportunities. *Reviews in Environmental Science and Bio/Technology*, 14(2), 317–337. https://doi.org/10.1007/s11157-014-9352-4

Subedi, M., Pandey, S., & Khanal, A. (2023). Integrated solid waste management for the circular economy: Challenges and opportunities for Nepal. *Journal of Multidisciplinary Research Advancements*, 1(1), 21–26. https://doi.org/10.3126/jomra.v1i1.55100

Tamang, A., Sharma, D., & Shrestha, R. (2021). Use of personal protective equipment among waste workers at Sisdol landfill site. *International Journal of Occupational Safety and Health, 11*(2), 92–97. https://doi.org/10.3126/ijosh.v11i2.39768

World Health Organization. (2020). *Occupational health: A manual for primary health care workers*. https://apps.who.int/iris/handle/10665/67385