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Original Research Article

A Study to Assess Morbidity Patterns among the Solid Waste Workers in Municipal Corporation of a Metropolitan City

Sandeep Kasbe[1*], Sumit Wasnik[2], Mandar Sadawarte[3], Ramesh Singh[1]

[1]Department of Community Medicine, Dr. NY Tasgaonkar Institute of Medical Sciences, Diksal, Karjat, Maharashtra
[2]Department of Community Medicine, Dr. Vithalrao Vikhe Patil Foundations Medical College, Ahmednagar, Maharashtra
[3]Department of Community Medicine, Grant Government Medical College, Mumbai, Maharashtra
*Correspondence: Dr. Sandeep Kasbe (kasbesandeep56@gmail.com)

ABSTRACT

Background: The International Labour Organization (ILO) has projected that over 125 million workers face occupational accidents and illnesses within a single year, leading to roughly 220,000 fatalities and impacting about 10 million individuals who suffer significant disabilities. This alarming scenario is compounded by the fact that municipal workers handling solid waste, often hindered by limited education, knowledge, and awareness, find themselves at an elevated vulnerability to occupational hazards. Their line of work exposes them to a diverse range of risk factors including dust, bio-aerosols, volatile organic compounds, and mechanical strain, all of which contribute to their heightened susceptibility to various occupational diseases. This study was conducted to assess the morbidity pattern among the solid waste workers and to study epidemiological correlates affecting health of solid waste workers.

Material and methods: Study Area was 'M' ward of the metropolitan city Mumbai. Study was carried out from June 2012 to July 2013. 160 Permanent male workers who were handling the solid waste and who agreed to participate were included in the study. Employees were contacted at their work place. According to their convenient timing interviews were taken & examination was carried out.

Results: Out of 160 employees, 49.4% employees were in 20-29 year age group and 11.9% employees were above 40 years age group. Most of the employees were belonging to Lower Upper Class (IV). Out of 160 participants, 58 were obese and hypertension was found in 37 participants.

Conclusion: The study unveils a comprehensive overview of the morbidities prevalent among municipal waste workers, highlighting the diverse range of health challenges they encounter in their daily activities.

Keywords: Waste Handlers, Solid Waste, Morbidities, Municipal Corporation

INTRODUCTION

The past decades have witnessed a surge in urban population growth in developing nations, driven by economic advancement, urbanization, and rural-to-urban migration. Municipal solid waste handlers play a crucial role in upholding the cleanliness of urban areas. Nevertheless, their involvement in waste management exposes them to potential infections and severe accidents.[1] Urbanization is on the rise, particularly in India, leading to a heightened waste generation challenge. The global scenario reflects an

anticipated increase in municipal solid waste production, projected to rise from 2.01 billion tons annually in 2016 to 3.40 billion by 2050.[2] About 75 percent of the global workforce lives and works in the third world countries. According to the International Labour Organization (ILO), in a span of a single year, over 125 million workers fall prey to occupational accidents and illnesses, leading to approximately 220,000 fatalities and leaving around 10 million with severe disabilities.[3] Municipal solid waste handlers are engaged in a range of tasks, including collecting waste, manually transferring and unloading refuse bags into vehicles, and ultimately disposing of waste in landfills. As a consequence of these responsibilities and the inherent risks tied to waste management, these workers encounter various health and safety hazards in the course of their duties.[4-6]

A study conducted by Jayakrishnan T et al in 2013 within India revealed that waste handlers encountered occupational-related health issues, including eye disorders, injuries, and respiratory problems.[7] Engaged in waste collection, waste pickers gather an array of materials ranging from plastics, paper, and cardboard to wires, glass bottles, rubber items, and even hazardous electronic components. This role exposes them to potential health hazards, as they encounter infectious agents and toxic substances that could lead to illness. Beyond these health risks, waste pickers often confront social discrimination and mistreatment from certain segments of society, potentially contributing to broader social challenges. Moreover, they sometimes adopt unhealthy behaviors like smoking, alcohol consumption, and drug use during their work, further exacerbating their health vulnerabilities.

In Mumbai, an expansive and densely populated Indian metropolis, the management of municipal solid waste poses considerable intricacies and hurdles. Given the city's substantial population and confined space, addressing this challenge requires a multifaceted approach. The daily waste output of the city is substantial, necessitating a comprehensive framework of strategies and endeavors to guarantee efficient collection, proper disposal, and the adoption of sustainable practices.

