Analysis of factors related to granting sickness benefits to industry workers on leave due to Work-related Musculoskeletal Disorders (WMSD)

Análise dos fatores relacionados à concessão de auxílio-doença a trabalhadores da indústria afastados por Distúrbios Osteomusculares Relacionados ao Trabalho (DORT)

Análisis de factores relacionados con la concesión de auxilio-enfermedad a trabajadores en baja por Trastornos Musculoesqueléticos del Trabajo (TMERT)

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Abstract
Background: Sickness absence represents a serious problem for industry and Social Security, since many of these workers become beneficiaries by the National Social Security Institute. The relationship between the factors that lead to dismissal and granting benefits to workers in the industry has yet to be studied. Objective: To determine the relationship between social and occupational factors to granting sickness benefits to industrial workers affected by Work-related Musculoskeletal Disorders. Methods: This is a retrospective cross-sectional with quantitative approach study involving industrial workers. The data contained in the evaluation form of workers who were admitted between 2016 and 2020 in a Reference Centers in Occupational Health were used. The data were descriptively evaluated and a logistic regression model was used to estimate the factors which are related to the type of assistance granted to the workers. Results: 108 medical records of industry workers were evaluated and 56.5% received the accident-related sickness assistance benefit (B-91). Most are workers from industry with light demand (95.4%), who perform repetitive work (93.5%), intense work pace (83.3%), with the shoulder being the region most frequently affected (85.2%). The factors that were significantly related to grating accidental-related sickness benefit: time in the current occupation (OR = 1.01), work involving cervical spine flexion (OR = 4.68), participation in the rehabilitation program (OR = 31.27) and referral to specialist consultations (OR = 3.10). Conclusion: The creation of institutional programs in the industry and the implementation of public health and social security policies are necessary to manage these factors.
Keywords: Musculoskeletal diseases; Occupational health; Social security.

Resumo
Introdução: O absenteísmo por adoecimento representa um grave problema para a indústria e Previdência Social, pois muitos trabalhadores afastados se tornam beneficiários do Instituto Nacional de Seguro Social. A relação entre os fatores que levam ao afastamento e a concessão de benefícios a trabalhadores da indústria precisa ser estudada. Objetivo: Determinar a relação entre fatores sociais e ocupacionais na concessão de auxílio-doença a trabalhadores da indústria com Distúrbios Osteomusculares Relacionados ao Trabalho. Métodos: Trata-se de um estudo retrospectivo transversal com abordagem quantitativa, envolvendo trabalhadores da indústria. Foram usados os dados da ficha de

avaliação dos trabalhadores admitidos entre 2016 e 2020 em um Centro de Referência em Saúde do Trabalhador. Foi conduzida análise descritiva e utilizada regressão logística para estimar os fatores que se relacionam ao tipo de auxilio concedido ao trabalhador. Resultados: 108 prontuários de trabalhadores da indústria foram avaliados e 56,5% receberam o auxílio doença acidentário (B-91). A maior parte são trabalhadoras (72,2%) de indústria com demanda leve de trabalho (95,4%), que executam trabalho repetitivo (93,5%), ritmo intenso de trabalho (83,3%), sendo o ombro o segmento mais frequentemente acometido (85,2%). Os fatores que foram significativamente relacionados à concessão de auxílio-doença acidentário: tempo na ocupação atual (OR=1.01), trabalho com flexão da coluna cervical (OR = 4.68), participação no programa de reabilitação (OR = 31.27) e encaminhamento para interconsulta com especialistas (OR = 3.10). Conclusão: É necessária a criação de programas institucionais na indústria e a implementação de políticas públicas de saúde e de previdência social para controlar tais fatores.
Palavras-chave: Doenças musculoesqueléticas; Saúde do trabalhador; Previdência social.

