



Assessment of Respiratory Health of Landfill Workers and Its Correlation with Their Knowledge and Use of Personal Protective Equipments

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ABSTRACT

Introduction: Waste management is an issue of social concern owing to its impact on public health. PPE are found very effective in preventing respiratory health hazards.

Aims and Objective: To find out the level of knowledge regarding personal protective equipments (PPE) and assessment of respiratory health among landfills workers.

Materials and methods: This cross sectional study was conducted among landfill workers. All workers were examined covering hundred percent sample size. Lung capacity was measured and Analysis of data was done by using the MS Excel and SPSS for percentage and χ^2 (chi square).

Results: Among the participants out of 50, 44 (88%) were male and 6 (12%) were females, majority of the workers were between age 31-40 years that is 26 (52%). 32% male workers were smoker on the other hand no female worker were ever smoke. Pulmonary function test (PFT) findings concluded that workers with FEV1/ FVC % below 80% had poor knowledge regarding legislation, waste management & use of PPE as compare to workers with (FEV1/ FVC %) >80%.

Conclusion: Health education to workers and making provision of PPEs can be helpful to safe guard their respiratory health.

Keywords: landfill workers, respiratory health, occupational health, PPEs, spirometer, municipal waste

INTRODUCTION

Waste management particularly assortment, transportation, sorting, processing and disposal of waste materials, is an issue of social concern owing to its impact on public health and workers engaged in it. Waste produced by humans is source of environmental contamination and a large proportion of this waste is disposed off in the landfills in urban area¹. The waste collected in developing nations isn't hold on in barred containers and is drop straight on the ground, requiring it to be shovelled by hand or left in open carton or basket to be collected by hand. Workers therefore have considera-

bly more direct contact with solid waste than their counterpart countries, which mainly manage sealed waste.² There are chiefly three kinds of landfills category I-municipal solid waste landfill, category II- industrial waste landfills, category III - dangerous waste landfills, The landfills are vital to forestall contamination of waste into the encircling atmosphere³

A landfill can be considered as a dynamic reactor, since a chemical and biological reaction results in emission of gases. Many bio-aerosols, organic and inorganic gases are produced in the landfills by decaying organic waste, which are associated with

health effects such as respiratory problems, influenza like symptoms and COPD. The incidence of work related pulmonary problems which is exuberated by smoking seems to be greater in waste collectors.^{4,5} This occupation is physically strenuous resulting in workers to breathing through mouth rather than their nose leads to increased pulmonary ventilation⁶. Thus PPE are very effective in preventing health hazards, accident, and promotion of health. The use of gloves, protective goggles, and mouth protection are the very effective methods for protecting from harmful hazards due to solid waste.⁷

It is fact that a large number of workers are engaged in handling the waste at landfills. They are exposed to harmful materials at the landfill sites. Since there are very few studies conducted on the subject in Bhopal city thus keeping in mind this study was conducted.

MATERIALS AND METHODS

This cross sectional study was conducted in a month of July 2019 among landfill workers located at Bhanpur, Bhopal. One worker is considered as one sampling unit, a total of 50 workers were examined presented on the day of survey so hundred percent sample size were taken. All the worker were personally examined and interviewed using self administered questionnaire based on general information, smoking habit, waste management, knowledge about PPE and awareness regarding respiratory health. Lung capacity was measured using spirometer in the sitting position, each subject undergo simultaneously two test and the best one is selected for our study.⁸

All the workers were appointed on contractual basis as per contractor the duration of working all most same for workers. Workers present at the time of data collection were included in our study.

Analysis of data using the MS Excel and trail version of Statistical Package for the Social Sciences (SPSS) For percentage and χ^2 (chi square test).

Permission has been obtained from local landfill authority and formal consent taken by among study population. Strict confidentiality of data has been maintained. Permission from RAC and IEC of the institute were taken.

RESULTS

Among the study population out of 50, 44 (88%) were male and 6 (12%) were female, majority of the workers were between age 31-40 years 26 (52%), most of them educated up to primary level 31(62%) and their BMI falls under normal category 32 (65%). **Table 1**

Among study population 16 (32%) male workers were smoker on the other hand no female worker were ever smoke. **Table 2**

Table 1: General information of subject among study population (n=50)

Category	Male (n=44)(%)	Female (n=6) (%)	Total (n=50 (%))
Age			
19-30	06(12)	00(0)	06(12)
31-40	22(44)	04(8)	26(52)
41-50	14(28)	02(4)	16(32)
51-60	02(4)	00(0)	02(4)
Education			
Illiterate	00(0)	00(0)	00(0)
Up to 5 th	29(58)	02(4)	31(62)
6 th to 8 th	10(20)	04(8)	14(28)
9 th to 10 th	05(10)	00(0)	05(10)
11 th 12 th	00(0)	00(0)	00(0)
BMI			
Under weight	02(4)	02(4)	04(8)
Normal	29(58)	03(6)	32(65)
Over weight	09(18)	01(2)	10(20)
Obese	04(8)	00(0)	04(8)

