Research Article

Effect of the Employment Duration on Occurrence of Health Hazards among Municipal Waste Collectors in Sohag City, Egypt

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Abstract
Background: Waste collectors 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:** This study was carried out to identify the effect of occupational duration upon the occurrence of health hazards, among 250 municipal solid waste (MSW) collectors in the municipalities of Sohag City. **Subjects and Methods:** A total of 250 waste collectors were subjected to an interview sheet including socio-demographic characteristics, occupational history, and previous medical history of diseases or injuries. **Results:** The occurrence physical complaints among MSW collectors in relation to more than 20 year working duration as follow injury (68.2%), followed by musculoskeletal disorders (61.8%), fatigue (60.0%) then the respiratory disorders (52.7%) and the least frequent skin disorders (25.90%). About (38.00%) of MSW collectors were from 30 to less than 40 years old age, (100.0%) of them were males, (84.0%) were married, (68.0%) were rural inhabitants, (40.0%) were illiterates and (62.0%) were none smokers **Conclusion:** 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.
Keywords: MSW collectors, occupational hazards or exposure, solid waste management

Introduction
Solid waste is movable solid items, arising from human activities, which discarded as useless or unwanted and that have no positive value. It constitutes a big environmental problem for the landscape, soil, atmosphere and groundwater. It is also the source of many health and hygienic problems. For centuries, people have been getting rid of it by organizing, collection, transport and dump system in Egypt[(1)]. Municipal solid waste workers or refuse collectors, universally expose to many work related health hazards and safety risks, notably allergic and other diseases of the respiratory system. Health impacts could also entail musculoskeletal, gastro-intestinal and infectious diseases as well as injuries caused by work-related accidents [(2,3,4,5,6)]. Waste collection can be practice as either an occupation or essential mean of survival which exposed them to various high work hazards, as are the risks of various morbidities and factors like socio- economic status which is low and their working environment make them more vulnerable to hazardous exposure. Risk of morbidities increases with the intensity and duration of exposure to hazards, as well with the age of workers[(7)]. Globally, solid waste collection (SWC) is an important task and among the highest risk occupation. It is the removal of municipal solid waste with variety of biological, chemical, mechanical, physical and psychosocial hazards[(8)]. Commonly observed health problems among (SWC) include respiratory systems, irritation of the skin, nose and eyes, gastro-intestinal problems, fatigue, headaches, psychological problems, allergies, chemical poisoning, tuberculosis, scabies, asthma, ophthalmic diseases, ulcer, stomach problems,

musculoskeletal and dermal injuries[9]. Egyptian waste collectors are therefore, dealing manually with mixed hazardous wastes with substantially increased occupational health impacts. Waste manage-ment 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 waste collectors [10].

Aim of the work: This study was carried out to identify the effect of occupational duration on the occurrence of health hazards, among 250 MSW collectors in the municipalities of Sohag City.

Subjects and Methods

Study Design

A cross-sectional study was conducted to identify the effect of occupational duration in the occurrence of health problems among municipal waste collectors working at Sohag city, Egypt.

Study Setting and population

The study was conducted on 250 municipal waste collectors working at Sohag city, Egypt.

Research tool

Participants were interviewed (face to face) using pre-designed an interview sheet. The sheet was tested on a subset of 20 workers prior to starting to obtain information that might improve the work plan and facilitate the execution of the study. This pilot also enabled the adaptation of the sheet, the estimation of the time needed for interviewing the participants (15- 20 min). The final data collection sheet was completed for each participant and covered socio-demographic characteristics (age, gender, residence, edu-cation, marital status, etc.), work related complaints (injury, gastrointestinal tract (GIT), musculoskeletal disorder (MSD), respiratory disorders, eye disorders, skin disorders).

Ethical consideration

The study was conducted after explaining the steps of the study and its objectives to the participants. Oral consent was obtained from all the participants in the study.

