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OCCUPATIONAL HEALTH HAZARDS IN STREET SWEEPERS OF CHANDRAPUR CITY, CENTRAL INDIA

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Abstract

Street sweepers play an important role in maintaining health and hygiene in cities. They are exposed to road dust and other contaminants while cleaning streets. Exposure of this dust and contaminants irritates respiratory symptoms and airway obstruction. Twenty workers were selected as sample size (10 male and 10 female) and 10 individual as control (5 male and 5 female) for analysis of occupational health hazards in street sweepers of Chandrapur city. The study was carried out from November 2015 to January 2016. Peak Expiratory Flow Rate analysis which was carried out through Breath-o meter and other occupational health hazards through interview schedule specially designed and developed for this study. The results of the study showed that, Peak Expiratory Flow Rate values were lower in exposed workers (sample population) as compared with control group. These workers were exposed to number of environmental and occupational hazards leading to musculoskeletal disorders (100%), respiratory problems (95%), dermatological problems (90%), headache (75%) and gastrointestinal problems (15%) during work. It was further observed that theses workers were suffering from allergies (100%), cough and cold (75%), asthma and bronchitis lungs (65%), hearing disorder (50%), malaria and typhoid (25%), fever (15%) and vomiting (10%) after completion of work. To reduce occupational health hazards in sweepers, they must be made alert and aware of potential health risk arising from their work. Reduction in exposure and use of personal protective equipments should be encouraged.

Keywords: Chandrapur, Occupational health, Street sweeper

Introduction

Waste is any substance of which is discarded after primary use or it is worthless, defective and of no use. It includes municipal solid waste (household trash/refuse), hazardous waste, wastewater such as sewage, which contains bodily wastes (feces and urine) and surface runoff, radioactive waste and others. Different types of solid waste are generated in a city. It includes municipal solid waste, road dust, garbage etc. in addition to this hazardous waste are also being generated. Theses wastes are being collected by workers which include manual scavengers, street sweeping workers, drain and manhole cleaners and rag pickers. Owing to their continuous exposure for prolonged period of time these workers are prone to suffer from different occupation related diseases (Tiwari, 2008).

Street sweepers carry on an essential role in continuous process of city cleaning. Since this occupation deals with waste and dirt, street sweepers are exposed to several hazards (Dutkiewicz, 1997 and Krajewski *et al*., 2002). Occupational respiratory diseases are one of the main morbidities to which they are exposed (Sabde and Zodpe 2008; Nayera *et al*., 2015). Due to inhalation of road dust, which consist of a mixture of bioaerosols (Lavoie and Dunkery, 2002), high concentration of dust, continuous production of viable microorganisms (bacteria and fungi) and endotoxins (Krajewski *et al*., 2002) long term inhalation of such complex dust during street sweeping cause impairment of lungs function and may cause respiratory illnesses (Nku *et al*., 2005). Bioaerosols are formed during handling of wastes through the action of microorganisms on them. This may lead to infectious, allergenic or toxic hazards (Nielsen *et al*., 1997).

Street sweeping and waste collection may lead to a group of respiratory disorders, for example, mucous membrane irritation, rhinitis, allergy, asthma, bronchitis, conjunctivitis, hypersensitivity pneumonitis, allergic broncho-pulmonary mycosis, dermatitis and diarrhea (Allmers *et al*., 2000, Lavoie and Dunkerley 2002, Wouters *et al*., 2002).

The problem associated with street sweeping occupation is rising in developing countries due to several reasons, of which is rapid urbanization (Ramchandra and Varghese, 2003) is one of them. In addition, occupational safety and health measures taken to prevent sweeper's morbidities are not applied is most developing countries, which in turn predispose them to the development of respiratory illnesses, for example, chronic obstructive pulmonary diseases (Anwar *et al*., 2013). The seriousness and complexity of this problem arise from the fact of limited resources, technologies, low socioeconomic standard and low educational level (Stambuli, 2012). Other morbidities include hazards of infection, cut wounds, traffic accidents and exposure to a high level of noise especially in crowded areas (LeGrande, 2014). Cardiovascular and eye diseases are also common among street sweepers (Sabde and Zodpe, 2008), Owing to increasing complex occupational health diseases of street sweepers the proposed study was carried out in Chandrapur city of Central India during November 2015 to January 2016.

