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Waste collection in developing countries – Tackling occupational safety and health hazards at their source

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ABSTRACT

Waste management procedures in developing countries are associated with occupational safety and health risks. Gastro-intestinal infections, respiratory and skin diseases as well as muscular-skeletal problems and cutting injuries are commonly found among waste workers around the globe. In order to find efficient, sustainable solutions to reduce occupational risks of waste workers, a methodological risk assessment has to be performed and counteractive measures have to be developed according to an internationally acknowledged hierarchy. From a case study in Addis Ababa, Ethiopia suggestions for the transferral of collected household waste into roadside containers are given. With construction of ramps to dump collected household waste straight into roadside containers and an adaptation of pushcarts and collection procedures, the risk is tackled at the source.

1. Introduction

Waste management procedures in developing countries are characterised by a dominance of manual handling tasks. Working procedures and properties of waste expose persons involved in the business of waste collection and recycling to a diversity of occupational health hazards which might not be treated adequately due to limited access to health care facilities. Hence, improving occupational safety of waste collectors and recyclers is one important step to increase their social welfare. To do so in an efficient way, the actual occupational risks associated with a solid waste management activity have to be found out in a first step. Existing studies can be consulted to get an overview on the potential risks waste workers face and to place own findings into perspective.

This paper is divided in three sections. Part one illustrates occupational safety and health (OSH) hazards waste workers of developing countries are exposed to. Part two deals with concepts of occupational risk assessment and derivation of adequate safety interventions. In part three, an example for feasible, low-tech safety measures for waste collection derived from a case study in Addis Ababa, is presented.

2. Occupational safety and health situation of waste workers in developing countries

2.1. Methodology

Developing appropriate safety interventions requires a deep insight into working procedures and occupational hazards of the target group. During personal field observations from Ethiopia, India and Bangladesh, we assessed typical tasks performed during waste collection as well as associated hazards. We performed a literature study to find out which occupational injuries and diseases are caused by these hazards in comparable working environments in other developing countries/countries in transition. During our case study in Addis Ababa, Ethiopia we interviewed representatives of the municipality about reported health problems of waste workers as well as household waste collectors about their experiences.

2.2. Exposure to safety hazards

Occupational exposure depends on various factors. In the case of waste management, it is primarily defined by the properties of the waste, secondly by the management task (collection, transport, recycling) and the applied procedures and technologies.

Waste collection in developing countries involves carrying heavy loads. Rotting organic waste or waste contaminated with pathogens and/or hazardous substances is handled. All occupational risks listed in Table 1 can be expected.

Working conditions and working environment influence all hazards. To give two examples: Restricted workspace, slippery

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Table 1
Occupational hazards of waste collectors.

Hazard	Tasks
Muscular-skeletal disorders	Lifting and carrying heavy loads, pushing pushcart
Biological agents	handling of organic waste, handling contaminated materials, working in contaminated environment (mould, dirt)
Hazardous substances	Working with mixed wastes, near heavily frequented roads, on dumpsite
Mechanical hazards	Unintentional contact with sharp items, deliberate handling of sharp items work near moving parts of machinery/vehicles, work on elevated platforms/ in restricted areas/ near heavily frequented roads
Fire/explosion	Waste picking on the dumpsite
Noise	Work near heavily frequented roads, in vicinity of loud machinery/vehicles (workshops, collection trucks)
Vibration	Pushing vehicles on uneven ground
UV- /IR radiation	Sun
Electrical risks	Taking waste from workshops
Human beings	Work in the streets (assaults)
Animals	Work in the streets/entering compounds (mammals); work in unhygienic conditions (insects)
Psychological burden	Working with waste, disrespect of society

surface and dim lighting enhance mechanical risks such as slipping, falling, cutting and insufficient hygienic behaviour, often due to a lack of facilities, increases exposure to biological agents.

