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*Original Article*

# Livelihood impacts of job-related illnesses among informal waste workers in Kathmandu Metropolitan City, Nepal

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## ABSTRACT

**Introduction:** Informal Waste Workers (IWWs) face numerous occupational hazards, including exposure to toxic materials and a lack of safety measures, which can lead to various health issues. This study investigates the prevalence of job-related illnesses among IWWs in Kathmandu Metropolitan City (KMC) and identifies the most common types of illnesses experienced.

**Methods:** A mixed-method cross-sectional study was performed. The primary data were collected via a survey of 100 IWWs using snowball sampling from November 2022 to January 2023, covering Itinerant Waste Buyers (IWBs), landfill workers, rag pickers, and scrap center workers. Interviews with key informants, including the head of the Solid Waste Management Association of Nepal (SWMAN), Samyukta Safai Jagaran (SASAJA), and waste collection service providers, were conducted. The data was analyzed using SPSS and ALTAS.ti software.

**Results:** Health issues are prevalent, with 49% of respondents reporting illness in the past year, 69% of which were job-related. Common ailments include headaches, body aches, and fevers. Workers often avoid health checkups due to cost, relying on self-medication. Only 15% received medical benefits from employers, and Personal Protective Equipment (PPE) usage was inconsistent, with many reusing gloves found in waste. There was no significant correlation between gender, nationality, and type of waste worker with the likelihood of becoming unwell.

**Conclusion:** IWWs in KMC face numerous job-related health issues which impact their ability to work. Safety concerns, such as lack of proper medical care and inadequate use of PPE, increase their vulnerability.

**Keywords:** Informal waste workers, Job-related illnesses, Kathmandu, Solid waste management

## Introduction

Solid waste management is a major issue for urban areas globally, posing significant risks to human health and the environment. The world produces approximately 2.01 billion tons of municipal solid waste (MSW) annually, with projections indicating that this amount will increase to 3.40 billion tons by 2050.[1] In 2016, the average daily waste generation per capita in Asia was 0.52 kg, which was lower than the global average of 0.74 kg.[1]

Waste picking constitutes the primary source of income for millions of individuals worldwide, highlighting the significant role waste management plays in livelihoods globally.[2] The

Informal Waste Workers (IWWs) collect, sort, sell, and recycle materials that have been discarded as waste. However, IWWs encounter a range of occupational hazards, such as biological, chemical, physical, ergonomic, mechanical, and social risks, while handling toxic waste that can harm their health.[3]

A study in 2017 estimated that globally, approximately 2.3 million work-related deaths occur each year, and the economic impact of work-related injuries and illnesses is around 4% of the world's Gross Domestic Product (GDP).[4] The same study indicated that an estimated 2.9 billion workers worldwide are at risk in their workplaces, resulting in a loss of about 3.5 years of healthy life per 1,000 workers globally. Still, specific figures on work-related injuries and deaths in the informal sector are unavailable. IWWs are often exposed to hazardous chemicals, toxins, and pathogens.[5] These exposures can result in various health issues, such as respiratory and gastrointestinal problems, skin diseases, and infectious diseases like hepatitis and tuberculosis.[6] Likewise, workers in waste collection face hazards such as musculoskeletal disorders from carrying heavy loads and exposure to microorganisms.[7] There is a risk of accidents, dust exposure, solar infrared and ultraviolet radiation, cuts, and exposure to cold or heat during different seasons. The lack of access to basic facilities and equipment for personal protection, sanitation, and healthcare increases the vulnerabilities of the waste workers, which is a significant concern for the health and well-being of IWWs.[8]

Urban areas in Nepal generate approximately 4,900 tons of solid waste daily, averaging 0.30 kg of waste per capita per day.[9] Countries like Nepal are predicted to experience a 40% increase in waste generation by 2050.[1] KMC generates a substantial amount of solid waste, approximately 865 tons daily, which is projected to increase to 1,259 tons per day by 2035.[10] Most of the collected waste is taken to the Sisdol landfill site on the city's outskirts, highlighting a deficiency in the city's solid waste management system, including ineffective waste collection, transfer, treatment, and disposal.[11,12] Kathmandu's waste management system includes multiple stakeholders, including the KMC office, service providers (mainly private companies), and IWWs. IWWs collect recyclables from households and institutions, including offices, industries, and commercial houses. Additionally, they work at scrap centers and landfill stations. Meanwhile, private companies are engaged in waste collection, transportation, recovery, and transferring materials to landfill sites.

