

Occupational profile and exposure of solid waste collectors from a Brazilian municipality

Perfil laboral e exposição ocupacional de cantoneiros de recolha de resíduos sólidos de um município do Brasil

Perfil laboral y exposición ocupacional de los recolectores de residuos sólidos de un municipio de Brasil

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Abstract

Background: The working conditions of solid waste collectors (SWC) expose them constantly to occupational risks.

Objectives: To describe the occupational profile and exposure of SWC from a municipality of Minas Gerais, Brazil.

Methodology: A quantitative, cross-sectional, descriptive study was conducted with 43 SWC from a municipality of Minas Gerais, Brazil, in 2015.

Results: This group of workers is mostly composed of young men in a stable union, with a low level of education, who reported being satisfied with their work, despite claiming to be often exposed to occupational risks.

Conclusion: There is a need for interventions focused on the workers' health, which include actions to promote health and prevent risks and injuries among these workers.

Keywords: solid waste collection; solid waste segregators; garbage; work; occupational health

Resumo

Enquadramento: As condições de trabalho dos cantoneiros de recolha de resíduos sólidos (CRRS) expõem estes trabalhadores a constantes riscos ocupacionais.

Objetivos: Descrever o perfil laboral e a exposição ocupacional dos CRRS de um município de Minas Gerais, Brasil.

Metodologia: Estudo quantitativo, transversal, descritivo, realizado com 43 CRRS de um município do interior do Estado de Minas Gerais, Brasil, no ano de 2015.

Resultados: Verifica-se que este grupo de trabalhadores é constituído, essencialmente, por homens jovens, em união estável, de baixa escolaridade, que declaram estar satisfeitos com o seu trabalho, apesar de alegarem sofrer frequentemente de exposição a riscos ocupacionais.

Conclusão: Conclui-se que são necessárias intervenções do ponto de vista da saúde do trabalhador, que compreendam ações de promoção da saúde e prevenção de riscos e danos destes trabalhadores.

Palavras-chave: coleta de resíduos sólidos; catadores; lixo; trabalho; saúde do trabalhador

Resumen

Marco contextual: Las condiciones de trabajo de los recolectores de residuos sólidos (RRS) exponen a estos trabajadores a constantes riesgos ocupacionales.

Objetivos: Describir el perfil laboral y la exposición ocupacional de los RRS de un municipio de Minas Gerais, Brasil.

Metodología: Estudio cuantitativo, transversal, descriptivo, realizado con 43 RRS en un municipio del interior del Estado de Minas Gerais, Brasil, en el año 2015.

Resultados: Se verifica que este grupo de trabajadores está conformado especialmente por varones jóvenes, con una unión estable, de baja escolaridad, que, a pesar de que alegan que sufren exposición a riesgos ocupacionales con frecuencia, indican que están satisfechos con su trabajo.

Conclusión: Se concluye que se necesitan, desde el punto de vista de la salud del trabajador, intervenciones que comprendan acciones de promoción de la salud, así como prevención de riesgos y agravios de estos trabajadores.

Palabras clave: recolección de residuos sólidos; segregadores de residuos sólidos; basuras; trabajo; salud laboral

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Introduction

The increase in consumption and the improper waste disposal resulting from consumerism are harmful to public health and lead to environmental degradation (Lopes, Maciel, Carrieri, Dias, & Murta, 2012).

Therefore, it is necessary to hire urban cleaning workers, who are popularly known in Brazil as *gari* or *lixeiro* (solid waste collectors [SWC]; Barbosa, Melo, Medeiros, & Vasconcelos, 2010; Lopes et al., 2012). A large number of people work in waste collection services and are exposed to various factors which can interfere, directly or indirectly, with their health, namely physical, chemical, and biological risks that lead to occupational health problems (Freire, Costa, Alves, Santos, & Santos, 2016).

The purpose of waste collection is to provide well-being to all citizens. Public cleaning workers are responsible for street sweeping, weed removal, and garbage collection. However, despite the importance of their profession, the fact that they are in contact with garbage in their everyday life can be considered a source of social exclusion, in addition to the instability of the work process, because the jobs of a large number of SWC are subjected to significant organizational and employment changes, which lead to discomfort and daily tensions in the performance of their functions (Smilee, Dhanyakumar, Samuel, & Suresh, 2013).

Background

The global transformations, the consumption pattern, and the massive waste production have become a serious problem threatening urban sustainability and the health and quality of life of the populations (Barbosa et al., 2010).

