

OCCUPATIONAL HEALTH-RELATED MORBIDITIES AMONG STREET SWEEPERS AND WASTE COLLECTORS AT BENI-SUEF, EGYPT

By

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Abstract

Introduction: Street sweepers play an important role in maintaining the health and hygiene in the communities. However, their job exposes them to various hazards while, little or no attention is paid to their health status. **Aim of the work:** To study the possible work-related morbidities among street sweepers and waste collectors emphasizing on the occupational risks they are exposed to and the preventive measures they take to avoid their job-related hazardous exposures. **Materials and Methods:** A total of 138 street sweepers and waste collectors and a matching control group of randomly selected 127 university workers and clerks were interviewed, answered the study questionnaire, and had medical examination, then they offered blood and stool samples for laboratory investigations. **Results:** Compared to the control group, street sweepers and waste collectors had significantly higher rates of HCV seropositivity, parasitic infestations, skin irritation, respiratory complaints and work-related injuries; but with significantly lower mean hemoglobin levels, ($p < 0.05$).

However, no significant difference was detected for HBV infection, eye complaints, joint or lower back pains. Most of street sweepers had never been medically examined, vaccinated, trained for safety practices or even health educated regarding their occupation-related health hazards. **Conclusion:** Street sweeping and waste collection

is a hazardous job that exposes its workers to infections especially with the little, in any, protective measures they apply. Guidelines for safety measures and controlling infections should be emphasized and employed for those workers, while offering periodic medical examinations and supplying them with personal protective equipments.

Key words: Street sweepers - Occupational hazards - Waste collection - Morbidity – HCV

Introduction

Poor sanitation is a multidimensional problem that comprises a wide variety of infrastructural and daily human activities including improper waste disposal. In developing countries, the wastes and refuse still comprise a major public health threat; and many of the health problems experienced by residents of different communities are traceable to the poor sanitary environment (Bernardo, 2008).

Human activities create waste, and it is the way this waste is handled, stored, collected and disposed of, which can pose risks to the environment and to public health (Zurbrügg, 2002). One job that has contributed greatly to human health by reducing the risk of several diseases like typhoid fever or cholera is waste collecting (Kuijer et al., 2010). Therefore, street sweepers and waste collectors are considered by the people and government as responsible for this task.

Street sweeping and waste collecting exposes these workers to a variety of risk factors such as dust, bioaerosols, volatile organic matter and mechanical stress, which make them susceptible to certain occupational diseases (Dutkiewicz, 1997 ; Krajewska et al., 2002). Several studies reported that waste collectors are at high risk for developing disease resulting from exposure to various work hazards (Schibye et al., 2001; Wouters et al., 2002 and Kuijer et al., 2010). The important morbid conditions detected in these workers included diseases of the respiratory system and eye, accidents, injuries, cuts and wounds, skin infections, animal bites, etc (Diggikar, 2004; Nagaraj et al., 2004). Moderate evidence is available that waste collecting increases the risk of respiratory complaints and limited evidence is available for gastrointestinal complaints and hearing loss according to the systematic review by (Kuijer et al., 2010). Furthermore, collecting wastes is a physically demanding job, which is associated with a high prevalence rate

of musculoskeletal disorders (Poulsen et al 1995; Dorevitch and Marder, 2001; Kuijer et al., 2003).

Industrialized countries have significantly reduced occupational health impacts on street sweepers and waste collectors by applying standardized waste management processes (Dall'Agnol et al., 2007). However, in developing countries, the health-related underpinnings of solid waste management still need to be addressed (Cointreau-Levine, 1995).

In Egypt, since there are no designated areas for waste collection, some households bring their mixed wastes to the waste collectors when they knock their doors. Others leave their wastes in a container or plastic bags in front of their apartments. Some may put their garbage on the road side or a street corner, which is not usually a designated pick-up point. Stray animals or some scavengers may happen to scatter such wastes to the streets while searching for something to eat or recyclable items. Moreover, due to the lack of garbage bins in streets with people's mal-behavior towards their environment, lots of wastes from people's daily activities are being disposed on streets, e.g., biscuits wrappers, nuts' crusts, cigarettes, tissues, papers, foods, etc.