IWWs are essential in solid waste management in developing countries such as Nepal. However, they often encounter economic hardships since they belong to low-income families and are economically deprived, earning low wages.[13] Further, they are excluded from social protection programs.[14] Waste recovery and recycling programs generate income-generating activities for waste workers; however, the income is volatile and largely depends on the market price, quality, and quantity of the materials collected.[15]

IWWs' work poses several risks to their health and well-being. The documentation of job-related illnesses among the IWWs in KMC is limited, which, coupled with an absence of their recognition and legal protection, adds to their vulnerability. These workers cannot access essential rights and protections without formal recognition, including fair wages, a safe working environment, and social security benefits.[16]

This study investigates the prevalence of job-related illnesses among IWWs in KMC, Nepal, to identify the most common types of illnesses experienced. It further aims to identify any relationship between illness and gender, nationality, and the type of waste workers. By understanding the impact of job-related illnesses on the livelihoods of IWWs and the coping mechanisms they use to manage these illnesses, this study can contribute to developing interventions that enhance the well-being of IWWs in Nepal.

## Methods

The study was conducted in KMC, in the Bagmati Province of Nepal. KMC was chosen purposively due to its high number of IWWs, and a mixed-method cross-sectional study was performed.

The study utilized secondary and primary data sources to determine the prevalence and types of job-related illnesses among IWWs in KMC and assess the support and benefits provided by their employers during illness and recovery. The secondary data were obtained from journals, books, previous studies, and reports from national and international organizations, providing academic perspectives on solid waste management, the occupational health of IWWs, and the global and national challenges they face.

Different tools were deployed to generate primary data, namely a questionnaire survey, key informant interviews, and site observations. A survey questionnaire was administered to the selected IWWs after obtaining informed consent. The identities of respondents were masked when reporting the results to maintain their confidentiality. The study employed snowball sampling, a non-probability sampling method widely used in sociological studies (including those of vulnerable/marginalized groups such as waste workers), to choose 100 respondents. It is found that snowball sampling can better capture the response in the survey for a low-income and ethnically diverse community[17], which has a higher response rate[18] and increases the chances of the researcher being trusted, as they are recommended through a trusted social network.[19]

There is no universally established statistical formula for determining sample size in exploratory surveys, as the number of participants cannot be predetermined without a full list of the population, in this case, the IWWs. It is up to the researchers to stop the survey when they consider that the information generated is satisfactory.[20] Additionally, a fine balance between representativeness and quality of responses, alongside the purpose of the study, guides the sample size, which could be as low as one and as high as a few hundred. For example, a study analyzing 798 articles from qualitative studies published in 2003 and 2013 in the top ten and second-tier academic journals found a median sample size of 32.5 participants (ranging from one to 330).[21] In this study, the sample size was also ensured to be large enough to capture diverse perspectives of KMC's waste workers community.

The formula used to arrive at 100 participants follows the concept introduced by Leo A. Goodman in his paper "Snowball Sampling", which outlines the s-stage k-name snowball sampling procedure.[22] This method is a chain referral procedure which begins with an initial random sample from a population (stage 1), where each individual is asked to name different individuals. These individuals then refer to other individuals (stage 2), and likewise, the process continues until a desired sample size is achieved. The formula in equation 1 represents the cumulative process inherent in snowball sampling. The data collection started with one respondent from each of the four locations where IWWs are mainly found: Teku, New Baneshwor, Chabahil, and Nuwakot ($n_0$=4). These initial respondents acted as the starting point for the sampling process and continued until the desired sample size of 100 was reached. The sampling process is represented by the formula (Equation 1):

$$N = n_0 + \sum_{i=1}^{k} n_i \dots\dots\dots\dots\dots\dots\dots (1)$$

Where,

N = total sample size (100),

$n_0$ = number of initial participants (4),

$n_i$ = number of respondents referred in subsequent iterations.

In this study, respondents from Teku (n=36), New Baneshwor (n=30), Chabahil (n=22), and Nuwakot (n=8) were recruited through iterative referrals, starting with one respondent per location. The total sample size was N=4+36+30+22+8=100.