Waste collection is a dynamic process and covers various aspects which should be analyzed and acted upon because the workers, during their working hours, walk, run, go up and down the streets, lift weights, and are exposed to the sun, the rain, cold, and abrupt temperature changes. In this scenario, some aspects of occupational health, that is, the relations between the work process and the health/disease process of this professional class should be analyzed and acted upon within the scope of public health (Lazzari & Reis, 2011).

Due to the profession's ergonomic aspects, some of these professionals develop muscu-

loskeletal diseases which, consequently, lead to low performance and productivity (Araújo et al., 2016).

Thus, these workers are exposed to all types of risks, particularly those related to the use of sharp objects and the lack of personal protective equipment (PPE; Alencar, Cardoso, & Antunes, 2009).

In view of the above, this study is justified due to the working conditions to which SWC collectors are exposed on a daily basis. Moreover, SWC have high-strain, harmful, and dangerous jobs which can lead to diseases and have an impact on their health. The development of a study with these workers, who are often discriminated against, can contribute to better understanding the important role that these professionals play in society.

Therefore, the objective of this study was to describe the occupational profile and exposure of SWC from a municipality in Minas Gerais, Brazil.

Research question

Are SWC exposed to occupational risks?

Methodology

A quantitative, cross-sectional, and descriptive study was conducted with the SWC of an urban and rural waste collection company of a municipality in the interior of Minas Gerais, Brazil. The city's citizens and businesses produce approximately 150 tons per day and 4,500 tons per month of commercial and urban waste. This waste collection company is the only one responsible for the collection of all rural and urban waste from households, businesses, and health services, as well as for the treatment of healthcare waste and the construction and maintenance of landfills and selective waste collection.

The study was approved by the Committee of Ethics and Research with Human Beings, under Opinion no. 846.156, in accordance with the Brazilian Resolution no. 466/2012 of the National Health Council. As inclusion criterion, the participant could not be away from work or on leave on the day of data collection, which occurred between February and July 2015.

During data collection, the company had 47 workers: 43 were working, two could not participate because they were not in an active situation, and two were on vacation.

Thus, the sample was composed of 43 workers. A questionnaire was applied to characterize these workers' profile. It was divided into three categories: Socioeconomic, Demographic, and Occupational characteristics, with a total of 62 questions about their education level, age, marital status, living arrangements, income, work characteristics, and occupational exposure.

The questionnaire was developed by the authors of this study and its content was assessed by three Ph.D. nurses specialized in occupational health, who gave important suggestions to reach the research objective. After the adjustments, the questionnaire was again assessed by these professionals and, after their final approval, data were collected.

The questionnaires were applied by one of the researchers at the home of each SWC, after a previous phone call to schedule an interview. During the questionnaire application, the researcher read each question out loud so that the worker could clearly understand what was being asked.

In the questionnaire, the questions related to occupational exposure during the SWC working hours were placed in table format. The table included the main occupational risks to which these workers could be exposed

to, such as weather, noise, carbon monoxide, repetitive movements, physical exertion, organic materials and sharp objects, inadequate lighting, and unpleasant smells. These risks were identified based on the current scientific literature. The workers classified their degree of exposure during their working hours by choosing one of the following options: *always*, *half of the time*, *rarely*, and *never*.

Data were entered into a Microsoft Excel spreadsheet, version 2013, using double entry technique. Subsequently, data were exported to IBM SPSS Statistics software, version 20.0. A descriptive analysis was performed for the presentation of the results into distribution tables of frequencies for categorical variables and measures of central tendency, position, and variability for numerical variables.

Results

Table 1 shows the demographic and social reality of SWC. All of them (100%) were men, most of them were married or in a stable union, with a low education level. Of these, only 34.9% of workers own a home.

Table 1

Descriptive analysis of the social and demographic variables of SWC (n = 43).

Variables	n	%
Gender		
Male	43	100.0
Age		
Mean ± standard deviation	33.6 ± 9.2	
Median (Minimum - Maximum)	31 (20 - 58)	
Marital Status		
Single	11	25.6
Married	12	27.9
Divorced	2	4.7
Cohabiting	18	41.9
Has children		
No	9	20.9
Yes	34	79.1
Number of children		
Mean ± standard deviation	2.3 ± 1.3	
Median (Minimum - Maximum)	2 (1 - 7)	
Education level		

Had not completed 2 nd to 5 th grade	6	14.0
Had completed 2 nd to 5 th grade	5	11.6
Had not completed 6 th to 9 th grade	11	25.6
Had completed 6 th to 9 th grade	1	2.3
Had not completed secondary education	16	37.2
Had completed secondary education	4	9.3
Living arrangements		
Own house	15	34.9
Rented house	13	30.2
Lives with parents/relatives	11	25.6
Borrowed house	4	9.3