With the aim of delving into the health patterns of municipal solid waste workers employed by the municipal corporation of Greater Mumbai, this study was meticulously devised. Its purpose was to uncover prevalent health conditions and identify epidemiological factors that impact their well-being.

Objectives:

1. To study the morbidity pattern among the solid waste workers.
2. To study epidemiological correlates affecting health of solid waste workers.

MATERIAL AND METHODS

Study Area: M ward of the metropolitan city Mumbai.
Study period: Study was carried out from June 2012 to July 2013.
Inclusion criteria: Permanent male workers who agree to participate; upper limit was the age of retirement.
Exclusion criteria: Not willing to give consent and temporary workers.
Sampling method:
The city is divided into 24 wards for administrative convenience; by simple random sampling one ward was selected by lottery method. 24 chits were prepared in which 24 wards were enlisted, from those 24 chits one chit was selected randomly and chit came out to be of M-ward.
Sample size estimation: Pilot study was done on 30 employees and prevalence of musculoskeletal disorder i.e., back pain was found to be 71%. On basis of prevalence of musculoskeletal problem among those employees in the sample survey, we calculated the sample size for the given study using formula give below:
$n=4pqN/L^2(N-1)+4pq$
p= prevalence of disorder
q=1-p
N=Universe
L=10% of p
$n=4pqN/L^2(N-1)+4pq$; (where p=0.7129, q=0.2871, L=0.07129 & N=24,000)
n=4*0.7129*0.2871*24000/0.07129*0.07129(24000-1)+4*0.7129*0.2871
Thus, sample size for study was 160.

Methodology- Employees were contacted at their work place. According to their convenient timing interviews were taken & examination was carried out. Questionnaires were prepared in Marathi & interviews were taken in Hindi & Marathi whichever language they best understood. Pre-designed interview schedule consisted of standard questions related to Socio-Demographic factors and working conditions. In addition, questionnaire also included questions on past and present medical history and their health seeking behavior, followed by general and systemic examination and investigations.

Hypertension- According to WHO[8] Individuals detected with average SBP >= 140 mmHg or DBP >= 90 mmHg on screening, or were previously diagnosed as hypertensives, or were taking antihypertensive medication were classified as hypertensive.

Diabetes mellitus- Patients those who were known diabetic and on medicine were considered as diabetes mellitus patients

Obesity- Classification of obesity was done based on Body Mass Index. BMI, formerly called the Quetelet index, is a measure for indicating nutritional status in adults. It is defined as a person's weight in kilograms divided by the square of the person's height in metres (kg/m2).[9]

The socioeconomic status of study participants was classified according to Modified Kuppuswami socioeconomic classification.[10] Written Informed Consent was taken from the participants. Face to face interview with worker was conducted using a semi structured and pre designed questionnaire.

Statistical Analysis: Data was analyzed using SPSS version 20. Mean, median and standard deviation was calculated and Chi square test was applied wherever necessary as a test of significance.

Ethics: Institutional Ethical Committee approval was taken prior to the study.

RESULTS

Table 1 provides a breakdown of various demographic characteristics among the sample of 160 individuals. Notably, the majority of participants fall within the age range of 20-29 years (49.4%). In terms of religion, the largest group identified as Buddhist/New Buddhist (50%). Regarding education, the distribution reveals that a significant portion has primary education (62.5%), followed by secondary education (23.1%). In terms of socioeconomic status, the majority of participants belong to the Lower Upper (IV) category (89.37%).

Table 1: Distribution of study participants as per age, education, religion, marital status and socioeconomic status

Age (Years)	**Number (%)**
20-29	79 (49.4%)
30-39	62 (38.8%)
40 above	19 (11.9%)
Total	160 (100%)
Education	**Number (%)**
Illiterate	23 (14.4%)
Primary	100 (62.5%)
Secondary	37 (23.1%)
Total	160 (100%)
Marital Status	**Number (%)**
Married	137 (85.6%)
Unmarried	23 (14.4%)
Total	160 (100%)
Religion	**Number (%)**
Hindu	59 (36.9%)
Muslim	17 (10.6%)
Buddhist/New Buddhist	80 (50%)
Others	4 (2.5%)
Total	160 (100%)
Socioeconomic Status	**Number (%)**
Upper (I)	0 (%)
Upper Middle (II)	0 (0%)
Lower middle (III)	17 (10.6%)
Lower Upper (IV)	143 (89.37%)
Lower (V)	0 (0%)
Total	160 (100%)

Table 2: Morbidity patterns in solid waste workers (multiple responses)

