

BODY PARTS AFFECTED IN ACCIDENTS AT WORK: A POPULATION CROSS-SECTIONAL STUDY IN BRAZILIAN SEMI-ARID MUNICIPALITIES

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Abstract

Knowing the body parts affected in accidents at work is important to support managers and professionals in the sectors of work safety in the adoption of measures to promote health and prevent accidents. This study identifies the body parts affected in a work accident registered at the Reference Center for Occupational Health (CEREST) in Sobral, Ceará, Brazil. It is a cross-sectional study, carried out from the database of the Reference Center for Occupational Health in Sobral, Ceará, Brazil. Data were collected between March 2015 and February 2016, from notifications of occupational accidents from the National System of Notifiable Diseases (SINAN), referring to the period from 2009 to 2013, totaling 2,438 occurrences. There were accidents involving the hands (37.6%), upper limbs (15.4%), lower limbs (13.0%) and feet (10.9%) were the most frequent. Were observed a greater number of victims of occupational accidents among men (90.7%) in the age group of 20 to 59 years (85.6%). There is, in fact, a predominance of body parts involved in occupational accidents in the population, with emphasis on the hand, upper limb, lower limb and foot ($p = 0.0001$). The study showed workers' health promotion strategies should be encouraged in the workplace, as well as the guarantee of access and the correct use of personal protective equipment, for the prevention of risks, injuries and diseases, considering that accidents cause expenses for the State and losses for the victims.

Keywords: Occupational Accidents. Occupational Health. Occupational Health Nursing. Public Health.

1. Introduction

The current model of capitalist production has contributed to the worker becoming increasingly vulnerable to risks, injuries and illnesses related to work. Accidents at work are an important public health problem, which involves a whole social, political, economic and legal situation. Depending on the conditions and the scenario in which they occur, accidents at work can cause everything from mild injuries, such as abrasions or minor trauma, to serious ones, such as loss of limb function or mutilation, leading to temporary, permanent disability or death (Cordeiro 2018).

In Brazil, accidents at work are defined by Law No. 8,213, of July 24, 1991, as those that occur as a result of work, at the service of a company or a domestic employer, as well as by the work of the special insured, and they can cause bodily injury or temporary or permanent functional disorders (Brasil 1991).

Considered a socially determined phenomenon, occupational accidents also include those that occurred during the journey from home to work. There are also work-related illnesses, which are acquired or triggered by virtue of work activities and are directly related to the activity performed by the worker (Brasil 2017a; Dwyer 2013).

According to the International Labor Organization (ILO), every 15 seconds there is a death due to an accident or illness at work and 160 workers are victims of work-related accidents worldwide. Annually, more than 2.3 million deaths and 337 million accidents occur at work, many of which result in prolonged absences from work (Brasil 2020a; OIT 2020).

In Brazil, accidents affect thousands of workers every year. According to data from the Statistical Yearbook of Accidents at Work (SYAW), in 2016 there were 478,039 accidents, 355,560 (74.4%) of which were typical accidents, 108,552 (22.7%) of commuting accidents and 13,927 (2.9%) of accidents occupational disease. Of the total, 107,587 (22.5%) occurrences were not registered through the Work Accident Communication (WAC), and the accident incidence rate, according to the National Classification of Economic Activities (NCEA), was 14.26 occurrences per 1,000 links; mortality of 5.57 occurrences per 1,000 bonds and lethality of 3.91 occurrences per 1,000 bonds (Brasil 2017b).

A large part of the direct costs of accidents at work in Brazil falls on Social Security (Carvalho et al. 2020). Between 2012 and 2018, Brazil spent 191 million reais of Social Security on amputations caused by accidents at work, with 69% of the total expenses (R \$ 131 million) paid to workers who were victims of amputations caused by machines (Brasil 2019).

Still, in the period from 2012 to 2018, the highest occurrence of occupational accidents, leaves of absence, and Social Security spending on benefits occurred in the states of the Southeast and South regions, which concentrate the largest number of jobs and industries. The Northeast region ranked third in the number of work-related accident-related leaves of absence. Despite being the second most populous region in Brazil, the Northeast has a higher rate of informal activities (work without employment), which favors the underreporting of accidents at work (Carvalho et al. 2020).

Data from the Digital Observatory for Occupational Health and Safety (2012 to 2018) also shows that lower limbs are the hardest hit parts in accidents and the most common injuries involve cuts fractures and contusions (Brasil 2020b).