Additionally, hazardous medical wastes from the scattered health facilities and private clinics are disposed with the general wastes. Moreover, many patients with chronic diseases are being treated at home with the resulting medical wastes (e.g., sharps, needles, wound dressings,...) are being disposed with the general waste.

Egyptian street sweepers and waste collectors are therefore, dealing manually with mixed hazardous wastes with substantially increased occupational health impacts. Waste management practice in Egypt has been largely focused on the issues of collection and disposal with little or no attention paid to the health status of street sweepers and waste collectors.

Aim of Work

In this study, we aimed at studying the possible work-related morbidities of street sweepers and waste collectors emphasizing on the occupational risks they are exposed to and the preventive measures they take to avoid their job-related hazardous exposures.

Materials and Methods

The study was conducted in Beni-Suef district, about 120 Km south to Cairo, where, the number of workers

engaged with street sweeping and waste collection is about 850 workers (340 of them were permanently employed by the government; and the rest of workers, i.e., the other 470, were hired as temporary contractors). A permanent position ensures for the workers a fixed monthly salary, health insurance in case of sickness or any adverse health condition, with a regular system for working and off-days. Unlike this system are the contracting workers who are paid a fixed amount of money as monthly salaries, without providing workers the rights for health insurance or payment for the missing days, during sick-leaves or national holidays. The institute for street sweepers and waste collectors is based on short term temporary contracts that can be extended or renewed for not more than a year at a time.

In this study, we randomly recruited 164 workers who agreed to participate in the study, however, 26 of them refused to give blood samples for analysis and withdrew from the study; therefore the total number dropped finally to 138 workers who were interviewed, answered the study questionnaire, had medical examination and offered blood and stool samples for

laboratory investigations. Chest x-ray was performed to participants with chest complaints. As a control group we examined a randomly selected group of 127 university workers and clerks who were matching with the street sweepers and waste collectors for their male sex and age.

Data collection took place between November, 1st, 2010 and end of August, 2011.

All participants were asked about their sociodemographic data, past and present medical history and medical complaints. The questionnaires included the personal and demographic data such as age, residence, smoking habit, and education level. Additionally, it included occupational history items such as status of employment, period of employment, and whether the worker is engaged with other part-time or any additional job. The workers were requested to indicate their job necessitates dealing with any kind of blood or blood products.

They were also subjected to general medical examination; including measuring body weight, height, blood pressure as well as urine and stool analysis.

All participants were requested to offer blood samples for complete blood picture, fasting and postprandial blood sugar, HBV and HCV. Serum samples were collected in plain vacutainer tubes (BD, USA). Each participant was allocated a study code which was written on his corresponding questionnaire and the same corresponding identifying code labeled his blood and stool specimen as well.

HBV surface antigen (HBsAg; Murex) anti-HBc (total anti-HBc IgM and IgG, Adaltis, Italy) and anti-HBs (Adaltis, Italy) EIA were performed according to the manufacturer's instructions and as previously described (Meky et al., 2006)

Anti-HCV was tested by a third generation EIA assay (Murex anti-HCV; version 4.0; USA) according to the manufacturer's instruction.

Reverse transcriptase polymerase chain reaction (RT-PCR) was performed on sera from subjects who were anti-HCV positive. Conventional RT-PCR was performed for the detection and amplification of HCV-RNA after extraction of viral RNA using Qiagen viral RNA extraction kit according to the manufacturer's instructions (QIAGEN, USA) and as

previously described (Abdel Hamid et al., 1997) 7. Moreover, quantitative RT-PCR was performed according to the manufacturer's instructions (Applied Biosystems, USA) to confirm and quantify HCV-RNA levels in the anti-HCV positive subjects.

Antibody and HCV-PCR data were kept strictly confidential and were reported only to the corresponding investigator for following up and counseling the positive participants.