Morbidities	Type of Morbidities	Frequency (%)
Injuries/ Accident	Fracture	28 (17.5%)
	Laceration with Needles and Glass Material	129 (80.6%)
	Contusion after getting job	65 (40.6%)
	Accidents associated by vehicle during operating	11 (6.8%)
Skin Disease	Rashes/Infective Disease	84 (52.5%)
	Fungal infections	82 (51.3%)
Respiratory Related Disease	Dust allergy	14 (8.8%)
	Episode of Asthma	14 (8.8%)
	Chronic Cough	42 (26.3%)
	Running Nose	68 (42.5%)
	Wheeze and Breathlessness	108 (67.5%)
	TB	9 (5.6%)
Musculoskeletal related Disease	Sprain	53 (33.1%)
	Backache (Lower Backache)	117 (73.1%)
	Shoulders	107 (66.9%)
	Joint pain (Hip/Knee/Ankle)	100 (62.5%)
Eye Related Disease	Eye Soreness/Infection	20 (12.5%)
	Redness of Eyes	85 (53.1%)
	Watering of Eyes	94 (60%)
	Itching of the Eyes	74 (46.3%)
Gastrointestinal related Disease	Loose Motion	4 (2.5%)
	Episodes of Gastroenteritis	3 (1.9%)
	Acidity	67 (40.9%)

Table 3: Distribution of study participants according to BMI , blood pressure and diabetes mellitus

HTN and DM	Body Mass Index			Total	p value
	Underweight	Normal	Obese		
Blood pressure					
Normal	14 (66.6%)	70 (86.41%)	39 (67.2%)	123 (76.8%)	0.014*
Hypertension	7 (33.3%)	11 (13.5%)	19 (32.7%)	37 (23.12%)	
Total	21 (100%)	81 (100%)	58 (100%)	160 (100%)	
Diabetes mellitus					
Normal	16 (76.2%)	72 (88.8%)	45 (77.5%)	133 (83.1%)	0.14
Diabetes mellitus	5 (23.8%)	9 (11.2%)	13 (22.4%)	27 (16.9%)	
Total	21 (100%)	81 (100%)	58 (100%)	160 (100%)	

Table 2 outlines the prevalence of various health issues among the individuals. Notable findings include a high occurrence of lacerations caused by needles and glass material (80.6%), widespread musculoskeletal problems such as lower backache (73.1%) and shoulder pain (66.9%), significant respiratory concerns like wheezing and breathlessness (67.5%), and a common occurrence of eye symptoms like watering (60%) and redness (53.1%).

Table 3 presents the distribution of individuals based on their Body Mass Index (BMI) in relation to Hypertension and Diabetes Mellitus. Notable findings include that among those with normal blood pressure, the majority fall within the normal BMI range (86.41%), whereas a smaller portion is underweight or obese. In contrast, individuals with hypertension show a different pattern, with a higher percentage falling into the obese category.

For diabetes, those with normal blood sugar levels are predominantly within the normal BMI range (88.8%), while a smaller proportion are underweight or obese. On the other hand, individuals with diabetes mellitus display a slightly different distribution, with a larger percentage falling into the obese category.

DISCUSSION

In our study, Out of 160 employees, maximum 79 (49.4%) employees were in 20-29 year age group, 62 (38.8%) employees were in 30-39 year age group and 19 (11.9%) employees were above 40 years age group. In Bangalore, Chitra N et al[11] conducted study on 450 street sweepers found that majority of the subjects belonged to the age group of 30 to 50 years.

In our study, out of 160 employees, maximum 100 (62%) were less than secondary education level, 23 (14.4%) illiterate & 37(23.1%) were above secondary education level. Out of 160 employees, 137 (85.6%) were married & 23 (14.4%) were Single. Marital status of employees did not have effect on morbidity pattern. Out of 160 employees, maximum 80 (50.0%) were Buddhist/New-Buddhist, 59 (36.9 %) were Hindu, 17 (10.6 %) were Muslims & 4 (2.5%) were others. Chitra N et al[11] in their study in Bangalore also found that majority were Hindus (95.1%) while remaining were Christians and Muslim. In our study, based on the Modified Kuppuswamy Classification, the majority of employees fell under the Lower Upper Class (IV) category, comprising 143 out of 160 individuals. Additionally, 17 employees were classified as belonging to the Lower Middle (III) category.