2.3. Health problems of waste workers in developing countries

Waste workers experience a variety of adverse health effects, and the situation of waste workers in different developing countries is comparable. They are generally more exposed to all risks than their counterparts in developed countries where direct handling had been limited for process efficiency and worker protection.

Waste pickers, street sweepers and household waste collectors have higher incidents of diarrhoea, viral hepatitis as well as significantly higher incidence of obstructive and restrictive respiratory disorders than control groups and suffer from dog and rat bites, skin diseases and jaundice (van Eerd, 1996, 1997). The Department of Environmental Health Engineering of the Sri Ramachandra Medical College and Research Institute (2005) found high prevalence of Hepatitis B carriers and elevated levels of allergen markers, as well as an increased potential for tuberculosis transmission among waste workers in Chennai, India.

High blood lead levels were reported for children waste pickers at the dumpsite at Metro-manila, supposedly caused by inhalation exposure to gases emitted by openly burning solid waste. Such emissions are also expected to be the cause for headache and nausea dumpsite workers suffer from. There are strong hints for increased birth defects of children of female workers at uncontrolled disposal site (dumpsites), children mortality and morbidity are also higher (Cointreau, 2006).

Risk assessments in developed and developing countries alike have shown a high risk of muscular-skeletal disorders for waste collectors and respective health symptoms were reported. Household waste collectors experienced low back pain and elbow/wrist pain twice as often as the control group due to handling heavy loads. Additionally, the repetition of similar movements of hands and arms when grabbing and disposing waste containers causes joint problems. (Yang et al., 2001; Cimino, 1975; Poulsen and Midtgard, 1996; Vega Engenharia Ambiental S.A., 2002).

Common mechanical hazards are cuts from sharp items (razor blades, glass culets, metal pieces) and needle pricks from healthcare waste disposed with household wastes. As a consequence, workers are exposed to the risk of infections caused by biological agents, especially virus infections like Hepatitis B/C. Tetanus infection is another major concern since workers are rarely vaccinated and wounds are not treated adequately due to a lack of hygiene and the necessity to resume work immediately in order not to loose income (Yang et al., 2001; van Eerd, 1997; Gebreselassie, 2007).

Other mechanical risks include bruises from hitting equipment, fractures and contusions evoked by falling from unsecured platforms of trucks.

During our case study in Addis Ababa, Ethiopia, we interviewed solid waste authorities and household waste collectors about occupational health problems. Common cold, cough, bronchitis, bronchial asthma, tuberculosis, other respiratory problems, eye irritations, head ache, back ache and intestinal disorders were reported. However, as other authors have stated before (van Eerd 1996; Gebreselassie, 2007; Porta et al., 2009) it is difficult to prove a direct link between these diseases and occupation.

Clearly associated with waste collection are cuts from sharp items and falling accidents from small platforms of waste collection trucks as well as limb entrainment in rotating devices of compactor trucks.

3. Exposure prevention approach

Since it is more sustainable, especially from the medical point of view, to prevent harm than to cure it, workplaces and procedures should be designed in the safest possible way. This section aims at giving a brief overview on the internationally acknowledged approach to find and reduce occupational risks.

3.1. Risk assessment

Depending on working procedures, environment and especially the precise activities executed, a worker is exposed to different health and safety hazards. Risk assessment is the process of finding and evaluating risks to workers' safety and health. It is the central part of occupational safety and health management since it enables the employer (as well as the employee) to fully understand the workplace related hazards and to derive efficient preventive measures.

Risk assessment directly relates to actual working techniques and procedures. For each workplace and work step it considers what hazards could cause injury or long term health impacts. Then the risk is evaluated. Risk is defined as the combination of the likeliness that harm is caused and the potential severity of the injury or disease. If evaluation reveals considerable or high risks, counteractive measures need to be taken to reduce risks to an acceptable level. All preventive measures have to be monitored which can be done by applying the same risk assessment cycle again (Fig. 1). Through monitoring it can be found out if the measure is sufficient