Study area

Chandrapur formerly Chanda (19.57^{o} N latitude and 79.18^{o} E longitude) is a city and municipal corporation in Chandrapur district of Maharashtra state of India (Figure 1).

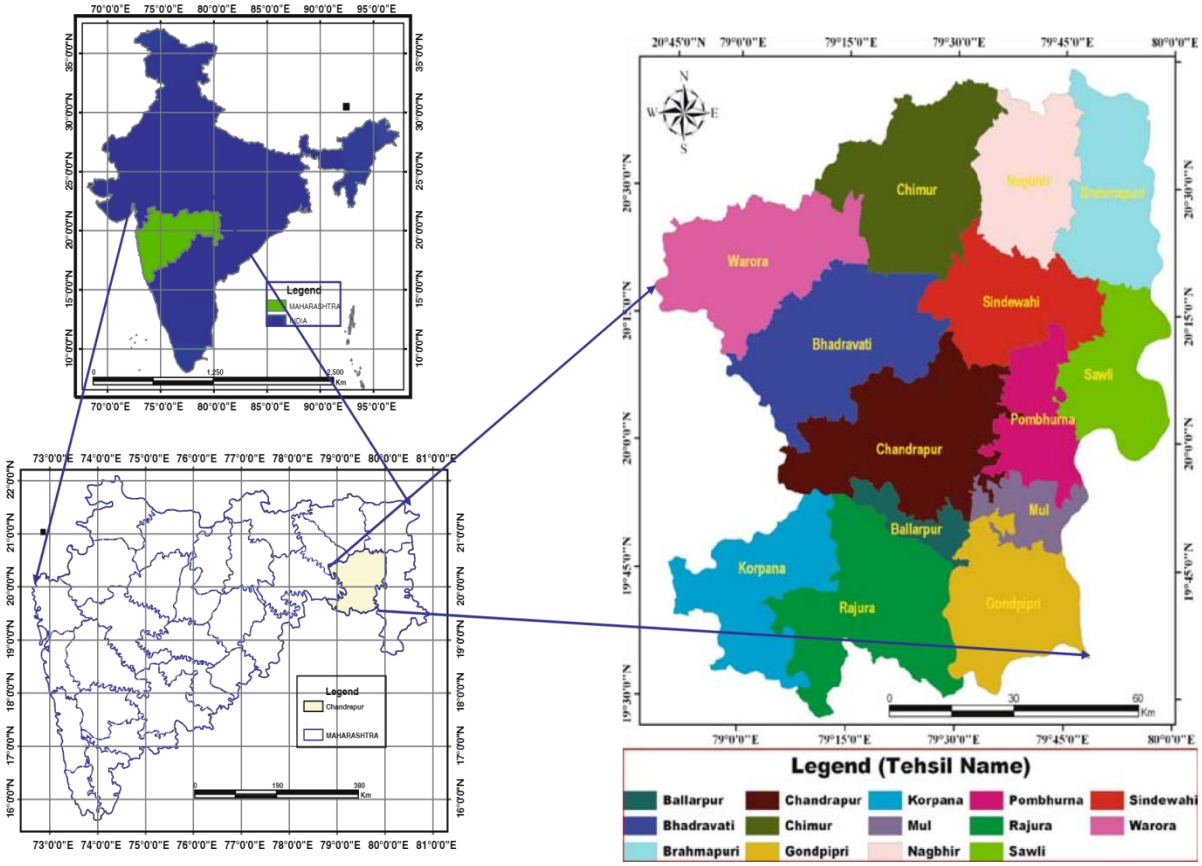

Figure 1. Chandrapur district with differnet talukas in central India

The city is located at the confluence of Irai and Zarpat River. The city has higher elevation at north side whereas lower elevation at south side. The city is situated at an altitude of 189.90 m above sea level and has an area of 70.02 sq km. The north-south length of the city is about 10.6 km, while the east-west is about 7.6 km. According to 2011 census, the city had a population of 3,20,379 (Census of India, 2011). In a 2011 state cabinet decision, Chandrapur Municipal Corporation was elevated to D grade Municipal Corporation. The city has 67 wards and divided into 3 zones.