Resumen
Introducción: La baja de trabajadores por enfermedad representa un grave problema para la industria y la Seguridad Social, porque muchos trabajadores pasan a ser beneficiarios del Instituto Nacional del Seguro Social. Aún no se ha estudiado la relación entre los factores que conducen a baja y el otorgamiento de beneficios a los trabajadores de la industria. Objetivo: Determinar la relación entre factores sociales y ocupacionales en la concesión de prestaciones a trabajadores de la industria con Trastornos Musculo esqueléticos Relacionados con el Trabajo. Métodos: Se trata de un estudio retrospectivo transversal con abordaje cuantitativa, que envolvió a trabajadores industriales. Se utilizaron los datos contenidos en el formulario de evaluación de los trabajadores que fueron admitidos entre 2016 y 2020 en un Centro de Referencia en Salud Ocupacional. Los datos se evaluaron de manera descriptiva y se utilizó regresión logística para estimar los factores que se relacionan con el tipo de asistencia otorgada al trabajador. Resultados: Se evaluaron un total de 108 registros clínicos de trabajadores de la industria, de los cuales el 56,5% recibió el auxilio-enfermedad relacionada con accidentes. La mayoría son trabajadoras (72,2%) de la industria con baja demanda (95,4%), que realizan trabajo repetitivo (93,5%), ritmo de trabajo intenso (83,3%), siendo el hombro el segmento más frecuentemente afectado (85,2%). Los factores que se relacionaron significativamente con la concesión del auxilio-enfermedad relacionada con accidentes: tiempo en la ocupación actual (OR = 1,01), trabajo con flexión de la columna cervical (OR = 4,68), participación en el programa de rehabilitación (OR = 31,27) y consulta con especialistas (OR = 3,10). Conclusión: Es necesario crear programas institucionales en la industria e implementar políticas de salud pública y seguridad social para controlar dichos factores.
Palabras clave: Enfermedades musculoesqueléticas; Salud laboral; Seguridad social.

1. Introduction

The increase in the sickness rates and sick leave by workers without clarifying the causes, added to inefficient rehabilitation, carrying trough an impact on public spending on social security and healthcare (Palheta & Guimarães, 2017; Goorts, et al., 2018). According to Jay, et al. (2018), the estimated amount of spending on workers away from work in Nordic countries amounts to about €3.36 billion. Silva, et al. (2011) refer that even in developed countries where there is a greater appreciation and compliance with preventive practices in the workplace, spending on absenteeism permeates 4% of the Gross Domestic Product (GDP), while these expenditures can reach 10% of GDP for developing countries (such as Brazil).

Musculoskeletal disorders represent the main causes of decreased work ability of industry workers, comprising one of the main causes of dismissal (Alexopoulos, et al., 2006; Hämmig and Bauer, 2014). Regarding this, Leinonnen, et al. (2018) add that pathologies vary according to the work performed and the type of industry, but that Work-Related Musculoskeletal Disorders (WMSD) are highly prevalent in all occupational classes in this sector.

Industry workers are exposed to a variety of risk factors that can lead to health problems and impaired quality of life (Lowe, et al., 2017). Thus, for Oenning, Carvalho and Lima (2012), an analysis on sick leave should respect the multi-causality of this phenomenon. Factors related to workers' individual aspects should be considered such as the worker's genetics, age, personal habits, hobbies and lifestyle (Virtannen, et al., 2018; Michelleti, et al., 2019); biomechanical factors related to work conditions such as inadequate posture, exposure to the use of physical force, repetitiveness, intense work pace (Cote, et al., 2008); organizational factors related to the type of company, production methods, and periodical medical examinations (Mekonnen, Lamessa & Wami, 2019); and, finally variables related to physical work conditions - such as cervical flexion

(Cote, et al., 2008) In addition to the above, Øyeflaten, et al. (2014) confirm that there are factors which predispose sick leave with social security benefits and establish a relationship between returning to the job with participation in professional rehabilitation programs.

Benefits are granted for insured workers of the National Social Security Institute (INSS in Brazil) affected by sickness or accident which temporarily or permanently interferes with their ability to work and receive wages (Brazil, 1991). Social security sickness allowance (B-31) benefit is granted in situations where there is disability for reasons which do not necessarily involve their work activity, and an accident-related sickness allowance (B-91) benefit is granted to workers unable to work as a result of accident or occupational disease. According to Social Security data (Brazil, 2018), over R$2 billion (Reais) were spent on granting these two benefits, which together account for more than half of the total benefits granted to formal workers and INSS beneficiaries.

Workers' healthcare in the Brazilian public healthcare system has gained notoriety through the creation of Reference Centers in Occupational Health (CEREST in Brazil) (Brazil, 2009). In this sense, it is the role of CEREST to: identify and attend sick workers, ensure the correct diagnosis through previous and current occupational anamnesis, in addition to clinical and functional assessments, and with that enable (or not) a causal link with work, refer the worker to the INSS, and finally, facilitate access to rehabilitation (Brazil, 2012).