Following the interview a brief health education was performed about the occupational hazards of street sweeping and waste collection with the proper protective measures e.g., personal protective equipment, protective working uniform or clothes, safety practice, first aid measures, importance of receiving vaccinations against the possible work-related infections and importance of taking periodic medical examination.

Ethical considerations:

The study was conducted after obtaining the approval of the ethical committee of the Faculty of Medicine, El-Minia University.

Prior to data collection, all participants were asked to give a

verbal informed consent before starting the interview. The researchers explained the purpose of the study for all the participants with confirming confidentiality of their information that it will never be used for purposes other than scientific research.

Statistical Methods:

The collected data were coded, entered to a computer and analyzed using the software, Statistical Package for Social Science, (SPSS) version 19. Qualitative data were presented as frequency distribution with its percentage; and for quantitative data, descriptive statistics with mean and standard deviation were calculated. Appropriate significant tests such as Chi-square test, student's t-test and correlations were done whenever needed. P-values of <0.05 were considered significant.

Results

This study includes 138 street sweepers and 127 university workers as a control group. None of the 138 street sweepers were noted to be using protective devices such as face masks, goggles, gumboots or gloves while working and none of them reported being-vaccinated nor trained before employment.

Compared to the controls, the mean age and the marital status of street sweepers were almost comparable. Around 50% of street sweepers and 28.3% of university employees were living in rural areas, known to have less medical and educational facilities and scarce job offers.

Street sweepers have significantly higher smoking rates (30.4%) compared to only 18.1% of the university workers ($p=0.001$), (Table 1).

Table 1: Socio-demographic characteristics of the studied street sweepers and university employees

Variables	Street sweepers n = 138		University Employees n = 127		X ²	P-value
	No.	(%)	No.	(%)		
Marital status						
Single	10	(7.3)	8	(6.3)	0.5	0.7
Married	127	(92.0)	117	(92.1)		
Widow	1	(0.7)	2	(1.6)		
Smoking						
No	92	(66.7)	87	(68.5)	13.3	0.001*
Current	42	(30.4)	23	(18.1)		
Ex-smoker	4	(2.9)	17	(13.4)		
Age Mean±SD	37.9 ± 8.8		39.1 ± 7.7		t=0.9	0.3

*: Statistically significant

Table (2) shows that 39.1% of street sweepers were temporary contractors while all the university workers were permanently employed (i.e., ensured governmental positions). A high percentage of street sweepers (94.9%) reported that they experienced work-related injuries during the past year compared to only 20.5% of university workers, ($p=0.0001$). Further, about 81% of street sweepers reported having part time jobs beside that of street sweeping, however only 28.4% of university employees were engaged with additional jobs beside their main ones ($p=0.0001$). None of the 138 street sweepers were subjected to periodic health examination and they did not have health insurance while all university employees had health insurance and reported having regular health examination, ($p=0.0001$).

Table 2: Occupational characteristics and types and frequency of work-related injuries among the studied street sweepers and university employees

Variables	Street sweepers n = 138	University employees n = 127	X	P-value
	No. (%)	No. (%)		
Position				
Permanent	84 (60.9)	127 (100.0)	62.4	0.0001*
Contractor	54 (39.1)	0 (0)		
Other jobs				
No	26 (18.8)	91 (71.7)	100.2	0.0001*
Farming	38 (27.5)	32 (25.2)		
Construction	33 (23.9)	1 (0.8)		
Loading and unloading	23 (16.7)	0 (0.0)		
Shop keeper	18 (13.0)	3 (2.4)		
Contact with medical wastes				
No	54 (39.1)	127 (100.0)	110.4	0.001*
Yes	84 (60.9)	0 (0.0)		
Ever injured during work in the past year				
No	7 (5.1)	101 (79.5)	178.3	0.0001*
Once	20 (14.5)	18 (14.2)		
Twice	19 (13.8)	8 (6.3)		
Three to five times	33 (23.9)	0 (0.0)		
Six to ten times	41 (29.7)	0 (0.0)		
More than ten times	18 (13.0)	0 (0.0)		
Type of injury				
No	7 (5.1)	83 (79.8)	148.4	0.0001*
Sharps	91 (65.9)	11 (10.6)		
Medical objects	20 (14.5)	0 (0.0)		
Blunt objects	20 (14.5)	10 (9.6)		
Health examination				
No	138 (100.0)	0 (0.0)	265	0.0001*
Yes	0 (0.0)	127 (100.0)		
Health insurance				
No	138 (100.0)	0 (0.0)	265	0.0001*
Yes	0 (0.0)	127 (100.0)		