Morbidity patterns in solid waste workers

In our study, maximum (89.4%) employees had musculoskeletal disorder which includes backache, neck pain, shoulder pain, joint pain & lower limb pain. Backache (73.1%) was the most common musculoskeletal disorder. Musculoskeletal disorders were due to improper handling of waste, heavy equipment & more work load. It was felt that management should employ adequate work force, should follow the principle of ergonomics, training & encouraging employees for exercise.

Forty six percent of employees had gastrointestinal problem which include loose motion, worm infection, acidity. The prevalent gastrointestinal issue was hyperacidity, potentially attributed to shift duties or improper dietary habits. Gastrointestinal problems of employees could have been related to personal hygiene & eating habits. There was no separate place for eating. Employees sit on floor to eat. Canteen or separate place for eating, washing & safe drinking water should be provided by management. 73.1% employees had skin diseases which include dermatitis, fungal infection. Fungal infection is common in workers. 87.5% had injuries on hand, leg, foot due to vehicle while operating, sharp objects, heavy objects etc. Employee injuries stemmed from inadequate training, haste, and excessive workload.

The ophthalmological related symptoms (eye soreness, redness of eye, watering of eye and itching of the eyes) in the study subject was 75 percent. Nearly 78.7 percent workers were found to be having respiratory complaints like breathlessness (67.5 percent) which was the major problem among the respiratory complaints.

A research effort led by Otto M. Poulsen et al. in 1995[12], examining solid waste workers in Denmark, uncovered a notable disparity in Occupational

Disease and Injury occurrence compared to other worker groups. Specifically, these workers exhibited a striking 6-fold rise in the probability of encountering infectious diseases, as well as a doubled likelihood of experiencing allergic pulmonary diseases.

A research investigation carried out among waste handlers at Beitbridge Town Council and Gweru City in Zimbabwe unveiled that workers responsible for municipal waste management faced exposure to biological hazards, including Gram-negative bacteria and fungi, within the confines of truck cabins. Additionally, a notable occurrence of musculoskeletal disorders was observed, alongside reported cases of ailments such as diarrhea, viral hepatitis, and respiratory issues characterized by obstructive and restrictive patterns.[13,14]

Distribution according to BMI of employees

The data reveals that among individuals with normal blood pressure, there were 14 underweight individuals, 70 individuals with a normal BMI, and 39 individuals classified as obese. The total count of individuals with normal blood pressure was 123. Among those with hypertension, there were 7 underweight individuals, 11 individuals with a normal BMI, and 19 individuals classified as obese. The total count of individuals with hypertension was 37. There was a significant association observed between body mass index and blood pressure of patients ($p<0.01$) The cumulative number of individuals having normal blood sugar levels was 133. Out of which there were 16 underweight individuals, 72 individuals with a normal BMI, and 45 individuals categorized as obese. Transitioning to the group of individuals with Diabetes Mellitus, the data indicates that among these individuals, 5 fall under the underweight category, 9 had a normal BMI, and 13 were classified as obese. The total count of individuals with diabetes was 27. There was no significant association between body mass index and blood sugar level of participants ($p<0.14$). Many researchers have shown strong association between high body mass index and hypertension and diabetes mellitus.[15-19] In our study, a significant number of study participants were found to be unaware of their blood sugar levels during the examination, potentially leading to an underrepresentation of the true count of individuals with diabetes mellitus.

CONCLUSIONS

The study unveils a comprehensive overview of the morbidities prevalent among municipal waste workers, highlighting the diverse range of health challenges they encounter in their daily activities. The findings provide critical insights into the occupational health hazards faced by these workers, emphasizing the need for targeted interventions and preventive measures.

Recommendations

Based on the findings from the study, a few recommendations can be given as follows:

1. **Occupational Health Awareness:** Implement training programs to raise awareness among workers about potential occupational health hazards, emphasizing safe work practices and personal protective measures.
2. **Regular Health Check-ups:** Establish regular health check-ups for workers to detect and address health issues at an early stage. This can help in timely intervention and prevention of complications.
3. **Safe Work Environment:** Prioritize the provision of appropriate equipment and tools that minimize the risk of injuries, particularly when handling needles, glass materials, and heavy machinery.
4. **Blood Pressure Management:** Emphasize the importance of blood pressure control through lifestyle modifications, such as reducing salt intake, managing stress, and staying physically active.
5. **Education on Obesity:** Raise awareness about the risks associated with obesity and its potential impact on blood pressure. Provide resources to support weight management and healthy lifestyle choices.
6. **Government and Employer Involvement:** Collaborate with government bodies, employers, and health organizations to create comprehensive policies and initiatives that prioritize the well-being of municipal waste workers.

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