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Vulnerability of the Solid Waste Collectors' (Household Waste Collectors) Good Health and Well-being:With Reference to Bengaluru City, Karnataka, India

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ABSTRACT

The waste collectors' contribution to the community, environment, and public sanitation is great, but it can be found that occupational accidents are very frequent and common in this profession. It is found that the waste collectors' health is largely impacted through skin allergies, asthma, and other diseases. This paper explores the vulnerability in health and well-being of solid waste collectors in Bengaluru city. The city is divided into 198 wards under the Bruhat Bengaluru Mahanagara Palike (BBMP), and every day Bangaloreans produce 35,000 metric tons of solid waste, and there are different ways and means to collect it, every day Sixteen thousand garbage disposal workers are paid by the BBMP to collect the garbage. In this study, descriptive survey method has been adopted in two wards; one is maximum waste collection and other from lowest waste collection. The article intends to show that household waste collection can lead to chronic respiratory symptoms such as cough, phlegm, and wheezing, and chronic bronchitis and musculoskeletal symptoms such low back pain and elbow pain along with injuries and cuts caused by sharp objects. The sanitation workers are addressing various health issues and are extremely vulnerable to chronic diseases. The Bangalore city solid waste collectors suffer from skin allergies, tuberculosis, asthma, frequent fever, arthritis, eye allergies, and daily headaches. It was found that 72% of the solid waste collectors have skin allergies, 64.0% are getting daily headache, and 84.0% are frequently feverish.

Key Words : Occupational health, Municipal sanitary workers, Solid waste management, Health, Civil society

INTRODUCTION

In India, the Municipal Solid Waste Management (MSWM) is governed by the Municipal Solid Waste Rules (MSWR). However, majority of the Urban Local Bodies (ULBs) do not have appropriate action plans for execution and enactment of the MSWR (CPCB Report, 2013). No city in India can claim 100% segregation of waste at dwelling unit, and on average, only 70% waste collection can be observed, while the remaining 30% is again mixed and lost in the urban environment. Out of the total waste collected, only 12.45% waste is scientifically processed, while the rest is disposed of in open dumps (CPCB Report, 2013).

Waste is anything that is discarded by an individual, household, or organization. It can be a complex mixture of different substances, some of which may be intrinsically hazardous to health. The working conditions of the waste collectors remain extremely precarious and unsafe. The rapid uncontrolled and unplanned urbanization in Karnataka, has brought serious environmental degradation, and one of the most pressing matters is the management of solid, liquid, and hazardous waste.

"Solid waste" includes solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional

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waste, catering and market waste, and other non-residential wastes such as street sweepings, silt removed or collected from surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste, and e-waste such as battery waste and radio-active waste generated in the area (SWM Rules, 2015, GOI Gazette notification, 2016).

Objectives of the study:

1. To know about the socio- economic aspects of household waste collectors.
2. To know household waste collectors awareness about vulnerability of health and wellbeing.

METHODOLOGY

The study is an explorative as well descriptive in nature. In this study an attempt has been made to explore household workers awareness about health and wellbeing vulnerability.

Further the study is based on primary data and secondary sources. The primary data have been collected with structured interview schedule from two wards of two zones fifty waste collectors included. Among them one is of highest waste generation and collection and the other is the lowest waste generation and collection ward.

Waste management:

Waste management is very much regulated at the global level and includes the generation, collection, processing, transport, and disposal of waste. Municipal Solid Waste includes wastes generated from residential, commercial, industrial, institutional, construction, demolition, process, and municipal services (World Bank, 1999). The Indian *Municipal Solid Wastes (Management and Handling) Rules, 2000,* defines MSW as "Municipal solid waste" commercial and residential wastes generated in a municipal or notified in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes.

The Major Methods of Waste Management are -

Recycling—the recovery of materials from products after they have been used by consumers.

Composting—an aerobic, biological process of degradation of biodegradable organic matter.

Sewage treatment—a process of treating raw sewage to produce a non-toxic liquid effluent, which is discharged to rivers or sea, and a semi-solid sludge, which is used as a soil amendment on land, incinerated or disposed of in landfill.