As per discussion with municipal authorities total 196 street sweepers work in Chandrapur Municipal Corporation. Total quantity of municipal solid waste generation rate in Chandrapur city is approximately 50 metric tons each day (SoIE, 2016).

Study population

Study population was selected from study area comprising of 20 street sweepers (10% of the total population of street sweepers in Chandrapur Municipal Corporation) in the age group of

25-65 years working in this job for more than 10 years with daily exposure of 8-9 hours. Out of theses 20 workers, 50 percent were female (10) and 50 percent were male (10) (Table 1). Ten healthy non exposed subjects in the same age group were selected as a control group. The selection conditions for these control workers includes non smoker and with no history of any disease further it was conditioned that none of the control subject had respiratory symptoms such as cough and cold, wheezing during Breath-o metric testing for Peak Expiratory Flow Rate analysis.

Table 1: Gender distribution of sample population and control group

Gender	**Number (%)**
Sample population	
Male	10 (50%)
Female	10 (50%)
Control group	
Male	5 (50%)
Female	5 (50%)

Material and Method

Data pertaining to health conditions of study population was collected by using structured questionnaire especially designed and developed for this study. This structured questionnaire made emphasis upon work profile, occupation health related issues, women related issues, cover of life/health insurance, morbidity pattern and disease calendar. Peak Expiratory Flow Rate (PEFR) analysis was carried out by Breath-o meter (Cipla, India, as per European Union scale) by comparing it with standard chart prepare by Chest Research Foundation (CRF), Pune, India according to age and height of an individual.

Working environmental conditions of street sweepers were observed in the field to obtain first-hand information on occupational health, composition of wastes, types of tools used for its collection, uniform and other safety measures used.

Result and Discussion

Results of the study are presented in Tables 2-5. From the results as presented in Table 2 and Figure 2, it is observed that out of 20 street sweepers selected for the study during work health related ailments reported by them includes musculoskeletal symptoms such as low back pain and wrist pain in all workers, 19 (95%) workers had reported respiratory symptoms such as cough, phlegm, asphyxiate and wheezing; 18 (90%) workers were suffering from dermatological symptoms such as itching and rashes, 15 (75%) workers reported headache problem whereas three (15%) workers had gastrointestinal symptoms (nausea and diarrhoea). Various health ailments reported after completion of work includes allergies by all workers,

cough and cold by 15 (75%), asthma and bronchitis lungs in 13 (65%), hearing disorder was reported by 10 (50%) workers this may be due to exposure to obnoxious odour, road dust and traffic noise. Five (25%) workers each were suffering from malaria and typhoid whereas three (15%) from fever and 2 (10%) from vomiting problem (Table 3 and Figure 3).