*: Statistically significant

Systolic blood pressure, diastolic blood pressure, fasting blood glucose and postprandial glucose showed no differences between street sweepers and the control subjects. However, street sweepers had significantly lower mean hemoglobin level and higher WBCs than the university employees control group, ($p=0.001$ and $p=0.001$), (Table 3).

Table 3: Comparison between street sweepers and university employees regarding their mean blood pressure, blood sugar, hemoglobin and white blood cells

Variables	Street sweepers n = 138	University employees n = 127	t	P-value
	Mean \pm SD	Mean \pm SD		
Systolic blood pressure	121.7 \pm 8.6	121.6 \pm 7.9	0.2	0.8
Diastolic blood pressure	77.8 \pm 5.3	78.4 \pm 5.8	0.8	0.4
Fasting glucose	106.2 \pm 23.3	109.3 \pm 25.9	0.9	0.3
Postprandial glucose	122.9 \pm 31.1	126.0 \pm 40.3	0.7	0.5
Hemoglobin	12.4 \pm 1.2	13.5 \pm 0.9	7.6	0.001*
WBCs	7.1 \pm 1.9	5.1 \pm 1.2	9.6	0.001*

*: Statistically significant

Moreover, 18.1% of the street sweepers were significantly complaining of respiratory manifestations of chronic bronchitis ($p=0.02$) and history of bronchial asthma was reported by 3.6%. In the comparison group, manifestations of chronic bronchitis were reported by only 7.1% of the subjects, ($p=0.02$), while bronchial asthma was reported by 3.1%.

The prevalence rates of reporting chronic skin irritations were significantly higher among street sweepers than the university workers ($p=0.002$).

Similarly, HCV and parasitic infestations were more significantly prevalent among street sweepers than the control group ($p=0.03$ and $p=0.04$, respectively). However being statistically not significant, the prevalence of HBV and low back pain were higher among street sweepers than university workers (Table 4). About 61% of street sweepers and waste collectors reported that they collect wastes that contain medical material (syringes, needles, wound dressings, sharps, etc), (Table 4).

Table 4: Comparison between street sweepers and university employees regarding the prevalence of health problems

Variables	Street sweepers n = 138		University employees n = 127		X	P-value
	No.	(%)	No.	(%)		
Chest						
Normal	108	(78.3)	114	(89.8)	7.4	0.02*
Chronic productive cough	25	(18.1)	9	(7.1)		
Asthma	5	(3.6)	4	(3.1)		
Diabetes						
No	133	(96.4)	123	(96.9)	0.05	0.99
Type II diabetes	5	(3.6)	4	(3.1)		
HBV						
No	129	(93.5)	122	(96.1)	0.4	0.5
Yes	9	(6.5)	5	(3.9)		
HCV						
No	113	(81.9)	116	(91.3)	4.3	0.03*
Yes	25	(18.1)	11	(8.7)		
Parasitic infestations						
No	108	(78.3)	112	(88.2)	3.9	0.04*
Yes	30	(21.7)	15	(11.8)		
Eye irritation						
No	109	(79.0)	109	(85.8)	1.6	0.2
Yes	29	(21.0)	18	(14.2)		
Skin irritation						
No	119	(86.2)	124	(97.6)	9.8	0.002
Yes	19	(13.8)	3	(2.4)		
Low back pain						
No	126	(91.3)	117	(92.1)	0.06	0.8
Yes	12	(8.7)	10	(7.9)		
Joints pain						
No	130	(94.2)	112	(88.2)	2.3	0.1
Yes	8	(5.8)	15	(11.8)		