Work-related data show that the SWC started working, on average, at 13.7 years ($SD = 3.1$). They worked 44 hours a week, 6 days a week, in two fixed shifts. However, including extra hours, 93.1% of them worked 46 hours a week or more, 37.2% had already had an accident at

work and/or on their way to or from work, and 93% earned between one and one and one-half times the minimum wage per month. A relevant fact was that 97.7% of respondents reported being satisfied with their work. Table 2 shows the data on the workers' occupational profile.

Table 2
Number and percentage of SWC, according to the occupational variables (n = 43)

Variables	n	%
Age started working		
Mean \pm standard deviation	13.7 \pm 3.1	
Median (minimum - maximum)	15 (7 - 18)	
Time working as a collector (months)		
Mean \pm standard deviation	46.3 \pm 61.0	
Median (minimum - maximum)	18 (3 - 40)	
Weekly workload (including extra hours)		
44h	3	6.9
46h	2	4.7
48h	4	9.3
50h	16	37.2
52h	18	41.9
Income (dollar exchange rate on 08/12/2015 = R\$ 3.80)		
1 MW (US\$ 207.36)	13	30.2
1 MW and one-half (US\$ 311.05)	27	62.8
2 MW (US\$ 414.73)	3	7.0
Shift		
Day	24	55.8
Night	19	44.2

Have you had an accident at work?		
No	32	74.4
Yes	11	25.6
Have you had an accident on your way to/from work?		
No	38	88.4
Yes	5	11.6
Time away after the accident		
Mean ± standard deviation	18.6 ± 23.1	
Median (minimum - maximum)	11 (3 - 75)	
What do you enjoy the most about your work?		
Team	31	72.1
Work environment	9	20.9
Other	3	7.0
Are you satisfied with your work?		
No	1	2.3
Yes	42	97.7

Table 3 shows the variables related to SWC occupational exposure in their daily work.

Table 3
Number and percentage of the variables related to the occupational exposure of SWC (n = 43)

Type of Exposure	Frequency	%
Sun/Rain		
Always	37	86.0
Half of the time	5	11.6
Rarely	1	2.3
Noise		
Always	36	83.7
Half of the time	2	4.7
Rarely	2	4.7
Never	3	7.0
Exposure to carbon monoxide		
Always	28	65.1
Half of the time	4	9.3
Rarely	6	14.0
Never	5	11.6
Repetitive movements		
Always	41	95.3
Half of the time	2	4.7

Physical exertion		
Always	41	95.3
Half of the time	2	4.7
Organic fluids (blood, urine, feces)		
Always	9	20.9
Half of the time	14	32.6
Rarely	16	37.2
Never	4	9.3
Sharp objects (needle, glass, metal)		
Always	25	58.1
Half of the time	13	30.2
Rarely	5	11.7
Inadequate lighting		
Always	12	27.9
Half of the time	4	9.3
Rarely	10	23.3
Never	17	39.5
Unpleasant smells		
Always	41	95.3
Rarely	2	4.7
Body pain		
Yes	24	55.8
No	19	44.2
Pain region		
Back	12	50.0
Limbs	10	41.7
Others	2	8.3

Waste collectors are young men who have an extensive workload and have to work extra hours due to the work routes previously established by the company. These workers are exposed to many occupational risks, namely physical, chemical, biological, and ergonomic risks, as well as accidents at work (AW).

Discussion

The results of this study on the workers' socioeconomic and demographic profile are consistent with a study carried out with 96 SWC from a municipality in Minas Gerais,

which aimed to assess these workers' perception of quality of life. The authors observed that most interviewees (71.9%) were men; 66.7% were older than 40 years; 79.2% lived alone or with their family; 75% were illiterate or had not completed primary education; and 49% had up to three children (Jesus et al., 2012).

In a study conducted with 21 waste collectors in Jataí, Goiás State, Brazil, the interviewees were exclusively men (100%), aged between 18 and 24 years (41.18%), and the majority (35.30%) of them had a low education level (Carvalho et al., 2016).

In a study conducted in Japan, SWC were

aged between 24 and 60 years, worked 8 hours a day, and had a 1-hour break (Hara, Hanaoka, Yamano, & Itani, 1997).