Interviews with key informants and site observations were conducted to obtain more in-

depth information on the status of IWWs in KMC. The key informants included the head of the SWMAN, SASAJA members, waste collection service providers, and owners of scrap centers. The IWWs were also asked about the time (in minutes) it took to reach the nearest health facility by walking, with responses categorized as "Never" (no visits), "Rarely" (at least one visit per year), "Sometimes" (3 to 6 visits annually), "Always" (one visit per month), and "Often" (more than 12 visits annually). This helped to assess the frequency of visits to and accessibility of healthcare services.

Site observations for the study primarily focused on capturing working styles, the usage of personal protective equipment (PPE) while working, the status of the workplace, and the overall cleanliness of waste workers working in scrap centers located in Teku, New Baneshwor, Chabahil, and Nuwakot. Interviews, audio recordings, photographs, and videography were done with written and verbal consent from the respondents.

The quantitative data generated from the survey questionnaire were analyzed using descriptive statistics. Non-parametric tests were conducted using the Statistical Package for the Social Sciences (SPSS) version 25. The prevalence of job-related illnesses among IWWs in KMC was determined based on the self-reported health problems experienced by the respondents. The analysis of qualitative data was conducted using ATLAS.ti version 9. Codes were generated from the interview data, and themes were developed to analyze the nature of the illness and its impact on their livelihood. The specific excerpts illustrating the identified themes were marked as quotations within ATLAS.ti and included in this paper to provide personal narratives supporting the discussion of the health conditions and challenges faced by the IWWs.

This study examined the prevalence of job-related illnesses among IWWs in KMC, Nepal, identified the most common illnesses, and explored the relationship between these illnesses and factors like gender, nationality, and waste type. The hypotheses were tested using the Chi-square test.

## Results

Of the 100 respondents interviewed through the questionnaire survey, 66% were males and 34% were females. The respondents were from two nationalities, Nepal (59%) and India (41%). Among those from Nepal, the highest proportion (21%) was from Rautahat District. The remaining belonged to Dhading, Sindhuli, Nuwakot, Sarlahi, Palpa, Kavre, Dolakha, Rasuwa, Sindhupalchowk, Parsa, and Ramechhap districts of Nepal. The respondents from the neighboring country – India belonged to Samastipur, Hajipur, Motihari, Vaishali, Raxaul, and Begusarai. This shows the geographical spread of the respondents, natives of the mentioned areas, and migrants in KMC. Among all the respondents, a majority worked as IWBs (45%), followed by scrap center workers (37%), landfill workers (10%), and rag pickers (8%) (Figure 1).

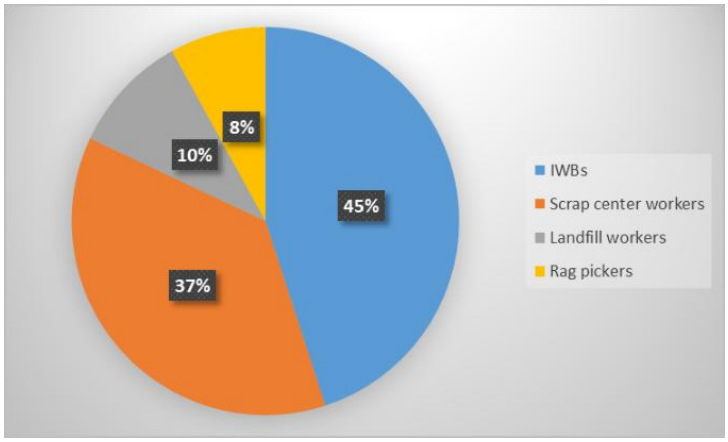


**Figure 1:** Typology of informal waste workers in KMC

Almost half (49%) of the respondents reported being unwell in the previous year, as shown in Table 1. Among them, most respondents (69%) linked their health issues to their current job. Headache was the most commonly reported health issue among the IWWs, being reported by the majority (68%), followed by body aches (51%) and fever (41%). Seasonal health issues like dengue fever, common cold, as well as gastrointestinal problems, were also reported by a few waste workers.