Data analysis

During this phase data coding, entry and analysis was accomplished with the aid of computer using Statistical Package for the Social Sciences (IBM SPSS) software package version 20. The results were represented in tabular and diagrammatic forms then interpreted. We use descriptive statistics and analytical statistics as chi square test. All statistical tests were considered significant at P-value of ≤ 0.05.

Results

This study include 250 waste collectors worker all of them were male with mean age (40.52 ± 8.85), and the majority of them were rural residence, large family number, not use PPE none of them trained, checked up or vaccinated before or during employment.

Table (1): Socio-demographic features of studied group

Socio-demographic data	No	%
Age (mean ± SD year)	40.52 ± 8.85	---
Age groups:		
20-29	40	16.0
30-39	95	38.0
40-49	75	30.0
50-60	40	16.0
Gender:		
Male	250	100.0
Female	0	0.0
Marital status:		
Single	35	14.0
Married	210	84.0
Widow	5	2.0
Divorced	0	0.0
Residence		
Urban	80	32.0
Rural	170	68.0
Level of education:		
Illiterates	115	46.0
Read and write	65	26.0
Preparatory	35	14.0
Secondary	35	14.0
Smoking:		
Nonsmoker	155	62.0
Cigarette	49	19.6
Gauza	40	16.0
Ex-smoker	6	2.4

Table (**1**) demonstrates that mean age of the studied population is 40.52±8.85 years, whereas 38% of the studied populations are aged from 30-39 years old. Also, table 1 100% of the workers were males. And more than two-thirds (68%) of the studied populations were rural residence. Table 1 also shows that 46% of the workers were illiterates, 26% of the subjects were able to read and write, and 14% of the workers had preparatory or secondary school. Those who was Single/widow represent 16% and who were married represent 84%. Finally table 1 reveals that about 35.6% of workers are smokers (cigarette and gauza).

Table (2): Health problems or complaints among studied groups total N=250.

Health problems or complaints	N =250	%
Injury	160	64.0
Musculoskeletal (MS) disorders	145	58.0
Respiratory disorders	81	32.4
Gastrointestinal (GIT) disorders	60	24.0
Eye disorders	45	18.0
Skin disorders	42	16.8
Fatigue	100	40.0

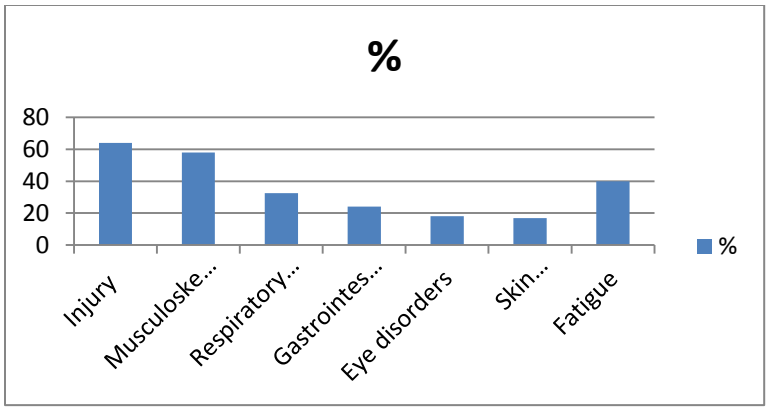

Figure (1): Health problems or complaints among studied groups total N=250.

Table (**2**) and **Figure (1)** reveal that the health problems or complaints among studied group were more than half of workers complain of injury (64%) and musculoskeletal problems (58%), followed by 40% complain of fatigue, one third complain of respiratory problems (32%), one quarter complain of Gastrointestinal (GIT) problems (24%), meanwhile about (18%) complain of eye problems, (16.8%) complain of skin problems.

Table (3): The occurrence of respiratory problems among the studied group regarding the duration of work total N=250.