A study conducted in Brazil, which aimed to describe the factors promoting satisfaction and dissatisfaction at work among recyclable material collectors, found that four out of 11 workers had not completed primary education; four had not completed secondary education; one had completed basic education; one had completed secondary education; and one had not completed higher education. With regard to the period of time working at the cooperative and in recycling in general, the minimum time was 8 months and the maximum was 20 years, and workers were satisfied with their job because they could buy products for their family and for personal use (Coelho et al., 2017).

This study corroborates a study conducted with the purpose of identifying the occupational profile and working conditions of recyclable material collectors from the municipality of Ipameri.

With regard to the monthly salary, in this study, 62.8% of the interviewees reported receiving one and one-half times the minimum wage. A study conducted with SWC also revealed that the average monthly salary was two minimum wages (Pinho & Neves, 2010). Another relevant result of this study concerns the repetitive movements: 95.3% of SWC performed repetitive movements during their entire workday. Knowing SWC precarious ergonomic work conditions, a study on the prevalence of musculoskeletal disorders and associated factors among garbage collectors of two medium-sized cities in the south of Brazil revealed that 88.2% of the workers had musculoskeletal disorders in the past 12 months, particularly in the legs, knees, and lower back (Cardoso, Rombaldi, & Silva, 2013).

In relation to physical exertion, a study conducted in Irã with SWC concluded that approximately 39% and 36.5% of workers reported a very high physical and psychological workload, respectively. SWC (92.5%) reported symptoms of musculoskeletal disorders at least in one body region during the past 12 months. The most prevalent and severe injuries were in the lower back and knee. Some individual factors such as age, body weight, and waste collecting duration, such as the

physical demands (lifting bag/bucket, pushing waste container, walking while carrying bags, and climbing up to the garbage truck) and the organizational climate (few holidays and high decision) were the most important risk factors for developing musculoskeletal disorders (Ziaei, Choobineh, Abdoli-Eramaki, & Ghaem, 2018).

Of the interviewees, 25.6% have already suffered an AW and 11.6% had accidents on their way to or from work. Thus, it should be noted that this profession has a high percentage of AW. Another study shows that 82.4% of respondents reported having suffered some type of accident during household waste collection (Carvalho et al., 2016).

With regard to the subcategory of sharp materials, waste collectors mentioned the danger and the accidents that they had while handling these materials, which are improperly disposed of in household waste (Carvalho et al., 2016).

One of the most worrying factors for SWC is the lack of population awareness about the dangers of disposing of sharp materials. This fact is characterized by little knowledge of the population about this subject and leads to improper disposal, increasing the risk of accidents among SWC (Pinho & Neves, 2010). The majority of accidents among this professional group consisted of cuts, contusions, fractures, and joint injuries. The leading causes of accidents were the lack of attention at work, noncompliance with the rules and safety procedures, lack of PPE, and lack of maintenance of machines and equipment used at work (Pinho & Neves, 2010).

A study carried out in Ethiopia in 2015, with 379 municipal SWC, concluded that 130 (34.3%) workers had suffered an AW at least once in the last year. Of these, 54 (41.5%) workers were injured once and the remaining 76 (58.5%) workers were injured two or more times. Approximately 45 (34.6%) workers reported injuries in the hands and the most common type of injury was cut (52.3%), followed by abrasion (20; 15.40%) and dislocation (12; 9.23%); 73.8% of them lost more than 10 working days due to injury; 66 (50.7%) workers were treated at a health facility, while 13 (10%) workers were admitted to a hospital (Eskezia, Aderaw, Ahmed, & Tadese, 2016).

A German study on SWC in various countries worldwide showed that these workers have higher incidents of diarrhea and viral hepatitis as well as a significantly higher incidence of obstructive and restrictive respiratory disorders, increased potential for tuberculosis transmission, high blood lead levels, and suffer from skin diseases, jaundice, and dog and rat bites. The authors also concluded that they have a high risk for musculoskeletal disorders and low back, elbow, and wrist pain due to handling heavy loads. In addition, the repetition of similar movements in the hands and arms causes joint problems, headache, and nausea (Bleck & Wettberg, 2012).

A study conducted in the Federal District, Brazil, aimed to estimate the prevalence of AW in open dumps and the associated factors. The majority of collectors (55.5%) had an AW and 51.7% of them reported not having received PPE. Moreover, 55.8% of workers reported having eaten food collected from trash, 50.0% of them reported food insecurity at home, and 44.8% of them received a family allowance. A statistically significant association was found between AW and perception of dangerous work environment, household food insecurity, and the presence of fatigue, stress or sadness ($p < 0.05$). The authors also concluded that the majority of collectors had accidents at work (55.5%), 95% of workers reported being aware that they worked in a dangerous work environment, and 51.7% of workers claimed not having received PPE (Hoefel et al., 2013).