**Table 1:** Health issues among the informal waste workers

| **Characteristics** | **Frequency (%)** |
|---|---|
| **Become unwell in the last year** | **N=100** |
| Yes | 49 (49) |
| No | 51 (51) |
| **Illness related to current job** | **N =49** |
| Yes | 34 (69) |
| No | 15 (31) |
| **Types of illness** | **N = 49 (multiple responses)** |
| Headache | 33 (68) |
| Body ache | 25 (51) |
| Fever | 20 (41) |
| Joint pain | 11 (22) |
| Leg pain | 8 (17) |
| Common cold | 7 (15) |
| Back pain | 4 (7) |
| Diarrhea | 2 (5) |
| Gastric | 2 (5) |

Based on the interviews with the waste workers, it was found that they commonly suffer from illnesses like headaches and fevers, particularly during summer. They have been facing inadequate protection from rain while working outdoors, mainly at the landfill site, as there is no shelter, and they are exposed to the open sky. One of the respondents said, *"I often suffer from headache and fever during the summer months and have to rest at home for 2-3 days."* A similar sentiment was shared by a landfill worker who mentioned, *"Working in open areas exposes us to rain, and we have to rely on the raincoats, which do not provide adequate protection from heavy rainfall."* Waste workers also need to be cautious when extracting recyclables due to the hectic nature of vehicle movement. Recalling an incident, a landfill worker shared that, *"Around two years ago, a new lady who had come to work was buried underneath waste piles when a vehicle was unloading the waste. She had a severe injury on her hand and leg"*.

The working conditions of IWWs are quite precarious, as observed from site visits and documented during interviews. It was found that the IWWs at the scrap centers often get wounded while segregating waste. Likewise, cuts from the sharps were common among the landfill workers as the mixed waste is directly disposed off at the Banchare Danda landfill site. The risky working conditions are further exacerbated by a general lack of awareness and an indifferent attitude of the waste workers towards the use of PPE. Despite perceiving the risks, a significant proportion of the workers, i.e., 68%, did not use PPE.

The use of PPEs is sporadic in different waste collection operations. It was found that the IWBs mostly prefer using masks and shoes when purchasing recyclables. One of the IWBs preferred not to wear shoes during the summer because they tend to smell. He mentioned that customers have complained about the smell, and

he feels awkward. Although workers only wear masks and gloves, they reported discomfort while wearing the full set of PPEs. On the other hand, landfill waste workers were found to be using gloves while working. The workers mentioned reusing the gloves they found in the waste dumped by trucks at the landfill site, specifically when collecting recyclables. An IWB felt that wearing PPE was unnecessary because their work was relatively clean compared to other waste workers. The workers emphasized the challenges, such as feeling uncomfortable and preferring fresh air, which could be obstructed if the mask is used.

During a visit to a scrap center in Pepsicola, it was observed that IWBs use bicycles with sacks tied to one end to transport recyclables. Maintaining balance was challenging when the researcher attempted to ride the bicycle with the load. However, the waste workers skillfully transport these loaded bicycles to the scrap center for sale. One of the respondents said, *"I don't sit on the seat while cycling as some people have developed hernias, and it increases with lifting the load and puts pressure on the abdomen."* Instead, IWBs prefer to walk by dragging the bicycle rather than riding if it is a long distance.

The health challenges are more than just those attributable to unsafe working conditions. One landfill worker shared, *"We work here for eight hours every day and even eat our meals in this area, so we are used to the odor."* Even maintaining a regular meal routine is difficult, as one of the IWBs reported, leading to digestion-related health issues. Since the IWBs need to start their day early, typically around 8 AM, to purchase scrap materials, they have limited options for having breakfast. *"After purchasing scrap materials, we must return to the scrap center around noon and cook food. This is why we need to have breakfast outside, relying on quick and easily available breakfast at the hotel,"* one of the IWBs added.

Only 15% of the respondents reported receiving medical benefits from their employers (Table 2).

**Table 2:** Medical benefits from employers and access to health facilities

| Characteristics | Frequency N=100 (%) |
|---|---|
| **Medical benefits from the employer** | |
| Yes | 15 (15) |
| No | 83 (83) |
| **Visit the hospital when unwell*** | |
| Never | 2 (2) |
| Rarely | 13 (13) |
| Sometimes | 48 (48) |
| Always | 34 (34) |
| Often | 3 (3) |
| **Time taken (minutes) to reach nearest health facilities (walking distance)** | |
| Less than 10 | 83 (83) |
| 11-20 | 10 (10) |
| More than 20 | 7 (7) |

Nearly half the respondents (48%) reported visiting healthcare facilities sometimes, followed by 34% always visiting, 13% rarely, 3% often visiting, and only 2% never visiting the health facilities for treatment. Regarding the time taken to reach the nearest health facility by walking, 83% of the respondents reported that it took them less than 10 minutes. Only 7% of the respondents shared that it took them more than 20 minutes. This shows that most IWWs live or work near health facilities. The extremes (up to 1 hour) were identified among the landfill workers who do not visit the health centers frequently due to the lack of personal vehicles and the health facility being far from the residence or place of work.