In addition to the work environment, factors such as the absence or inefficiency of prevention policies, lax inspections, carelessness, imprudence and negligence in the use of collective and individual protection equipment contribute to the increase of work accidents and occupational diseases in Brazil, with consequences that affect the employee, employer and society. Thus, in view of the alarming rates of accidents at work registered throughout the country, associated with the underreporting due to informal work, especially in the Northeast region, it becomes relevant to identify the parts of the body affected in accidents at work. Besides the impairment of quality of life and productive capacity, the victimized workers generate an important demand for the Brazilian health system and social security system, increasing financial and social costs (Carvalho et al. 2020).

In view of the above, this study aimed to identify the body parts affected in a work accident registered at the Reference Center for Occupational Health (CEREST) in Sobral, Ceará, Brazil.

2. Material and Methods

Cross-sectional, descriptive, census type study, developed from the database of the Reference Center for Occupational Health in Sobral, Ceará, Brazil. Data were collected between March 2015 and February 2016, from notifications of occupational accidents from the National System of Notifiable Diseases (SINAN), referring to the period from 2009 to 2013, totaling 2,438 occurrences.

The Reference Centers in Occupational Health are specialized services for workers' health care, offering matrix support for the development of workers' health actions in Primary Health Care (PHC), in

specialized and urgent and emergency services, as well as as in the promotion and surveillance in the different points of the Health Care Network (Sobral 2020).

The state of Ceará has nine Reference Centers in Occupational Health, one of which covers the state, located in Fortaleza, and eight regional centers, located in the municipalities of Sobral, Horizonte, Juazeiro do Norte, Tianguá, Quixeramobim, Aracati and Limoeiro do Norte (Sobral 2016).

Based on the organizational logic of the State Attention Network, the Sobral Worker's Health Reference Center covers 47 municipalities that make up the Health Microregions of Acaraú, Camocim, Crateús and Sobral, totaling 1,299,780 inhabitants (IBGE 2010). The choice of this Reference Center for the development of the study occurred due to the greater coverage of the number of municipalities, which allowed to outline the predominant characteristics in the Semi-arid region of Ceará.

The secondary data that make up this research were extracted from the SINAN database and organized using electronic spreadsheets, generated by the system of the program TabWin32®, version 3.6b, and exported to the Excel® programs, upon written authorization, signed by director of the service, previously required through the Term of Faithful Depositary.

The study included cases of serious occupational accidents reported to the Worker's Health Reference Center of Sobral, Ceará, Brazil. A serious occupational accident is that which causes physical or functional mutilation, and that which leads to an injury whose nature implies worrying impairment, which may have harmful or fatal consequences (Brasil 2006).

For the analysis of the parts of the body affected in work accidents, the following variables from the "Severe Work Accident Sheet" from the Ministry of Health were selected: gender (male and female), age group (10 to 19 years; 20 to 59 years; 60 years or more), and part of the body affected.

The notifications with incomplete filling out of the variables selected were excluded from the study.

During the analysis, 2,442 cases of serious occupational accident records were identified, of which four were excluded due to no filling out of the variables selected for the study. Thus, the total number of cases in the study corresponded to 2,438 cases.

The data were analyzed using the R program, version 3.5.0. Data analysis occurred in a descriptive way, based on the frequencies and percentages of the variables "body part affected", "gender" and "age group", in addition to the reason indicator, used with the variable "gender". In the inferential analysis, we checked whether there is a difference between the observed frequencies of occupational accidents reported in the information system and the expected frequencies, using the Chi-square test of adherence and considering significance level was set at 95% ($p \leq 0.05$).

The study was approved by the Research Ethics Committee at the State University of Vale do Acaraú with Opinion number #1,344,066, dated November 30, 2015 (Certificate of Ethical Appraisal Submission number 47808515.4.0000.5053).

3. Results

Table 1 describes the cases of occupational accidents taking into account the body parts affected, and the variables of gender and age group.

The highest percentages of accidents involve the hands (37.6%), upper limbs (15.4%), lower limbs (13.0%), foot (10.9%) and head (8.4%). Taking into account the gender variable, there were a total of 2,211 (90.7%) men and 227 (9.3%) women involved in accidents at work.