It is necessary to think about strategies for coping with the high number of workers affected by musculoskeletal disorders in need of sick leave which (in specific cases) burden social security. Measures to control musculoskeletal illness in industry workers and the implementation of public policies by CEREST, with the objective of avoiding such events or minimizing the effects of their injuries, depend on an in-depth study on the profile of sick workers and the factors which predispose them to their illness, sick leave and the granting of social benefits. Thus, this study aims to determine the relationship between social and occupational factors to granting sickness benefits to workers in industry affected by WMSD.

This study hypothesizes that the aspects related to current and past socio-occupational information and the work process and sickness of industry workers on sick leave from work due to musculoskeletal illnesses are associated with determining the type of sickness benefit which they will receive.

2. Methods

This is a retrospective cross-sectional study implementing a quantitative approach which followed the STROBE guidelines (Von Elm, et al., 2008) for reporting observational studies. Data collection was carried out between March and July 2020 at a Reference Center for Occupational Health (*CEREST*) in the macro-region of João Pessoa, in the state of Paraíba, Brazil. This CEREST is responsible for assisting workers in conditions of vulnerability to illness or accidents at work in 65 municipalities in Paraiba and organize, together with the other 3 CEREST in the state, the workers' health care network.

This work is in accordance with Resolution 466/12, which regulates research with human beings in Brazil, was approved by the Research Ethics Committee (*CEP*) of the João Pessoa University Center (*UNIPÊ*) with CAAE 04401318.2. 0000.5176, and approved by consolidated opinion no. 3,102,896.

Medical records with completed forms for users aged between 18 and 59 years, of both genders, linked to work in the industry according to the National Registry of Economic Activity (Brazil, 2014) were included to compose the sample. All medical records of industry workers who were admitted to *CEREST* for having a diagnosis of musculoskeletal illnesses of the spine, shoulder, elbow, wrist and hands were analyzed. These illnesses should form a presumptive link for pathologies classified according to the International Classification of Diseases (ICD) according to Brazil (2003) as Work-Related Musculoskeletal Disorders (WMSD). In addition, they should have been on sick leave from work and have access to a sickness

benefit granted by the *INSS*. Medical records of workers who were admitted for being involved in typical occupational accidents in the same segments and workers who were followed up but who did not receive any type of social security benefit were excluded from the survey. The admission period for this study was January 2016 to March 2020, as it refers to the service's active file.

A total of 170 records of workers on sick leave were evaluated. After analyzing the medical records, 14 were excluded for belonging to sick workers who did not return after the first reception and did not complete the evaluation, three medical records were excluded for belonging to workers who suffered a typical work accident or in commuting involving the upper limbs and/or the spine, and 45 others for belonging to workers who filled out the application, but did not receive any type of benefit due to rejection of the request by Social Security.

The Worker's Registration Form in the service was used for data collection, which addresses socio-demographic and socio-occupational issues, occupational and clinical anamnesis, physical examination and therapeutic and administrative procedures (Brasil, 2006). It is noteworthy that all the analyzed forms were filled out when the worker was admitted to the service by the professionals who work at the service, and after training to standardize procedures for approaching and evaluating workers.

The data contained in the form were analyzed using the $R^®$ software program (version 2.14.1). A descriptive analysis was conducted based on absolute and relative frequencies for the variables which comprised the socio-demographic and socio-occupational information, occupational and clinical anamnesis, physical examination and therapeutic and administrative procedures. It is also noteworthy that the averages for continuous variables were calculated and their categorization was determined via the 25th, 50th and 75th percentiles.

Next, logistic regression was used to identify the variables related to the outcomes (social security sickness grant - B31; and accident-related sickness grant - B91). The analysis of these data aimed to highlight characteristics of workers and their work process, as well as their monitoring by *CEREST*, considering ten groups of research variables. These variables divided by groups and considered likely to be included in the regression are presented in Table 1. The analysis was based on univariate frequency tables and contingency tables between the research variables and the outcome variables.