Work duration	Respiratory problems				χ^2	P value
	Yes		No			
	N.	%	N.	%		
< 10	13	27.1	62	72.9		
10-20	29	26.4	81	73.6	13.313	0.001
>20	29	52.7	26	47.3		

Table (3) shows that the percentage of respiratory problems was high (52.7%) among persons worked (>20 years) compared with 47.3% had no respiratory problem while the lower percentage of respiratory problems (26.4%) among persons worked (10-20years**)** compared with 72.9% had no respiratory problem. The differences between them are statistically significant (P value <0.001).

Table (4): The Occurrence of skin problems among the studied group regarding the duration of work total N=250.

Work duration	Skin complaints				χ^2	P value
	Yes		No			
	N.	%	N.	%		
< 10	1	1.8	54	98.2		
10-20	19	17.3	91	82.7	13.866	0.001
>20	22	25.9	63	74.1		

Table (4) shows that the percentage of skin problems was high (25.9%) among persons worked (>20 years) compared with 74.1 had no skin problems, while the lower percentage of skin problems (1.8%) among persons worked (< 10 years) compared with 98.2 had no skin problem. The differences between them are statistically significant (P value <0.001).

Table (5): The occurrence of musculoskeletal problems among the studied group regarding the duration of work total N=250.

Work duration	MS complaints				χ^2	P value
	Yes		No			
	N.	%	N.	%		
< 10	46	54.1	39	45.9	0.909	0.635
10-20	65	59.1	45	40.9		
>20	34	61.8	21	38.2		

Table (5) reveals that the percentage of musculoskeletal problems was high (61.8%) among persons worked (>20 years) compared with 38.2 had no MS complaints, while the percentage of musculoskeletal problems was lower (54.1%) among persons worked (>20 years) compared with 45.9 had no MS complaints. The differences between them are statistically non-significant (P value >0.05)**.**

Table (6): The occurrence of injury among the studied group regarding the duration of work total N=250.

Work duration	Injury				χ^2	P value
	Yes		No			
	N.	%	N.	%		
< 10	58	68.2	2731.8	38.2	1.003	0.606
10-20	68	61.8	42	38.2		
>20	34	61.8	21			

Table (6) shows that the percentage of injury was high (68.2%) among persons worked (<10years) compared with 31.8 had no injury, while the lower percentage of injury (61.8%) among persons worked (10-20) and (>20 years) compared with 38.2 had no injury. The differences between them are statistically non-significant (P value >0.05).

Table (7): The occurrence of fatigue among the studied group regarding the duration of work total N=250

Work duration	Fatigue				χ^2	P value
	Yes		No			
	N.	%	N.	%		
< 10	29	34.1	56	65.9	11.756	0.003
10-20	38	34.5	72	65.5		
>20	33	60.0	22	40.2		

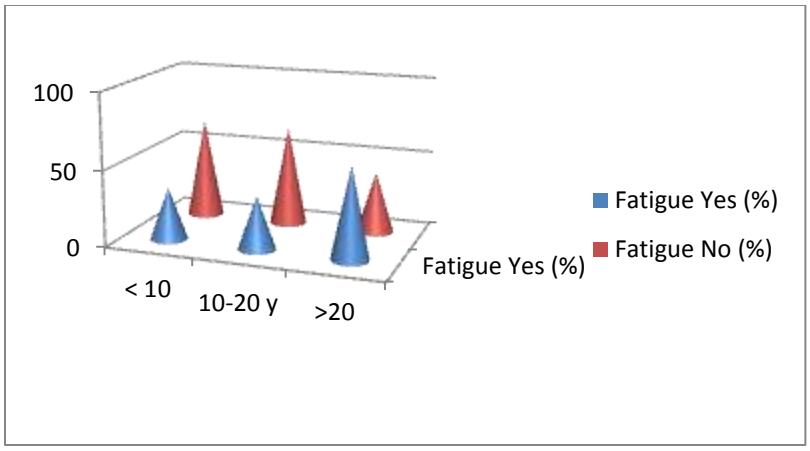

Figure (2) the occurrence of fatigue among the studied group regarding the duration of work total N=250

Table (7) and figure (2) showing that the percentage of fatigue during daily work was high (60%) among persons worked (>20 years) compared with 40.0 had no fatigue, while the percentage of fatigue during daily work was low (34.1%) among persons worked (< 10 years) compared with 40.0 had no fatigue. The differences between them are statistically significant (P value = 0.003).