Among men, the percentage values of the affected body parts follow the same order as the general values, with hands (39.2%), upper limbs (15.1%), lower limbs (12.4%), foot (10,3%) and head (8.3%) with the highest rates. Among women, the situation changes, considering that the second highest percentage of occupational accidents involves the lower limbs (18.0%), while among men the second position is occupied by accidents in the upper limbs (15.1 %).

It is also noteworthy that the percentage of accidents involving the whole body, neck, foot and head was higher among women (7.9%, 1.3%, 16.8% and 9.2%, respectively) than among men (3.6%, 0.4%, 10.3% and 8.3%, respectively).

The age group of 20 to 59 years old presents values almost nine times greater than the age group of 10 to 19 years old, and 19 times greater than the age group of 60 years older.

The highest prevalences in the 20 to 59 age group were: hand (36.0%), upper limb (16.0%), lower limb (13.2%), foot (11.2%) and head (8.7%).

Table 1. Description of body parts affected in occupational accidents stratified by gender and age. Sobral - Ceará, Brazil, 2013-2016.

Categories	Gender						Age Group (years)					
	Male		Female		10 to 19		20 to 59		60 and over			
Body part affected	n	%	n	%	n	%	n	%	n	%	n	%
Hand	915	37.6	865	39.2	50	22.1	114	47.0	750	36.0	51	47.3
Upper limb	375	15.4	335	15.1	40	17.7	32	13.1	333	16.0	10	9.2
Lower limb	317	13.0	276	12.4	41	18.0	34	14.0	276	13.2	7	6.5
Foot	265	10.9	227	10.3	38	16.8	18	7.4	235	11.2	12	11.1
Head	205	8.4	184	8.3	21	9.2	17	7.0	181	8.7	7	6.5
Eye	100	4.1	91	4.1	9	4.0	7	2.9	87	4.2	6	5.5
Whole body	97	4.0	79	3.6	18	7.9	9	3.7	80	3.8	8	7.5
Chest	70	2.9	67	3.0	3	1.3	3	1.2	64	3.1	3	2.8
Abdomen	25	1.0	24	1.1	1	0.4	0	0.0	24	1.1	1	0.9
Neck	11	0.4	8	0.4	3	1.3	1	0.4	9	0.4	1	0.9
Other	47	1.9	44	2.0	3	1.3	6	2.5	40	1.9	1	0.9
Ignored	11	0.4	11	0.5	0	0.0	2	0.8	8	0.4	1	0.9
Total	2,438	100.0	2,211	100.0	227	100.0	243	100.0	2,087	100.0	108	100.0

Source: Sobral. Secretariat of Health. Reference Center for Occupational Health (CEREST). Information System for Notifiable Diseases (SINAN): occupational accidents. Sobral: SINAN, 2016.

Table 2 shows the observed frequencies of occupational accidents recorded in the information system and the expected frequencies, considering that there is no predominance of any part of the body involved in accidents in the population. The chi-square test evidenced that there is, in fact, a predominance of body parts involved in occupational accidents in the population, with emphasis on hand, upper limb, lower limb and foot.

Table 2. Observed and expected frequencies of body parts affected in accidents at work. Sobral - Ceará, Brazil, 2013-2016.

Body part affected	Frequencies		p-valor (Chi-square)
	Observed	Expected	
Eye	100	220.6	0,0001
Head	205	220.6	
Neck	11	220.6	
Thorax	70	220.6	
Abdomen	25	220.6	
Hand	915*	220.6	
Upper limb	375*	220.6	
Lower limb	317*	220.6	
Foot	265*	220.6	
Whole body	97	220.6	
Other	47	220.6	

Source: Sobral. Secretariat of Health. Reference Center for Occupational Health (CEREST). Information System for Notifiable Diseases (SINAN): occupational accidents. Sobral: SINAN, 2016. * = significant value above the expected frequency considering the null hypothesis.

4. Discussion

The parts of the body most affected by work-related accidents notified to the Workers' Health Reference Center (CEREST) of Sobral, Ceará, were the hands, the upper limbs, the lower limbs, the foot and the head, among men, who represent the majority of workers affected.

The main limitation of this study is related to the use of data from the National System of Notifiable Diseases (SINAN), which is subject to underreporting of accidents, in addition to information losses due to unfilled variables. However, this study is one of the few to deal with the parts of the body affected in

accidents at work and, therefore, it becomes a powerful production to subsidize policies, programs, protocols and instruments for the protection and safety of workers, in addition to designing future studies.