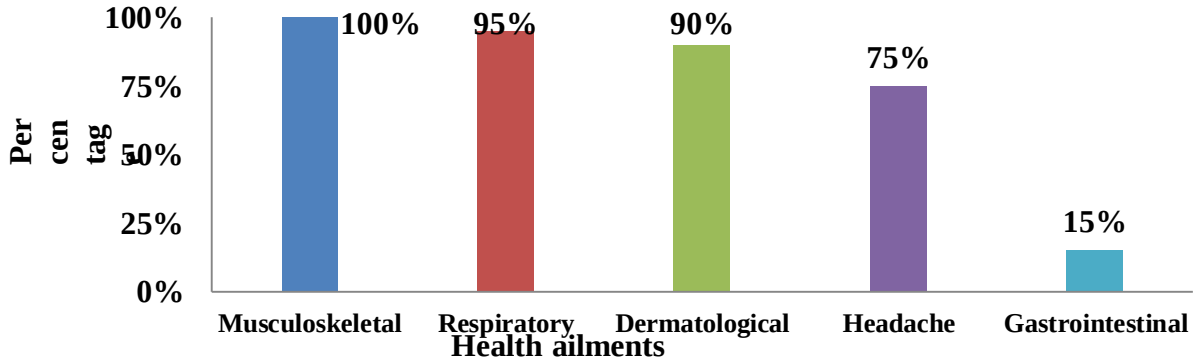

Figure 2: Health problems in street sweepers during work

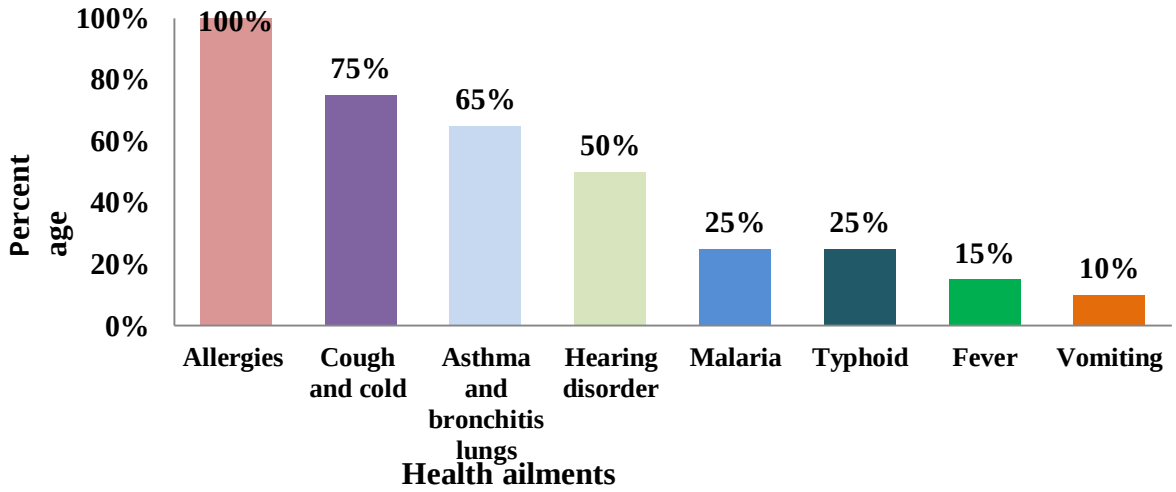

Figure 3: Heath problem in street sweepers after completion of work

Table 2: Health problems in street sweepers during work

Health problem	Number (%)
Musculoskeletal symptoms (low back pain, elbow and wrist pain)	20 (100%)
Respiratory symptoms (cough, phlegm, asphyxiate and wheezing)	19 (95%)
Dermatological symptoms (itching and rashes)	18 (90%)
Headache	15 (75%)
Gastrointestinal symptoms (nausea and diarrhea)	3 (15%)

Table 3: Health problems in street sweepers after completion of work

Health problem	Number (%)
Allergies	20 (100%)
Cough and cold	15 (75%)
Asthma and bronchitis lungs	13 (65%)
Hearing disorder	10 (50%)
Malaria	5 (25%)
Typhoid	5 (25%)
Fever	3 (15%)
Vomiting	2 (10%)

Tables 4 and 5 depicts Peak Expiratory Flow Rate (PEFR) in street sweepers with exposure period of 10-20 years, 21-24 years and >25 years and control group. From the results it is observed that street sweepers had lower PEFR than expected values as depicted standard chart prepare by in Chest Research Foundation, Pune with increased in exposure period. Moreover, PEFR values decreases with increasing years of exposure of workers. This decrease in PEFR can be assigned to road dust, bioaerosols and occupational conditions. In case of control group (n = 10), observed PEFR values were in accordance with expected values or sometimes more than that as in Table 6. These observations confirmed that, theses workers owing to exposure to vehicular exhaust, road dust, pathogenic microorganisms and bacteria from road waste may have reduced their lung capacity and thus decreased their PEFR values as compared with control group. These observations showed that lung capacity of these workers from study area had reduced and they were suffering from asthma, bronchitis and other lung problems.