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.

Concerning the socio-demographic characteristics of waste collectors (table 1), all of them were men and the majority were in the middle-age groups, this could be attributed to waste collection work, which needs muscular efforts. The same findings were similar results with Milhem[10], Abou-Elwafa[11], and Inyang[12], who stated that waste collection work is mainly performed by male employees than female. In contrast with study done by Jayakrishnan, et al.,[13]: among municipal solid waste management workers in India which revealed that all workers were female.

As for marital status of MSW collectors more than three quarters were married **(table 1)**, this results in accordance with Ewis et al.,[14] which found about 92% of waste collectors and street sweepers were married also agree with Awad et al.,[15] which found about 76% of waste collectors were married. also agree with Abou-Elwafa[11] which found about 98% of waste collectors were married.

Regarding educational level, residence, family number, month income, and smoking habit of MSW collectors **(table1)** the majority of them had low educational level (illiterate and read & write). This could attribute to unsatisfactory level of knowledge, most of them rural residence and had more than 5 family number, and about one third current smoker, this in agreement with studies conducted by Milhem[10] and Abou-Elwafa[11].

Regarding the prevalence of injury about 64% of MSW collectors experienced one or more injuries in the past 3 months, and the most frequent was cut wound (24%), followed by punctured wound (16%), contusion (14%), strain (6%), and finally fracture (1. 2%). These findings in agreement with Das (2009) who stated the most frequent injury was cut wound 42.3%, followed by

contusion 6.4%, puncture wound 4.3%, then fracture 2.56% and strain 2.13%. Also, in agreement with Bourdouxhe et al.,[16] and Robazzi et al.,[17].

The present study revealed that the most frequent physical complaint among MSW collectors was that of injury (64%), followed by musculoskeletal (58%) then the respiratory system (32.4%), digestive system (24%), eye problems (18%), and the least frequent skin disorders (16.8%).

This results were in agree with study conducted by Das[18] (2009), occupational hazards among door to door solid waste handlers which revealed the prevalence of hazards as follow, injury 77% musculoskeletal l71%, respiratory system 62.3%, digestive system 39.3%, eye problems36.3%, and the least skin problems 30%.

Regarding occurrence of fatigue **(table 6)** the present study revealed about 40% of MSW collectors complain of fatigue during or at the end of work this was higher than study conducted by El wahab et al.,[19] which reported 27.5% of workers suffered from fatigue.

The results of the present study are supported by New Zealand Department of Labour[20]. who stated that Occupational fatigue is caused by working long hours, by working with intense physical or mental effort, by having inadequate access to rest or recovery time, or by working during some or all of the natural time for sleep (i.e., nights). Fatigue is characterized by a lack of energy and motivation. Fatigue is a natural response to physical and mental challenges; under ordinary circumstances, sufficient quality sleep can serve to replenish temporary physical and mental deficits. Fatigue can adversely impact a person's physical or mental capabilities, with ramifications for workplace and public safety. Fatigue can also have a long term impact on worker health**.**

Regarding musculoskeletal disorders the anatomical distribution showed that the most frequently affected body regions were back pain (24%), followed by shoulder pain (12%), knee pain (8%), elbow pain (7.2%), neck pain and wrist-hand pain (6%), and finally hip pain (2%). this result in agreement with Klein et al.,[21], Yang et al.,[22], and Mehraded et al.,[23].

Regarding the respiratory disorders the present study revealed that frequency of respiratory symptoms among workers in past 3 months were productive Cough (16%), followed by sneezing (4.4%), itching nose (4.4), and sore throat (4.4%), dry cough (4%) and running nose (4%), chest tightness (2%), allergic rhinitis (2%), wheeze (2%), and chronic bronchitis (2%), and finally bronchial asthma (1.6%). This result agrees with Milhem[10], Abou-Elwafa et al.,[11], Ira [24], and Issever et al.,[25].