An estimate was initially made through multiple logistic regression, in which each variable was individually analyzed starting from the contingency tables with the variables which would form the outcome of this study. A significance level of 20% was considered at this stage, being less judicious than the frequent 5% used in statistics as it is a screening. Hosmer & Lemeshow (2000) introduce the idea that variables with a p-value < 0.25 on the Pearson's Chi-Squared test of the contingency tables become likely candidates for inclusion in logistic regression.

Thus, we used the function deviance (D) in this study to confirm the hypothesis, which is used to measure the discrepancy between the saturated model (best possible model with all variables) and the current model (which includes only the variables included in the final model) to indicate that the model is valid. Next, values were obtained through the contingency tables for the unconditional odds ratios (Odds Ratio), thereby presenting factors which increase or decrease the chance of workers on sick leave to become beneficiaries of one of the types of sickness benefits. The Odds Ratio interpretation of the variables in the final logistic regression model is useful for verifying the effect of each variable on the possibility of the worker on sick leave receiving the B31 (when OR < 1) or B91 (when OR > 1) assistance benefit. A significance level of up to 5% was considered for the p-value for the final model adjustment.

Table 1 – Variables from the *CEREST* (Reference Center for Occupational Health) evaluation sheet.

Variable group (quantity)	Variables	
Registration data (1)	Gender	
	Age	
Socio-occupational data (10)	Time in occupation	
	Type of contract	
	Time of sick leave	
	Salaried or Not	
	Income declared by the worker	
	Pensioner	
	Number of people living in the house with the worker	
	Conducting Occupational Exams	Admission Exam
		Periodical
		Dismissal
	Health services offered by the company to the worker	*SESMT* - Specialized Service in Safety Engineering and Occupational Medicine
		Health insurance
		Physiotherapy
		Psychology
		Nutrition
	Issuance of Workplace Accident Report (WAR)	
Biomechanical aspects of work (4)	Use of manual tools	
	Repetitive work	
	Having to perform difficult physical efforts	Working in extended sitting posture
		Working in standing posture for a long time
		Activities which require lumbar flexion movements
		Activities which require lumbar rotation movements
		Activities which require cervical flexion movements
		Activities which require cervical rotation movements
		Activities being performed in inappropriate postures
		Activities which require elevation of the upper limbs (flexion or abduction) above 90º range of motion
		Activities which require shoulder rotation

		Activities which require circular movements of the wrists
		Application of sudden forces to the upper limb muscles
		Squatting
		Application of sudden forces to the lower limb muscles
		Need to go up and down stairs
	Lifting weight	Lifting frequency
		Weight of lifted material
Organizational aspects of work (8)	Breaks included in the work process	
	Job satisfaction	
	Previous training	
	Intense work pace	
	Number of hours worked per day	
	Number of days worked per week	
	Meal provided in the company	
	Overtime performed	Number of overtime hours worked per week
Work safety aspects (4)	Exposure to environmental risks at work	Physical Risks
		Chemical
		Biological
		Mechanical
	Use of Personal Protective Equipment (PPE)	
	Lack of job security	
	Implementation of security actions by the company	
Previous occupational history (3)	Child labor history	
	Formal work prior to last or current job	
	Exposure to environmental risks in previous work	Physical Risks
		Chemical
		Biological
		Mechanical
Affected region/segment (5)	Lumbar spine	
	Cervical spine	
	Shoulder	
	Elbow	
	Wrist/Hand	
History of disease and benefits (10)	Symptom onset time	
	Change of function in the current company due to sickness	
	Leave of less than 15 days with medical certificates	How many days on leave

	Leave with benefits greater than 15 days	Number of months on leave with sickness benefit
		Number of months on leave with accidental sickness benefit
	Diagnosis completed by exams	
	Performing surgery because of sickness	
	Conducting physical therapy treatment because of sickness	
	Participation in *INSS* (national social security institute) professional rehabilitation programs	
	Presentation of expert report	
	Diseases presented by parents with the potential for heredity.	
Technical conducts (10)	Indication for continued leave	
	Prescription or guidance on the use of medications	
	Referral to physiotherapy	
	Indication for surgery	
	Establishment of nexus	
	Compulsory disease notification	
	Issuance of documents	Medical certificate
		Report to the company
		Report to the union
		Workplace Accident Report (WAR)
		Issuance of declaration
		Issuance of Reports
	Labor and/or social security guidelines	
	Examination request	
	Indication for professional rehabilitation programs	
Administrative conducts (6)	Referral to the *INSS*	
	Worker return for control	
	Return of the worker for investigation of pathology	
	Referrals to expert consultations	
	Discharge with referral to other health services	
	CEREST discharge	

Source: Research Data (2020).