Discussion

In Egypt, as well as in other developing countries, the traditional cultures still categorize street sweeping and waste collection as a filthy and stumpy occupation. Being ranked as such, those workers are usually having lower self-esteem; and the medical problems, which cannot be prevented by the little protective measures they take against their work-related hazardous exposures are further complicated or aggravated by various socioeconomic factors e.g., poverty, illiteracy or inadequate education, poor diet, and poor housing conditions.

The primary work of street sweeping and waste collecting is done by those underprivileged individuals. Nationally, media reports on waste management focus on street sweepers as the ultimate symbols of poverty and degradation.

Because of the low payment from their institutes, most of street sweepers tried to find an additional source of earnings to improve their socioeconomic conditions by having other part-time jobs.

Anemia is a disease of the poor people, as a consequence of hunger and unbalanced diet. In our study,

street sweepers' mean hemoglobin levels were significantly lower than that of the university employees group, ($p=0.0001$). Consistently, in 2008, Sabde and Zodpey concluded that the most important morbidity among street sweepers was anemia (Sabde and Zodpey, 2008).

Complaints of having productive cough were observed to be a significant morbid hazard affecting the street sweepers 18.1% compared to only 7.1% of the controls ($p=0.02$). This significance may be due to the fact that street sweepers were exposed directly to street dust unlike the control group. Moreover, none of the 138 street sweepers were noted to be using protective devices such as masks. Compost of organic and inorganic dust particles together with other pollutants from the street, car exhausts, fumes and gases contribute to increase respiratory health symptoms. Similar studies have reported high prevalence of cough and sneezing symptoms (Yogesh and Sanjay, 2008) and chronic bronchitis (Nku et al., 2005) in street sweepers.

However, diagnosis of chronic bronchitis could not be established in any of the street sweepers or their control university employees. The higher rate

of productive cough amongst street sweepers than their controls can also be referred to the relatively high percentage of current smokers in street sweepers 30.4% compared to only 18.1% of the comparison group ($p=0.001$).

Nonetheless, further analysis of the relationship between street sweeping and the prevalence of respiratory complaints after eliminating the effect of smoking, revealed that street sweeping itself was a determinant for the reported respiratory complaints among street sweepers than the university employees ($p=0.002$).

Our results is consistent with that of Simpson et al., 1998 who suggested that subjects who were exposed to organic dusts might have a high prevalence of work-related respiratory tract symptoms, which were not related to dust exposures only but to smoking habits as well (Simpson et al., 1998).

Further, systolic and diastolic blood pressure measurements showed no difference between the street sweepers and their controls which was consistent with previous studies (Diggikar, 2004; Nagaraj et al., 2004; Sabde and Zodpey, 2008). However, a recent study from Brazil detected hypertension amongst 32.8% of street sweepers and waste pickers (Auler et al., 2014).

Unlike previous studies (Poulsen et al 1995; Dorevitch and Marder, 2001 ; Kuijer et al., 2003), our street sweepers showed insignificant rates of low back pain and other joint pain compared to their matched controls, despite the heavy physical loads they experience in their daily work.

Surprisingly, all of the surveyed street sweepers reported coming into contact with all of the following materials: blood, fecal matter, broken glass, needles/syringes, sharp metallic objects, air particulates, chemical fumes, run-off, mice/rats, flies, mosquitoes, stray animals and animal carcasses which agreed with studies emerging from other developing countries such as that of (Sabde and Zodpey, 2008).

About 13.8% of street sweepers complained of skin irritations, which might be explained by the direct contact with wastes while using no protective devices. This figure significantly exceeded that of our control subjects 2.4%, ($p=0.002$), (Table 4). It also exceeded that of other studies such as that of Diggikar, (2004), 4.2% and Nagaraj et al., (2004) 3.1% (Diggikar, 2004; Nagaraj et al., 2004).