Three hypotheses were tested using the Chi-square test to determine the relationship between gender, nationality, type of waste worker, and

illness. The chi-square tests revealed no statistically significant relationship between gender, nationality, type of IWWs, and whether or not respondents became unwell in the last year, as shown in Table 3.

**Table 3:** Association of different characteristics with being unwell in the last one year

| Characteristics | Unwell in the last one year (N=100) | | Total (%) | p-value |
|---|---|---|---|---|
| | Yes N (%) | No N (%) | | |
| **Gender** | | | | |
| Male | 34 (52) | 32 (48) | 66 (66) | 0.483 |
| Female | 15 (44) | 19 (56) | 34 (34) | |
| **Nationality** | | | | |
| Nepali | 27 (46) | 32 (54) | 59 (59) | 0.437 |
| Indian | 22 (54) | 19 (46) | 41 (41) | |
| **Types of workers** | | | | |
| Scrap center workers | 17 (46) | 20 (54) | 37 (37) | 0.475 |
| Itinerant waste buyers | 24 (53) | 21 (47) | 45 (45) | |
| Landfill worker | 3 (30) | 7 (70) | 10 (10) | |
| Rag picker | 5 (63) | 3 (37) | 8 (8) | |

For gender, the p-value of 0.483 was greater than the threshold of 0.05, suggesting that gender did not substantially impact the likelihood of IWWs becoming unwell. Similarly, the p-value of 0.437 for nationality and 0.475 for the type of waste worker were also greater than the threshold of 0.05, indicating that both of these characteristics were not significantly associated with the likelihood of IWWs becoming unwell in the last year.

## Discussion

This study found that almost half (49%) of respondents reported being unwell the previous year with common ailments such as headache, body aches and fever. Gastrointestinal problems are commonly reported by IWBs as given the nature of work, they eat breakfast and snacks outside their homes as they travel across the city and far from their house to purchase recyclables. Several studies report a variety of health issues among the waste workers. A study among waste workers in Kerala, India, found that 39% had knee pain and 33% had low back pain.[23] Musculoskeletal disorders are identified as the primary occupational hazards for waste workers, resulting from lifting heavy loads, carrying, pushing, and working in improper postures.[24–26] A study conducted among IWWs in Bhutan, Mongolia, and Nepal found that waste workers face numerous hazardous and unhealthy conditions, often due to substandard working conditions.[27] The waste management industries (segregation, recycling, and processing) are associated with respiratory infections, injuries, and skin allergies[28] as exposure to bioaerosols and heavy metals in the work environment contributes to such health issues. Sharp objects (23.7%), heavy waste containers (12%), and exposure to dust (10.4%) were reported as the primary causes of work-related injuries among IWWs in Ethiopia.[29] Injuries were most commonly reported in the legs, knees, and feet (25.3%), followed by the hands and fingers (14.5%) in a study on waste workers in Korea.[30] Similarly, a study among IWWs in Nepal found that common physical risks included injuries (66.2%), with cuts from glass (44.4%) and metal (43.9%) being the most frequently reported injuries, and 69.9% of workers experiencing respiratory symptoms.[8]

The current study found two main occupational hazards among the IWWs in KMC. The first is the reluctance among some IWWs to use a complete set of PPEs on routine basis. Despite some awareness among IWWs on the potential benefits

in wearing complete PPEs, the practice is sporadic, and they sometimes only wear masks and gloves, many of which are actually discarded waste. Physical discomfort in using PPEs although cited as the reason, however, appeared a greater concern than the risk of their direct exposure to hazardous waste materials. This is despite the IWWs perceiving their work as risky. The findings are in consonance with other studies on the use of PPEs among waste workers, with the study on waste workers in Kathmandu and Lalitpur revealing that despite having proper information, the workers were not using a complete set of PPEs,[31,32] and in another study, despite 72.5% of waste workers perceiving their work as risky, a significant proportion of the workers (67.6%) did not use PPE.[8] Likewise a study conducted in Bangladesh found that waste pickers in developing nations face higher occupational health hazards due to direct contact with waste while manually handling it and inadequate PPE.[33]