Incineration—a process of combustion designed to recover energy and reduce the volume of waste going to disposal.

Landfill—the deposition of waste in a specially designated area, which in modern sites consists of a pre-constructed 'cell' lined with an impermeable layer (man-made or natural) with controls to minimize emissions.

Hazardous substances associated with waste management:

The monitoring of all potential sources of environmental pollution from different waste management options has been and is being continuously carried out and thus, a great deal is known about the types and amount of substances emanating from them. Whatever the waste management option, it is generally the case that: (a) there are usually a large number of different substances, and (b) only a few of these are produced in any quantity with many being at extremely low levels (Johnson and DeRosa, 1997). Gases emitted from landfill sites, for example, consist principally of methane and carbon dioxide, with other gases such as hydrogen sulphide and mercury vapour being emitted at low concentration, and a mixture of volatile organic compounds (VOCs) comprising approximately 0.5% (Zimrou *et al*., 1994). The WHO exposure assessment expert group suggests that priority pollutants should be defined on the basis of toxicity, environmental persistence and mobility, bioaccumulation, and other hazards such as explositivity (WHO, 2000). In addition to the substances above, they suggested that landfill site investigations should consider metals, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), chlorinated hydrocarbons, pesticides, dioxins, asbestos, pharmaceuticals, and pathogens. Ten pollutants considered (IEH, 1997) to have the greatest potential impact on human health based on environmental persistence, bioaccumulation and amount emitted and/or on inherent toxicity are cadmium, mercury, arsenic, chromium, nickel, and dioxins, PCBs, PAHs, PM_{10}, and SO_2. Microbial pathogens are a potential source of hazard, particularly in composting and sewage treatment, and also in landfill. Dust and the production of particulate matter are produced in landfill, incineration and composting processes, and by road traffic involved in all

waste management options.

Impact of waste management practices on health:

There is a large body of literature on the potential adverse health effects of different waste management options, particularly from landfill and incineration. There is little on potential problems resulting from environmental exposure from composting and very little on recycling. Although much research has focused on the health of the general population, particularly those living near a waste disposal site, occupational health problems of the workforce involved in waste management are also important. A study of twenty- one European hazardous waste sites found that residence within three km of a site was associated with significantly raised risk of congenital anomaly, with a fairly consistent decrease in risk with distance away from the sites. The risk was raised for neural-tube defects, malformations of the cardiac septa, and anomalies of the great arteries and veins (Dolk *et al*., 1998). A study by the same group showed similar increases in chromosomal anomalies, even after adjustment for maternal age (Vriheid *et al*., 2002).

Household waste generation:

There is relationship between education, income and socio-economic status and the quantity of waste generated have not mentioned results. A person with high income and higher education generates more waste (Abel, 2007). The household size and income does not have any direct impact on waste generated per capita per day. And among the educated families, the waste generation rate was found to be less, and waste generation rate was low in low income economies (Qu *et al*., 2009). Kuwait City has higher waste generation rate averaging 7.1 kg per household, and larger households produce more waste than smaller households (Koushki *et al*., 2004).

Occupational health problems of municipal solid waste management workers:

In solid waste management, risks occur at every step in the process, from the point of collection at homes, during transportation, and at the sites of recycling or disposal. The workers are exposed to occupational health and accident risks related to the content of the materials they handle, emission from those materials, and the equipment being used (Cointreau-Levine, 2006). The exposure to healthrisks have not yet been identified as special occupational problem. In most high? income countries, the data on health and accident consequences is inadequate, and in developing countries, almost non?existent. In developing countries like India, there has been little study of the health and injury incidence of solid waste workers. Most of the reviewed studies suffer from limitations related to poor exposure assessment and lack of information on relevant confounders (Porta *et al*., 2009). In India, the problem has worsened due to high consumption pattern and per capita solid waste generation and low per capita availability of land (Govt. of Kerala, 2008). The increased risk of respiratory disease is related to exposure to organic dusts containing high concentration of bacteria and fungi, biologically active agents, gases, and bio-aerosols, (Cointreau-Levine, 2006). Waste collection is conducted in high traffic density, and in developing countries, vehicle emissions are not controlled. This occupation is physically strenuous resulting in high pulmonary ventilation and requiring workers breathing through their mouth rather than nose (Govt. of Kerala, 2008). Higher prevalence was also reported from other parts of the world like Manila, New York, and Geneva (Gelberg, 1997). Though compared to other studies, less prevalence of respiratory complaints was higher than the general population of 3% (Jayakrishnan and Jeeja, 2007). The increased incidence is biologically plausible and indicated in other epidemiological studies (Athanasiou *et al*., 2010). The municipal solid waste management workers are exposed to occupational health and accidents risks. The chemical contents of the materials and emissions directly affect the workers' lives. Medical wastes and industrial toxic wastes are major health threats. Due to all these, they address high rates of occupational health problems (Cointreau-Levine, 2006). In majority of the developing nations, wastes are stored in closed containers and dumped directly by hands. So the workers directly get exposed to the contamination. But in the developed countries handled by sealed plastic bags and covered dust bins.

Bengaluru scenario:

The Municipal Solid Waste (MSW) consists of organic and inorganic waste materials generated by various societal activities. The improper disposal of MSW pollutes all the vital components of the living environment, *i.e.*, air, land, and water. Bengaluru, located in the southeast of India state is situated at 12.97N 77.56E and covers an area of 2,190 square kilometers at an average

elevation of 920 meters.

The city experiences moderate weather throughout the year. In summer, from March to May the maximum temperature rises to 38°. In winter months, the temperature varies between 28° and 32°. The annual rainfall is about 900 mm.

Presently, the Bruhat Bengaluru Mahanagara Palike (BBMP) is the agency vested with the responsibility of the collection and disposal of solid waste, and is engaged in a series of approaches such as involvement of citizens, investment in infrastructure and technology, as well as monitoring the various systems that are involved in managing the present mix of actions and techniques. For a more efficient and effective approach, the BBMP has been divided into different administrative units. There are 294 Health Wards within the BBMP, and 198 administrative or political wards. Within the BBMP, there are two departments directly involved in municipal solid waste management, namely, the Health Department and the Engineering Department. The Health Department is mainly responsible for the collection, transportation, and disposal of solid waste, while the Engineering Department is responsible for the removal of construction and demolition waste. It also provides technical and infrastructural support to the Health Department (BBMP.com). The waste generation rates are increasing and the characteristics are changing with the increase in population, industrial development, and living standards, particularly in growing cities such as Bengaluru. Due to financial constraints, a proper municipal solid waste collection and disposal mechanism is not in place (Sasikumar and Krishna, 2014).

RESULTS AND DISCUSSION

Table 1 presents detailed information about personal demographic profile of the solid waste collectors. It was found that 72 per cent of the respondents are female workers, who have chosen waste collection as a profession. The women are involved more in number in the profession of waste collection than men. (Furedy, 1990) in Hyderabad, the waste collection work is determined by social, economic, and environmental aspects and greatly involves gender issues. Women workers are more vulnerable to the working conditions. They complain that they are not provided with the protective gear. The women workers are also not happy with the present working situation. It is reflected that 96.0 per cent Hindus are involved in the waste collection profession in the West Zone Ward, 88.0 per cent in Yalahanka Zone Ward, 12.0 per cent Muslims are in Yalahanka Zone Ward, and 4.0 per cent are Christians in the West Zone Ward. On the whole, majority of workers are Hindus in both the Wards. Religious belief in its most ideal form is seen as a powerful force to create purposive transformations by transmitting ecologically positive habit of practice and attitudes of mind to succeeding generations that share similar religious beliefs (Foltz *et al*., 2003).

The table throws light on the age of the respondents as 52.0 per cent belong to the age group of 20 to 29 years, 80.0 per cent to 30 to 39 years' age group, 48.0 per cent to 40 to 49 years' age group, 48.0 per cent to the age group of 30 to 39 years, and 20.0 per cent to the 50 to 59 years' age group. Thus, majority (80 %) of the respondents belong to the 30 to 39 years' age group in both the wards. Professional efficiency is determined by age, hence there is scope to have an efficient waste management process in the city.