3. Results

The final sample consisted of 108 medical records of industry workers with a diagnosis of musculoskeletal disorders who were on sick leave from work and had access to a benefit typified as social security or accident-related sickness benefit granted by the INSS, as specified in the inclusion criteria.

Table 2 shows the sample distribution regarding its characterization in relation to the variables extracted from the medical records.

Table 2 – General characterization of the sample.

Characteristic	N	%
Type of industry		
Light Industry	103	95.4
Heavy Industry	5	4.6
Gender		
Male	30	27.8
Female	78	72.2
Age		
18 to 28 years	10	9.2
29 to 38 years	47	43.5
39 to 48 years	45	41.6
49 to 58 years	6	5.5
Time in occupation		
Up to 43 months	27	25
44 to 96 months	38	35.2
97 to 141 months	16	14.8
More than 142 months	27	25
Employment situation		
Employed	95	88
Unemployed	13	12
Time of leave		
Up to 15 days	34	31.5
From 16 days up to 2 months	22	20.4
From 3 months to 12 months	25	23.1
More than 13 months	27	25
Formalization		
Yes	95	88
No	13	12
Income		
No income	6	5.6
Have income	102	94.4
Type of benefit granted		
Social security sickness benefit (B-31)	47	43.5
Accident-related sickness pay (B-91)	61	56.5
Currently receiving the benefit		
Yes	57	52.8

No	51	47.2
Number of people living in the home		
Live alone	4	3.7
2 people	23	21.3
3 people	46	42.6
More than 4 people	35	32.4
Exams		
Admission Exam	107	99.1
Periodical	95	88
Dismissal	18	16.6
Healthcare in the company		
Healthcare services	106	98.1
SESMT	105	97.2
Healthcare plan	74	68.5
WAR issued		
Yes	15	13.9
No	93	86.1
Use of manual tools		
Yes	81	75
No	27	25
Repetitive work		
Yes	101	93.5
No	7	6.5
Rest breaks during work		
Yes	80	74
No	28	26
Intense work pace		
Yes	90	83.3
No	18	16.7
Difficult physical efforts		
Yes	108	100
No	0	0
Type of physical efforts		
Sitting work	15	13.8
Standing work	68	63
Lumbar flexion	47	43.5
Lumbar rotation	32	29.6
Cervical flexion	27	25
Cervical rotation	7	6.5
Inadequate postures	22	20.4
Elevated UL with shoulder ROM greater than 90º	31	28.8
Shoulder rotation	12	11.1
Circular wrist movements	2	1.9
Abrupt forces with UL	4	3.7
Squatting	10	9.3
Abrupt forces with LL	8	7.4

Stairs	2	1.9
Lifting weight	77	71.3
Work satisfaction		
Yes	69	63.9
No	39	36.1
Previous training for the job		
Yes	80	74.1
No	28	25.9
Work days/week		
5 days/week	27	25
6 days/week	81	75
Overtime		
Yes	45	41.7
No	63	58.3
Amount of overtime/week		
None	63	58.3
Up to 2 h/week	22	20.4
More than 2 h/week	23	21.3
Presence of environmental risks		
Physical	103	95.3
Chemical	60	55.5
Biological	25	23.2
Accidents	56	51.8
PPE use		
Yes	106	98.1
No	2	1.9
Lack of work safety		
Yes	67	62
No	41	38
Safety actions		
Yes	105	97.2
No	3	2.8
Meal provided		
Yes	105	97.2
No	3	2.8
Child labor		
Yes	3	2.8
No	105	97.2
Worked before		
Yes	62	57.4
No	46	42.6
Environmental risks in previous jobs		
Physical	43	39.8
Chemical	38	35.2
Biological	24	22.2
Accidents	35	32.4

Onset of symptoms

Up to 24 months	32	29.6
From 25 to 48 months	26	24.1
From 49 to 72 months	26	24.1
More than 73 months	24	22.2