The second occupational hazard is physical strain of transporting heavy loads on bicycles and a resultant peculiar condition of bicycle hernia. This study highlighted that some IWWs in KMC developed medical ailments such as hernia due to the nature of their work, including carrying heavy loads on bicycles and engaging in manual handling activities. A few studies have reported cases of bicycle-handlebar hernias and injuries to the abdominal wall muscles, affecting both outer and intra-abdominal organs, following falls from bicycles.[34–36]

Overall, this study shows that the working conditions of IWWs in KMC pose significant health and safety risks. These conditions are exacerbated by a lack of first aid, inadequate safety measures, and a reluctance to use personal protective equipment (PPEs). However, given the cost of using PPEs, these may be subsidized or provided free of charge to all IWWs, regardless of their status as a government or private sector SWM service provider. Providing safety equipment/PPEs to the IWWs can mitigate occupational hazards.[3]

While the present study on the health issues concerning IWWs in KMC broadly aligns with earlier studies conducted in other countries, however, it provides new insights into workers' behavioral patterns which have not been as extensively covered in other studies. Nearly half the respondents (48%) in the current study reported visiting healthcare facilities sometimes and 83% of all the respondents visited health facilities within walking distance of less than 10 minutes. This is similar to a study conducted among the IWWs in Johannesburg, South Africa, which found that around 41% used healthcare facilities last year and 87% chose to use facilities close to where they live.[37] However, the IWWs in KMC do not want to go for health checkups unless they have severe problems. While a lack of awareness about the importance of regular health checkups among the respondents is pervasive, however, considering the cost of visiting health centers through loss of daily wage and the associated expenditure on medicines, the waste workers prefer to rest and buy medicine from local medical stores without proper diagnosis or prescription. Frequently falling ill or being unable to work due to illnesses can severely limit their ability to collect waste and earn money, having a cascading impact on their financial stability. This highlights the importance of addressing the issues of health and well-being of IWWs to protect their livelihoods and establish sustainable working conditions.

This study on IWWs in KMC found no relationship between gender, nationality, or the type of IWWs and whether or not respondents became unwell in the last year. Thus, both men and women waste workers, whether Nepalese or Indian, involved in any SWM work, could be equally disposed to falling sick. This finding differs from a study among waste workers in Thailand, which found that health problems, including musculoskeletal issues and nail infections, were statistically significantly higher among males than females.[38] Furthermore, health concerns among waste workers are worsened by vaccination challenges, as many IWWs in

Kathmandu are afraid to take the vaccine.[39] The underlying living and working conditions being unhygienic, crowded and perilous with multiple people sharing a single room, often with a combined kitchen, limited resources as found during site visits, could predispose them to poor health. However, despite these challenges, many waste workers claimed they are "used to" living in such circumstances. Falling sick is one thing, but taking a medical treatment is another for the IWWs since their avoidance of visiting medical facilities, such as a hospital, shows the underlying financial constraints in treating their illness. Instead, they bear their sickness, purchase medicines from chemist shops and rest at home for a few days to avoid medical expenses. Additionally, the common medical issues reported during this study could also indicate underlying chronic conditions, which, in the absence of proper medical attention, may predispose the IWWs to serious health consequences in the long run.

## Conclusion

The IWWs in KMC are prone to several health issues related to their job that impact their workability. Additionally, a lack of awareness about safety measures, the workers' behavior and attitudes towards PPEs, a lack of emergency on-site medical care, access to health facilities, and the absence of medical benefits from employers put the workers at risk. It can lead to financial hardship in case of illness or injury. All these factors contribute to the precarity of life and livelihood of waste workers in KMC.

In light of the study's findings, there is an urgent need for proper training of IWWs to handle waste materials safely and use personal protective equipment (PPE) while on the job. This will likely minimize their health risk at work sites. A comprehensive intervention from the government and private sector employers on health, safety, and medical benefits measures that protect all IWWs equally, without discrimination based on gender, nationality, or job role, would be pivotal in securing their sustainable livelihoods.

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