The results of this study trigger the scenario of insecurity and precariousness that still lingers in the world of work. In Brazil, in particular, working conditions were even more threatened by the changes in the Labor Laws imposed and Social Security Reform, which occurred in recent years (Salvador et al. 2020; Lacaz 2019). The body parts identified as most affected in serious occupational accidents registered in the Brazilian Northeast corroborate the records from other regions of Brazil and are among the main body parts affected in occupational accidents (Carvalho et al. 2020). These results indicate the need to intensify protective measures for lower and upper limbs.

Such findings are similar to the few studies already available in the literature, especially those that show the occurrence of work accidents predominantly among men, in the younger age groups (between 20 to 39 years old). These studies show that, in most work accidents, whether mild or severe, the parts of the body most affected are the wrist and hand (Franz and Cargnin 2020; Pina et al. 2018).

Some studies show, in addition to the prevalence of injuries on the hands, involvement of the upper and lower limbs, expressed by trauma, extensive cuts, crushing, dislocations; in addition to trauma to the head and lower limbs (Batista et al. 2019; Andrade and Santos 2018; Malta et al. 2017). These injuries cause an important social and economic impact, since they require temporary and/or permanent absence of workers from their work activities. In the national context, Ceará occupied the tenth position in numbers of leaves of absence due to occupational accidents, in the period 2012-2018 (Carvalho et al. 2020).

The fact that most accidents at work affect men and affect, above all, the hand may be linked to factors, such as: the historical construction of work related to the male figure, since the beginning, with hunting, fishing, agriculture, among others; most workers work in more unhealthy professions, with longer exposure to work-related risks, and which require more effort / physical strength; the hand and the upper limbs are the parts of the body that are directly involved with all activities and productive sectors.

According to data from the Statistical Yearbook of Social Security (SYSS) pointed out that, among the cases of work-related accidents recorded as injuries, poisoning and certain other consequences of external causes, as per the International Classification of Diseases (ICD-10), the highest occurrence was fracture at the wrist or hand (ICD 10:S62), leg fracture, including ankle (ICD 10:S82) and Foot Fracture (Except ankle) (ICD 10:S92) with 17.9%, 12.6% and 9.9% of the total, respectively (Brasil 2021).

The identification of the body parts affected in accidents at work also allows inferring the lack of preparation of workers to handle certain machines and tools, inherent to the mechanization / modernization process of the work process. This unpreparedness is related to the lack of training of workers of both sexes and age groups, to the lack of access, non-use or inappropriate use of Personal Protective Equipment (PPE), such as gloves, boots and helmets. This scenario results from employers not complying with standard precautionary norms, in addition to the lack of inspection by health surveillance and protection services and the lack of guarantee of workers' constitutional rights (Ximenes Neto et al. 2020; Zavarizzi et al. 2019).

In most cases, the occupational accidents that affect important parts of the body, generate temporary or permanently disability for the development of work. Besides the losses caused to the public treasury, these work accidents compromise the quality of life and the self-esteem of the workers and cause a great social and emotional impact for their families, who lose the productive capacity and financial. Even those who struggle not to remain unproductive may find it difficult to readapt, especially if they have a low level of education and perform manual labor.

In this context, it is essential that companies implement individual and collective prevention measures, such as the proper use of protection equipment. In addition to guidelines that encourage changes in employee behavior. Nevertheless, the proper management of occupational health and safety programs are the most appropriate ways to ensure quality of life at work and preserve the lives of workers.

5. Conclusions

This study showed that the prevalence of work accidents involving different parts of the body does not occur proportionally, with a tendency for greater involvement of certain parts, such as the hands, upper limbs, lower limbs and feet, and men in the 20 to 59 age group.

These results can support managers and professionals in the sectors of work safety in the adoption of measures to promote health and prevent accidents, in order to reduce the impacts on the health of workers and public spending on assistance to victims and their families.

Moreover, it is essential to involve workers, employers, the Public Ministry, health professionals, workers' safety and protection services, and social and public control, in the discussion of public actions and policies aimed at protecting workers, with greater inspection and notification of accidents.

Finally, it is suggested the development of research that investigates the places where accidents happen and that present the characteristics of the evolution of cases, pointing out the consequences of these accidents for workers.

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