The high occurrence of truck accidents at work, particularly accidental falls and lower limb injuries due to the trash compactor at the rear of the truck, was also shown in other studies, thus pointing out the need for more attention to be paid to these workers' health (Santos, Lima, Murta, & Motta, 2009).

In their activities, SWC are exposed to various occupational risks; however, it should be noted that the incidence of accidents in the collection service is higher because of the inappropriate separation of sharp materials and the presence of microorganisms, viruses, and bacteria in solid waste (Pinho & Neves, 2010).

Waste is SWC object of work and it is known that waste should not be put only in plastic

bags and be selectively collected. However, the municipality where the study was conducted does not have a selective waste collection system and all types of waste are eventually disposed of as common waste. The participants in this study reported finding pieces of wood, syringes, and needles inside plastic bags and outside of rigid containers. In addition, they constantly found objects outside of garbage bags which were left by pedestrians, such as old furniture, debris, and garden waste. Thus, SWC often try to accommodate the collected waste inside the truck with their own hands and expose themselves to the risk of being injured by sharp materials.

It should be noted that other sources of accidents can contribute to this damage, including being bitten by a dog, run over by a car, or exposed to the sun. PPE are not always able to fully protect the workers from all the risks to which they are exposed in their daily lives because they only protect them from certain vulnerabilities and the uniform itself is uncomfortable, irritating the skin due to the shirts' reflective material (Silva & Junior, 2013).

Some people in certain neighborhoods express their revulsion, often through gestures, at the presence of SWC and the smell from the garbage truck on the streets (Silva & Junior, 2013).

In association with the results on SWC self-perception of exposure at work, a qualitative study aimed to discuss the meanings of garbage from the perspective of a group of SWC and recyclers living in Fortaleza, Ceará, Brazil. The results showed that the participants perceived garbage as something dangerous to their health due to the damage caused, but also as a means of survival due to the difficulty of insertion into the labor market as a result of lack of study and/or opportunities (Santos & Silva, 2011).

Thus, given this wide range of issues related to occupational exposure, a study on the planning for retirement and the key aspects for well-being of SWC working at an urban cleaning company in a municipality of Rio de Janeiro, Brazil, found that the workers perceived their quality of life as poor, particularly due to the unhealthy physical work environment.

The illness process does not result strictly from the workers' physical exposure to objects that are harmful to their health or from the fact that they usually walk or run more than 15 km every day, but also from the psychological and mental pressure of having to pay increased attention to 1) the type of waste; 2) the vehicles' movement to avoid being run over and to alert their colleagues; and 3) the movements of climbing up and down the moving truck (Silva & Junior, 2013).

It is known that work only becomes interesting for human beings when they are able to express themselves and it is precisely this dimension which is threatened when the work conditions and organization decrease the workers' motivation to perform their activities, because SWC work is associated with prejudice and stereotypes and society considers it repugnant to be dealing with waste (Santos et al., 2009).

Based on the results and discussion, it is clear that preventive measures are necessary. It is essential to raise the population's awareness and provide guidance on how to store and dispose of waste properly in order to preserve the environment and the health of both the citizens and the SWC. It should be noted that waste collection companies play a key role in teaching their workers about a safe working environment and in providing them with the necessary PPE and continuing education.

Conclusion

This study showed that SWC are exposed to risks caused by physical, biological, and ergonomic agents and AW during their working hours and on their way to and from their work. The reality found is worrying because the risk of accidents and injuries is imminent, which represents a serious public health issue. Therefore, it is recommended that these workers be provided with continuing education and the appropriate PPE. To do this, companies should seek partnerships with healthcare professionals of the public Brazilian Health System (*Sistema Único de Saúde*) and the universities so that they can guide them concerning health promotion strategies.

In addition, one of the major challenges for

reducing occupational risks is the population's collaboration. One of the main factors leading to accidents among SWC is the inappropriate attitudes and behaviors of the population towards domestic waste disposal. Therefore, managers need to correctly guide the population towards the most appropriate way of disposing of waste and the importance of its correct packaging with the purpose of preventing accidents among SWC who collect waste from households, businesses, and health institutions.

One of the limitations of this study was the number of SWC in the sample, which makes it difficult to generalize the findings. However, further studies should be carried out in different locations to trace SWC profile and design new interventions aimed at increasing these workers' well-being, health, and safety.

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