Concerning gastrointestinal disorders the present study revealed one quarter complain of diarrhea followed by nausea/vomiting and dysentery. This results in agreement with El-Wahab et al.,[19], Milhem[10] and Thorn[26].

Regarding eye disorders the present study found about 18% of workers complain of eye disorders most frequently burning of eyes followed by redness and foreign body impaction. This finding in agreement with Ewis et al.,[14] and, Rojers et al.,[27].

Concerning the skin disorders among MSW collectors were (10%) dermatitis or eczema, Allergic rash (6%) and paronychia (6%). this in agreement with Das[18] study which revealed that about 30% of collectors complain of dermatitis followed by allergic rash. this results agree with Diggikar[28], Abou-Elwafa et al.,[11], and Ewis et al.,[14].

Regarding occurrence of fatigue the present study revealed about 40% of MSW collectors complain of fatigue during or at the end of work this was higher than study conducted by El wahab et al.,[19] which reported 27.5% of workers suffered from fatigue.

Smoking Index (SI) values were calculated as the number of cigarettes smoked per day multiplied by the number of years of smoking (mild 0-100, moderate 100-200, and heavy smoker >200)[29].

Dust on people exposed to it are a major source of concern as the biological materials in

the dust are capable of causing allergic disease in humans, such as a runny nose, watery eyes, and sneezing by larger sized particles, as well as swelling of lung tissue and asthma by fine particles. [30]

Conclusion and Recommendation

We conclude that this working group of 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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References

1. Zurbrügg C (2003): Urban solid waste management in low-income countries of Asia How to cope with the garbage crisis. Presented for: Scientific Committee on Problems of the Environment (SCOPE), Urban Solid Waste Management Review Session, Durban, South Africa, November 2003. Available at: Christian Zurbrügg, Department of Water and Sanitation in Developing Countries (SANDEC) Swiss Federal Institute for Environmental Science Switzerland Phone: +41-1-823 5423 Fax: +41-1-8235399 email: zurbrugg@eawag.ch
2. Rushton L (2003): Health hazards and waste management. Br Med Bull.68:183-97
3. Dorevitch S and Marder D (2001): Occupational hazards of municipal solid waste workers. Occup Med.16:125–33.
4. Abdou MH (2007): Health impacts on workers in landfill in Jeddah City, Saudi Arabia. J Egypt Public Health Assoc. 82: 319–29.
5. Kuijer PP, Sluiter JK and Frings-Dresen MH (2010): Health and safety in waste collection: Towards evidence-based worker health surveillance. Am J Ind Med. 53: 1040–64.
6. Poulsen OM, Breum NO, Ebbehøj N, Hansen AM, Ivens UI and van Lelieveld D (1995): Collection of domestic waste. Review of occupational health problems and their possible causes. Sci Total Environ.170:1–19.
7. Frings-Deresen MHW (2005): Protecting waste collectors all around the world. Occup Environ Med. 62:820-821.
8. Dorevitch S and Marder D (2006): Occupational hazards of municipal solid waste workers. University of Illinois, Chicago, USA. PMID: 11107229.
9. Sarkar P (2003): Solid Waste Management in Delhi – A social vulnerability study. In: Martin JB, Suresh MV, Kumaran TV (eds.), Proceeding of the Third International Conference on Environment and Health, Chennai, India; 451-464.
10. Milhem A (2004): Investigation of occupational health and safety hazards among domestic waste collectors in Bethlehem and Hebron Districts. MSc thesis, Environmental Science, Faculty of Graduate Studies, at An-Najah National University, Nablus, Palestine.
11. Abou-Elwafa HS, El-Bestar SF, El-Gilany AH and Awad Eel-S (2012): Musculoskeletal disorders among municipal solid waste collectors in Mansoura, Egypt: A cross-sectional study. BMJ Open. 2:pii: e001338.
12. Inyang M.P (2007): Health and Safety Risks amongst the Municipal Solid Waste Collectors in Port Harcourt Metropolis of the Niger Delta Region of Nigeria International Conference "Waste Management, Environmental Geo technology and Global Sustainable Development, August 28- 30, 2007, Ljubljana Slovenia: Dept. of Human Kinetics and Health Education; Faculty of Education, University of Ibadan.
13. Jayakrishnan T, Jeeja MC, Bhaskar R (2013): Occupational health problems of municipal solid waste management workers in India. Int J Env Health Eng. 2:42-50.
14. Ewis AA, Rahma MA, Mohamed ES,