Table 2: Smoking habit among study population (n= 50)

Category	Smoker		Total (n=50) (%)
	Current (n=16)(%)	Never (n=34)(%)	
Male	16 (32)	28 (56)	44 (88)
Female	00 (00)	06 (12)	06 (12)

Table 3a: PFT (pulmonary function Test) findings among study population (n=50)

FEV1/ FVC%	PFT n=50		Total (%)
	<80% (%)	≥80% (%)	
Total	16(32%)	34(68%)	50(100%)

Table 3b: PFT finding among workers were found ratio (FEV1/ FVC %) is <80% (n=16)

FVC%	PFT n=16		Total (%)
	<80% (%)	≥80% (%)	
Total	12 (75)	04(25)	16(100)

The pulmonary function test was performed twice and the best out of two is selected for the study purpose. PFT report are showed above, out of total 50 participants only 16 (32%) workers showed FEV1/FVC ratio less than 80%. **Table 3a**

Out of 16 only 12(75%) workers showed FVC % less than 80% **Table 3b** that too more common among the smokers. It implies mixed effect of smoking and occupational exposure among the workers.

From the above table it is concluded that workers having poor respiratory health with (FEV1/ FVC %) is <80% showed lack of knowledge regarding

legislation & waste management (12.5%), using of PPE (12.5%) and Awareness regarding respiratory health (18.75%). On the other hand workers with

Table 4: Comparison knowledge regarding health and practices of PPE among study population showed workers with (FEV1/ FVC %) ≥80% and <80%.

		FEV1/ FVC%		χ^2 (p. value)
		n=16 (%)	n=34 (%)	
Knowledge regarding legislations and waste management	Yes	02(12.5)	12(35.29)	2.804 (<.094)
	No	14(87.5)	22(64.70)	
Knowledge regarding PPE	Yes	05(31.25)	25(73.53)	8.104* (<.004)
	No	11(68.75)	09(26.47)	
Regularly use of PPE	Yes	02(12.5)	30(88.23)	27.086* (<.001)
	No	14(87.5)	04(11.76)	
Awareness regarding respiratory health and diseases	Yes	03(18.75)	29(85.29)	20.911* (<.005)
	No	13(81.25)	05(14.70)	

*p value significant at <0.05(PPE -Mask, Gloves, Rubber boot, helmet)

(FEV1/ FVC %) ≥80% having good practices regarding legislation & waste management (35.29%), using of PPE (88.23%) and Awareness regarding respiratory health (85.29%) it may be due to low education level or lack of awareness. **Table 4**

DISCUSSION

In this study, as in other studies, most of the subject workers were male. The majority of subjects had low educational level and lack of knowledge regarding PPE. In our study most of the participants are in younger age group (20-50 years). Jayakrishnan et al (2013)⁹ Had conducted a study among solid waste management workers in Kerala, to assess the occupational health problems of municipal solid waste management workers. She found that respiratory disease is one of the leading cause of morbidity like poor respiratory health specially those with low education level and does not use PPE, similarly in our study out of 50 workers 16 are found to have poor respiratory health. Cointreau Levine et al (1998)¹ Had postulated a relationship between working at open dumps and increased respiratory illness and abnormal lung function test, the increased risk of respiratory illness are mainly due to exposed to dust. Similar results were found in our study. A study done by Luigi et al (2016)² To assess the potential effects on respiratory health of the workers engaged in waste management and disposal, found that respiratory health were poor among the exposed group which is nearly about 19%, similarly in our study 32% (16 out of 50) workers shows poor respiratory health. Kachel T. (2003)¹⁰ conduct a study among 1239 workers, 52.8% workers showed mixed exposure of smoking and occupational exposure both. In our study 75% (12 out of 16) of the workers showed mixed pattern in spirometry study. A cross sectional study done by Athanasiou et al (2010)¹¹

Among municipality solid waste workers in London, with an aim to evaluate their respiratory health. To assess they had used spirometer as a tool. Tests revealed a reduction in lung function parameters and that too among the workers with low education level and do not use PPE regularly. Similar result was found in our study too. Ray MR et al (2005)¹² has reported a study on 96 landfills workers of Okhla landfill. Spirometry showed impairment of lung function in 62% of the landfills workers. Similarly in our study impairment of lung function seen in 32% of the workers. A study conducted among landfills workers in Africa by Nonhlanhla (2019)¹³ as in our study they concluded that chemical waste exposure increases the risk of experiencing breathing problems such as coughing, Poor work conditions and lack of adequate PPE for waste recyclers are a contributing factor for adverse health effects. A study done to show the correlation between occupational exposure and lung function by Madhur S (2019)¹⁴ found that the lung functions of garbage collection staff are more affected than those of ordinary peoples. Study conducted among solid waste disposal collector in Kolkata by Shaoli De (2016)¹⁵ concluded that continuous particulate inhalation includes dust, fumes, nebula and smoke, causing lung damage and respiratory problems similar results we found in our study. Study conducted among door to door waste collecting workers by Jariwala (2013)¹⁶ and results indicate that door-to-door waste collection employees are at risk for chronic respiratory symptoms, and respiratory problem is the most important health hazard as we found in our study. A study conducted by Ravindra khaiwal¹⁷ to find out occupational exposure among municipal solid waste workers of Chandigarh and came to know that Respiratory diseases, accidents and allergies, with a prevalence of 12.3% -17.6%, 4.9% -44.4% and 35.3% -48.9% respectively, were