Change in function due to sickness

Yes	69	63.9
No	39	36.1

Diagnosis

Yes	108	100
No	0	0

Sickness absence with medical certificate issued by the company

Yes	80	74.1
No	28	25.9

Months on leave with B31

From 1 to 3 months	20	18.5
More than 4 months	27	25

Months on leave with B91

Up to 6 months	9	8.3
From 7 to 12 months	8	7.4
From 13 to 24 months	14	13
From 25 to 36 months	9	8.3
More than 37 months	21	19.5

History of surgery in the affected region

Yes	30	27.8
No	78	72.2

History of physical therapy intervention

Yes	79	73.1
No	29	26.9

Professional rehabilitation of the *INSS* (National Social Security Institute)

Yes	21	19.4
No	87	80.6

Forensic report

Yes	5	2.6
No	103	97.4

Genetic illness/disease

Yes	54	50
No	54	50

Affected region

Shoulder	92	85.2
Elbow	12	11.1
Wrist	26	24.1
Cervical	15	13.9
Lower back	20	18.5

Technical conducts

Leave	53	49.1
Medication	61	56.5
Physiotherapy Monitoring	52	48.2
Surgery	3	2.8
Nexus	67	62
Medical certificate	3	2.8
DRT notification	2	1.9
Report to the company	2	1.9
Union notification	2	1.9
VISAT notification	22	20.4
WAR issue	86	79.6
Referral to professional rehabilitation	1	0.9
Labor/social security guidance	8	7.4
Declaration	2	1.9
Issuance of reports	1	0.9
Request exams	1	0.9
Administrative conducts		
Referral to *INSS*	8	7.4
Return for control	2	1.9
Return for investigation/clarification	13	12
Referral to expert consultation	49	45.4
Discharge with referral to other services	6	5.6
CEREST discharge	13	12

Legend: *SESMT* - Specialized Safety and Occupational Medicine Service; UL - Upper Limb; ROM - Range of Movement; LL - Lower Limbs; PPE - Personal Protective Equipment; B31 - Social Security sickness benefit or Type 31 Benefit; B91 - Accident sickness benefit or benefit type 91; *INSS* - National Social Security Institute; DRT - Regional Labor Office; VISAT - Occupational Health Surveillance; WAR - Workplace Accident Report; *CEREST* - Reference Center for Occupational Health.
Source: Research Data (2020).

Table 3 presents the factors which determine granting each of the benefits. As evidenced, the variables which showed a significant association ($p < 0.05$) with granting the accident-related sickness assistance benefit (B-91) were: time in occupation current, work with cervical flexion requirement, participation in the INSS professional rehabilitation program, and referral for consultations with medical specialists; in addition, the variables with no significant association and with an effect for the social security sickness assistance benefit (B-31) were the performance of dismissal exam and previous work with exposure to chemical risk.

This table also shows the β values which is the regression coefficient, and represents the numerical slope for the type of sickness benefit to be granted in the case of sick leave in the final regression model.

Table 3 – Factors associated with the type of sickness benefit to be granted.

Variable	β	Type of benefit	p-value
Intercept	-1.28	-	0.014*
Current occupation time	0.01	B91	0.004*
Conducting a dismissal exam	-1.00	B31	0.036*
Working with Cervical Spine Flexion	1.55	B91	0.015*
Previous Work with Exposure to Chemical Risk	-1.55	B31	0.007*
INSS Professional Rehabilitation	3.44	B91	**
Referral for consultation with specialists	1.13	B91	0.028*

Note: *p-value<0.05; ** p-value<0.01
Legend: INSS – National Social Security Institute
Source: Research Data (2020).

The Odds Ratio results for the variables which influence the final model are shown in Table 4, and as evidenced in the case of sick leave from work due to WMSD, the industrial worker was more likely to receive the B91 when participating in the INSS rehabilitation program (OR = 31.27; 95%CI = 4.92 - 19.71), when performing a function that requires cervical spine flexion (OR = 4.68; 95%CI = 1.25 - 16.29), when attending consultations with specialists (OR = 3.10; 95%CI = 1.12 - 8.56), and those who have spent considerable time doing the same function (OR = 1.01; 95%CI = 1.00 - 1.01). Conversely, the chances of B31 being granted are increased when the worker performs a dismissal exam (OR = 0.22; 95%CI = 0.05 - 0.91) and when they are exposed to chemical risk in a previous job (OR = 0.21; 95%CI = 0.06 - 0.66).