Further, work-related injuries during the past year, were reported in

94.9% of our street sweepers compared to only 20.5% of university workers, ($p=0.0001$). This was similar to the results of Da Silveira et al., (1998) who also found that street sweepers were highly exposed to occupational accidents because of the nature of their work which oblige them to work in the open environment (Da Silveira et al., 1998).

A recent study in (Ethiopia) Addis Ababa estimated the occupational injuries among street sweepers during the past year to be 43.7%, with those who were not using protective devices having 2.6 times more likely to get injured; however that study did not detect the sero-prevalence of HBV and HCV (Bogale et al., 2014).

As a consequence of the profound negligence of using the protective devices among our street sweepers, laboratory results confirmed that 18.1% of the street sweepers were HCV sero-positive compared to 8.7% of controls, ($p=0.03$) (Table 4). However, there was no significant difference between street sweepers and the control group regarding the prevalence of HBV, 6.5% and 3.9%, respectively. A cross-sectional study performed on 141 garbage scavengers in Karachi, Pakistan showed that only

8.5% were HCV positive while 18.8% were infected with HBV. The authors argued that their results were consistent with a finding that only 16% of their subjects were using gloves (Rauf et al., 2013).

Rachiotis and colleagues found that the prevalence of HBV among waste collectors was 23% and those who reported needle stick injuries were at higher risk of HBV infection ($RR=2.64$; 95% $CI=1.01-6.96$), (Rachiotis et al., 2012).

Parasitic infestations such as *Entameba histolytica*, *Giardia lamblia* and *H. nana* were detected in stool analysis of 21.7% of our street sweepers, which was significantly higher than university employees (11.8%), ($p=0.04$), (Table 4). This difference can be attributed to the sweepers' poor hygiene, lower level of education, neglecting attitude towards safety and preventive measurements; especially using protective gloves, face masks and washing hands after work and before eating. In Vietnam, Nguyen et al., detected diarrhea amongst 8% of waste pickers but parasitic infestation was not confirmed in any of them (Nguyen et al., 2003).

Despite the higher prevalence of eye irritation symptoms among street sweepers than their controls 21% and 14.2% respectively, this difference was statistically insignificant. In contrast to our findings, a study by Diggikar concluded that street sweepers were more prone to eye infections and allergies (Diggikar, 2004).

The present study indicates that Egyptian street sweepers and waste collectors are a working group that needs to be considered and cared about by occupational health professionals. This care can include officially orienting them about their job-related health risks and providing health education, preventive and safety consultations to the workers as well as their institutes.

Egypt's occupational health challenges must include preventing harm and extending occupational health services to those workers, improving measures of their safety and health and monitoring actions taken to achieve this goal.

Our study brought up some messages that we want to deliver to the administration of street sweeping and waste collection institutes. It is important to value those workers and the work they do, see cleaning as an

essential task which can expose the workers to particular hazards and risks, assess the risks to cleaning workers and implement preventive measures and share health and safety information with workers and regional occupational health authorities. Additionally, waste management administrations have to take measures to ensure that their workers are appropriately trained by offering them considerable pre and in-service training, health education, and communicate the risks and hazards with them. Hopefully, the overview provided by this study will be of use to city planners, community organizations, and social researchers in order to improve the health and social life of street sweepers and waste collectors through effective and human coordination of governmental ordinances, basic health services, community development, social welfare programs and public policies.

Conclusion

We conclude that this working group of street sweepers and waste collectors should be treated as a vulnerable group that needs a special care. This care can be summarized as providing them pre-placement and in-service orientations about their tasks and health education

about the health hazards they are being exposed to while emphasizing the preventive measures to improve their knowledge, attitudes and practices. Immunization against tetanus, typhoid and HBV infections should be provided by their institutes and checked by local occupational health authorities.

Guidelines for safety measures and controlling infections should be emphasized and employed for those workers, while offering periodic medical examinations and supplying them with personal protective equipment.

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