Table 4: Peak Expiratory Flow Rate (PEFR) for street sweepers (Exp. = Expected, Obs. = Observed)

PEFR (L min^{-1})	**Duration of exposure (Years)**					
	10-20		21-24		>25	
	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.
Male	446	465	480	440	474	465
	428	400	423	423	443	440
	434	400	457	450	-	-
	466	462	481	470	-	-
Total	n= 4		n= 4		n= 2	
Female	300	290	340	339	315	312
	333	300	332	330	315	311
	324	315	324	321	-	-
	291	200	221	200	-	-
Total	n= 4		n= 4		n= 2	

Table 5: Statistical summary of Peak Expiratory Flow Rate values for different exposure periods

		Exposure period (Years)		
		10-20	**21-24**	**>25**
Gender		**PEFR (L min^{-1})**		
Male	Minimum	400	423	440
	Maximum	465	470	465
	Spread	65	47	25
	SD (±)	36.68	19.63	17.67
	Variance	1345.58	385.58	312.5
	Kurtosis	-5.96	0.29	-
	Skewness	0.005	0.20	-
Female	Minimum	200	200	311
	Maximum	315	339	312
	Spread	115	139	3
	SD (±)	51.86	65.41	0.70
	Variance	2689.58	4279	0.7
	Kurtosis	3.27	3.75	-
	Skewness	-1.76	-1.92	-

SD = Standard Deviation

Table 6: Peak Expiratory Flow Rate (PEFR) values for control group

PEFR (L min^{-1})	**Control group**	
	Expected	Observed
Male	445	425
	448	450
	446	449
	434	443
	490	500
Total	n = 5	
Female	318	330
	393	343
	300	340
	326	350
	294	312
Total	n = 5	

All workers were provided with personal protective equipment however some of them use and other are reluctant to use it. Most of the workers were aware of the importance and timing of hand washing and hygiene practices. Nevertheless, no convenient washing facilities (soap and water) were made available near collection point or for those working on street. All the workers wash their hand before eating while 19 (95%) of before drinking water. About 60% of workers abuse substance like *ghutka* (tobacco addition).

Statistical summary such as minimum, maximum, average, standard deviation, variance, kurtosis and skewness for Peak Expiratory Flow Rate values among male and female workers with different exposure periods were computed (Table 5). In male workers standard deviation observations for the workers exposure period it was observed that as the exposure period increases so the standard deviation values decreases which highlight that exposure period reduces the lung capacity of the male workers. Further, reduction in lung capacity conclusion can be confirmed from the spread of minimum and maximum PEFR values. Further variance which was maximum in first exposure period group (10-20 years exposure) was maximum as the exposure duration increases this significant reduction in variance values were observed.

In case of female workers the observations as obtained in male for spread, standard deviation and variance was in accordance with male counterparts except at exposure period group of 21-24 years which reported different results as those obtained in male workers. Comparison of female workers exposure period of group 1 and 3 shows significant reduction in PEFR values. In female workers with exposure period >25 years, standard deviation values was ±0.70. This shows that observations had narrow spread (3 L min^{-1}). The results obtained for this study were in accordance with Lavoie and Dunkerley (2002) and Sabde and Zodpe (2008).

Conclusion

The findings of the study provide evidence that street sweepers are suffering from number of health ailments such as musculoskeletal, respiratory, dermatological, headache and gastrointestinal problems during work and allergies, cough and cold, asthma and bronchitis lungs, hearing disorders, malaria, typhoid, fever and vomiting after completion of work. The occupation related lungs diseases in street sweepers are most likely due to deposition of harmful airborne dust particles in lungs that are inhaled during sweeping. Instead of using short brooms, workers were advised to use long handled brooms which will reduce amount and direct exposure to dust. The use of respiratory protection like face mask is recommended so as to prevent airborne dust entry into lungs during sweeping. Further, regular medical checkup of these workers along with medical insurance may be provided so as to tackle any adverse situations arising during the work.

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