the major occupational health concerns identified by various categories of waste staff. In our study we also find that respiratory problem is a major health issue among such workers. Study conducted by Somsiri¹⁸ and concluded that there is a strong relationship between municipality solid waste and adverse effect of the workers.

CONCLUSION

Due to its effect on the environment and public health, waste management is a social issue. Our study revealed a reduction in the FEV₁/FCV % and FVC% in the workers. We conclude most of the worker does not have adequate knowledge and importance regarding (PPE) Personal Protection Equipments.

RECOMMENDATION

There is an intense need of conduction an educational session for workers as we know the importance of adopting preventive measures, such as wearing Personal Protection Equipments (PPEs), to protect this category of workers from adverse effects on respiratory health. We also suggest the training programme on occupational health and periodic health assessment is compulsory for the workers working in the landfills.

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REFERENCES

- Cointreau-Levine S, Listorti J, Furedy C. Solid waste. In: Herzstein JA, Bunn WB, Fleming LE, Harrington JM, Jeyaratnam J, Gardner IR, editors. *International Occupational and Environmental Medicine*. 1st ed. St. Louis: Mosby, 1998; pp. 620-32.
- Vimercati, Luigi et al. Respiratory Health in Waste Collection and Disposal Workers. *Int J Environ Res Public Health* 2016;13(7): 631.
- Southern waste and recycling-Atlanta waste. management. <https://www.southernwasteandrecycling.com/Assesd>. June 9th 2019.
- Patil P, Kamble R. Occupational Health Hazards in Sanitary Workers of Chandrapur City, Central India. *Intl J Environ*. 2017;6(3):15-24
- Dorevitch S, Marder D. Occupational hazards of municipal solid waste workers. *Occup Med*. 2001;16:125-33.
- Yang CY, Chang WT, Chuang HY, Tsai SS, Wu TN, Sung FC. Adverse health effects among household waste collectors in Taiwan. *Environ Res*. 2001;85:195-9.
- Gutberlet J and Nazim Uddin S M. Household waste and health risks affecting waste pickers and the environment in low- and middle-income countries. *International journal of occupational and environmental health* 2017;23(4):299-310.
- Roopa S, Padmavathi R, Akolkar A, Sankar S, Ravishankar P, Vijayalakshmi T, et al. Respiratory functions of conservancy workers working in solid waste management sector of Chennai, India. *F1000 Res*. 2013;67:1-6.
- Jayakrishnan T, Jeeja M, Bhaskar R. Occupational health problems of municipal solid waste management workers in India. *Int J Environ Health Eng*. 2013;2:42.
- Kachel T. Effect of occupational exposure and smoking on spirometric tests and symptoms of chronic bronchitis. *Pneumonol Alergol Pol* 2003;71(9-10):428-39.
- Athanasiou M, Makrynos G, Dounias G. Respiratory health of municipal solid waste workers. *Occup Med*. 2010;60(8):618-23.
- Ray MR, Roychoudhury S, Mukherjee G, Roy S, Lahiri T. Respiratory and general health impairments of workers employed in a municipal solid waste disposal at an open landfill site in Delhi. *Int J Hyg Environ Health* 2005;208(4): 255-62
- Lotleng N, Kootbodien T, Wilson K, Made F, Mathee A, Ntlebi V et al. Prevalence of Respiratory Health Symptoms among Landfill Waste Recyclers in the City of Johannesburg, South Africa. *Int. J. Environ. Res. Public Health* 2019;16:4277.
- Kulkarni MS, Pingale DP. Effects of occupational exposures on the lung functions and quality of life of garbage collectors in the urban area. *Indian J Occup Environ Med* 2019;23:102-5
- De S and Debnath B. Prevalence of health hazards associated with solid waste disposal – a case study of Kolkata, India. *Procedia. Environmental Sciences* 2016;35:201-208.
- Namrata DJ and Robin AC. Study of Prevalence of Morbidity in Door to Door Waste Collecting Workers of Surat City, Gujarat. *Indian Journal of Public Health Research & Development*. 2013;4(4):123-7.
- Ravindra K, Kaur K, Mor S. Occupational exposure to the municipal solid waste workers in Chandigarh, India. *Waste Management & Research* 2016;34(11):1192-5.
- DECHARAT S. Prevalence of Adverse Health Effects among Municipal Solid Waste Workers, Southern Thailand. *Int J Occup Hyg*. 9(4):186-91.