The selection of profession is by choice and there are many reasons to choose a profession. The choice of profession depends on many factors as well. Professional choice determines the source of livelihood. Table 2

Table 1: Personal Demographic Profile of Solid Waste Collectors

Sr. No.	Variables	Categories	Yalahanka Zone N=25, (%)	West Zone Frequency N=25, (%)
1.	Sex	Male	14 (56.0)	7 (28.0)
		Female	11 (44.0)	18 (72.0)
2.	Religion	Hindu	22(88.0)	24(96.0)
		Muslim	3(12.0)	00 (00)
		Christian	00 (00.0)	1(4.0)
3.	Age (in years)	20-29	6(24.0)	7(28.0)
		30-39	12(48.0)	8 (32.0)
		40-49	6(24.0)	6(24.0)
		50-59	1(4.0)	4(16.0)

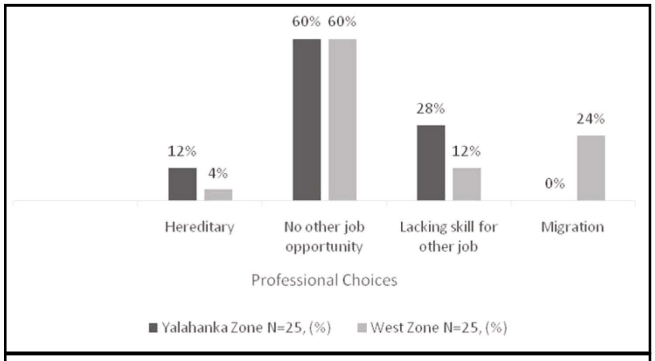

Fig. 1 : Choice of Profession

indicates the choice of profession by the solid waste collection workers as 40.0 per cent of the workers have chosen the profession due to lack of skill for other jobs, 24.0 per cent of respondents have opted for this profession due to migration, majority, *i.e.*, 60.0 per cent have taken up the profession because of no other job opportunities, and 16 per cent have opted for it as it is hereditary.

The waste management workers are falling into the very potential working age, hence there is wide scope for effective waste management provided with effective guidance and technology adoption. In fact, the profession has not been chosen by choice, but due to lack of job opportunities. Hence, there is need of skill training for the effective management of waste among the workers to improve their professional efficiency.

There are various occupational hazards associated with waste handling like skin, eye, and blood infection resulting from direct contact with the waste and from infected wounds along with intestinal infections due to flies in the waste. This profession has serious impact on the health of the workers. It is evident from the above data that majority of the respondents are aware about the occupational health hazards of the profession. About 96.0 per cent of the solid waste collectors are aware of fever, 16.0 per cent from the West zone are aware that blood pressure is caused by their nature of work, 12.0 per cent are aware of back pain, and 4.0 per cent are aware that diabetes is due to the profession, while 64.0 per centare not aware that skin diseases can be caused by the profession, 80.0 per cent are not aware that cough is due to their occupation, awareness for the reason of headache is found in only 24.0 per cent, 88.0 per cent are not aware that breathing problems is due to their daily work. In India, 89 per cent and 15 per cent have eye problems in Mumbai and Kolkata, respectively. Most of the eye problems involved burning sensation, watering, redness, and itching of the eyes (Cointreau-Levine, 2006).

The table also reflects that the solid waste collection workers are not aware that there is direct connection between individual health and their occupation. The solid waste collector does not aware about the health issues due to their occupational choices. (Tooher *et al.*, 2005) exposure to waste leads to multiple risk factors for municipal workers. They suffered from high rates of occupational health-problems. Majority of the diseases are water borne, air borne, and direct contact have exposure pathways to Hepatitis B Virus (HBV) and Tetanus. The risks can be reduced by adapting new waste management technologies, reducing contaminant emissions, and changing working methods, and by usage of protective clothing. On the whole, it is very clear that solid waste collectors need awareness about occupational health issues.