Hifnawy TM and Arafa AE (2013): Occupational health related morbidities among street sweepers and waste collectors at Beni–suef, Egypt. Egyptian Journal of Occupational Medicine. 37(1):79-94.
15. Awad HE, Seif NY and Ahmed HI (2013): Occupational Hazards and Preventive Measures among Waste Collection Workers. Occupational medicine. 16(1):125-33.
16. Bourdouxhe M., Cloutier E., and Guertin S (1993): Accident hazards associated with domestic waste collection IRSSTRR0-77.
17. Robazzi MLCC, Moriya TM, Favero M, Lavrador MAS and Luis MAV (1997): Garbage collectors: occupational accidents and coefficients of frequency and severity per accident. Ann Agric Environ Med. 4(1), 91-6.
18. Das (2009): Occupational health problems among door to door solid waste handlers in Surat city, Gujarat. Achutha Menon Centre for Health Sciences Studies Sree Chitra Tirunal Institute for Medical Sciences and Technology. Thiruvananthapuram, Kerela, India.
19. El-Wahab EWA, Eassa SM, Loffi SE, El Masry SA, and Shatat HZ (2014): Adverse Health Problems among Municipality Workers in Alexandria (Egypt): Int J Prev Med. 5:545-56.
20. New Zealand Department of Labour (2007): Managing shift work to minimize workplace fatigue: a guide for employers.
21. Klein, B.P., Roger, C.J. and Lee, M.S. (1984): Assessment of workers' compensation claims for back strains/sprains. J Occup Med. 26: 443-448.
22. Yang CY, Chang WT, Chuang HY, Tsai SS, Wu TN and Sung FC (2001): Adverse health effects among household waste collectors in Taiwan. Environ Res. 85:195-9.
23. Mehrdad R, Majlessi-Nasr M, Aminian O, Sharifian SA, and Malekahmadi F (2008): Musculoskeletal disorders among municipal solid waste workers. Acta Medica Iranica. 46:233-238.
24. Ira F (2004): Review of Health Impacts from Microbiological Hazards in Health Care Wastes. Department of Blood Safety and Clinical Technology & Department of Protection of Human Environment; World Health Organization, Geneva.
25. Işsever H, Özdilli K and Özyildirim BA (2007): Respiratory Problems in Tannery Workers in Istanbul. Indoor Built Environ. 16:177-183.
26. Thorn J (2001): Seasonal variation in exposure to microbial cell wall components among household waste collectors. Ann Occup Hyg. 45:153-154.
27. Rojers J, Englehardt J and An H (2002): Solid waste collection, health and safety risk: survey of Municipal solid waste collectors. J Solid Waste Technol Mang. 28:154-160.
28. Diggikar UA (2004): Health status of street sweepers with reference to lung function tests [Dissertation]. Pune University.
29. Sanjay P. Zodpey and Suresh N. Ughade (2006): Tobacco Smoking and Risk of Age-related Cataract in Men. Regional Health Forum; WHO South-East Asia Region, Vol.3:336-46.
30. Park K. Park's (2017): Textbook of Preventive and social medicine. 24th Ed. Jabalpur: Bhanot publishers: 1-976.