Health is wealth. If an individual has good health, his productivity will increase. And the individual can give greater contribution for the development of the nation. The solid waste collectors (household workers) are

Table 2 : Awareness of Occupational Health Issues

Variables	Awareness of Occupational Health Issues			
	No		Yes	
	Yalahanka Zone N=25, (%)	West Zone N=25, (%)	Yalahanka Zone N=25, (%)	West Zone N=25, (%)
Fever	9 (36.0)	1(4.0)	16(64.0)	24(96.0)
Skin diseases	14 (56.0)	16(64.0)	11(44.0)	9 (36.0)
Cough	20 (80.0)	19(76.0)	5(20.0)	6(24.0)
Headache	19(76.0)	19(76.0)	6(24.0)	6(24.0)
Breathing problems	22(88.0)	22(88.0)	3(12.0)	3(12.0)
Blood pressure	22(88.0)	21(84.0)	3(12.0)	4(16.0)
Back pain	20(80.0)	22(88.0)	5(20.0)	3(12.0)
Diabetics	23(92.0)	24(96.0)	2(8.0)	1(4.0)

Table 3: Major Health Issues Addressed by Solid Waste Collectors

Major Health Issues	Yes		No	
	Yalahanka Zone N=25, (%)	West Zone N=25, (%)	Yalahanka Zone N=25, (%)	West Zone N=25, (%)
Skin allergies	13(52.0)	18(72.0)	12 (48.0)	7(28.0)
Tuberculosis	4 (16.0)	11(44.0)	21(84.0)	14(56.0)
Asthma	5 (20.0)	13(52.0)	20(80.0)	12(48.0)
Frequent fevers	7(28.0)	21(84.0)	18(72.0)	4(16.0)
Arthritis	5(20.0)	14(56.0)	20(80.0)	11(44.0)
Eye allergies	9(36.0)	12(48.0)	16(64.0)	13(52.0)
Daily headaches	9(36.0)	16(64.0)	16 (64.0)	9(36.0)

addressing various health issues; they are extremely vulnerable to chronic diseases. The Bengaluru city sanitation workers are suffering from skin allergies, tuberculosis, asthma, frequently getting fever, arthritis, eye allergies, and daily headaches. About 72 per cent of the solid waste collectors are having skin allergies, 64.0 per cent are getting daily headaches, and 84.0 per cent of West Zone workers are getting frequent fevers. In Table 3, it was found that West Zone workers are more vulnerable to occupational health issues than Yalahanka Zone workers. Among the Yalahanka Zone workers, tuberculosis was found in 16.0 per cent of the workers, 20.0 per cent had arthritis, and 36.0 per cent had eye allergies.

Loading of waste manually without the use of protective gears is dangerous to the health of the workers (Naveen and Sivapullaiah, 2016). Heavy weight lifting during waste collection leads to major joint pains. Musculoskeletal disorders of the neck, shoulders, and arms along with low back pain are addressed by the waste collection workers (Athanasiou *et al*., 2010). On the whole, it was observed that skin allergies, frequent fevers, and daily headaches are the major health issues addressed by the Bhruth Bangalore Mahanagara Palike (BBMP) solid waste collectors.

Conclusion:

In the present work, it was found that majority of the respondents belonged to 30 to 39 years' age group, and maximum 80.0 per cent of the respondents belonged to this age group and 16.0 per cent belonged to 50 to 59 years' age group in both the wards. The waste management workers showed increased incidence of accidents and musculoskeletal problems. The health impact of new waste management technologies and the increasing use of recycling and composting will require assessment and monitoring. With regard to the choice of profession, majority of the respondents, *i.e.*, 60.0 per cent had taken up the profession because of lack of job opportunities, and very minimal respondents had opted for it on hereditary basis (16.0 %).The solid waste collectors lack awareness about occupational health, hence there is need for awareness about it. On the whole, it was found that skin allergies, frequent fevers, and daily headaches are the major health issues addressed by the Bhruth Bangalore Mahanagara Palike (BBMP) solid waste collectors.

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