It is also noteworthy that the model of our study presents results according to the deviance function (D) which confirm the hypothesis, since the D statistic related to the logistic regression model (97.90) was less than the Chi-squared reference value (125.45) with 101 degrees of freedom.

Table 4 – Predictors of logistic regression for the type of sickness benefit assistance granted.

Predictors	Odds ratio (95% CI)	Effect
Current occupation time	1.01 (1.003-1.019)	B91
Conducting a dismissal exam	0.22 (0.056-0.913)	B31
Working with Cervical Spine Flexion	4.68 (1.258-16.292)	B91
Previous Work with Exposure to Chemical Risk	0.21 (0.069-0.665)	B31
INSS Professional Rehabilitation	31.27 (4.923-19.717)	B91
Referral for consultation with specialists	3.10 (1.125-8.564)	B91

Legend: INSS - National Social Security Institute; 95% CI - 95% Confidence Interval.
Source: Research Data (2020).

4. Discussion

The results evidenced that the time in the current occupation, performing actions with frequent demand for cervical flexion, participation in the *INSS* professional rehabilitation program and investigating the diagnosis through consultations with several specialists may be factors which explain granting the accident-related sickness benefit (B91), which is only granted in social security when the causal link of work is established as a conditioning factor for the illness. The factors related to granting the social security sickness benefit (B31) without establishing a link were performance of a dismissal exam and previous work with exposure to chemical risk.

Regarding the relationship between the predictive factors for the type of benefit, it was found that time in the occupation is a factor which tends to explain the illness as being related to work. A similar result was found in the automobile industry (Zhou, et al., 2018); however, the time in our study became significant after 43 months in the same function. Coury, et al. (2002) found that periods of more than 7 months in a function can influence the appearance of musculoskeletal symptoms. Exposure time is considered a primary risk for these diseases (Putz-Anderson, 2017), as the time working in the same company or function is related to accumulated exposure to the risks that it imposes, in turn being reflected in illness (Viegas & Almeida, 2016), which Negri, et al. (2014) calls "activity-dependent" pathologies.

The variable of conducting a dismissal exam explained granting the B-31 benefit (social security sickness benefit). The fact that a portion of the workers who were receiving this benefit had been dismissed from employment when they entered the benefit expresses the vulnerability of the sick worker to be dismissed, since this type of assistance does not provide legal stability for returning to work after going on sick leave. Pestana, et al. (2017) found that fear of dismissal is common in sick leave workers who have to return to work. This feeling acts as a catalyst for the worker to neglect their own physical limitations imposed by their health condition, and seek to produce even more, placing them in a vicious cycle of greater exposure to the harmful mechanism and worsening the pathology, which consequently causes a need for new periods of absence.

A possible explanation regarding the B31 benefit granted being influenced by the fact that the worker has already worked in workplaces exposed to chemical risks is that exposure to different types of risk throughout their professional career can make it difficult to establish the main cause of illness, preventing granting the benefit which establishes the causal link of the disease (B91). Chemical risks in the case of musculoskeletal illness could be treated as a concausal link through the "theory of equivalence of conditions" proposed by the Brazilian Social Security evaluation system (Brazil, 1991). The presence of chemical risk does not prevent the musculoskeletal pathology from being related to work, but the lack of evidence or research to prove exposure to these risks in previous works may constitute factors which explain the refusal to grant the social security sickness benefit by social security.

The work performed requiring cervical spine flexion was one of the factors which explains recognizing the disease-work relationship and granting the B91 benefit. Cervical flexion has been identified as one of the main biomechanical risk factors in the work process for developing musculoskeletal disorders in the upper and cervical limbs (Palmer & Smedley, 2007; Park, et al., 2010; Zebis, et al., 2011). These were also the regions most frequently affected in our study, as evidenced by injuries to the shoulder (85.2%), wrists/hands (24.1%) and cervical spine (13.9%). Nourollahi-Darabad, et al. (2018) refer that cervical flexion predisposes a worker even more to WMSD when they are involved in repetitive or monotonous tasks and intense work pace; a situation which was also described as having high frequency by the workers in our study. These issues can provide the necessary security for the social security benefit to be granted. However, Oliveira & Oliveira (2020) suggest that ergonomic measures can be easily implemented to redesign the physical work environment in the industry.

Participation in the *INSS* rehabilitation program proved to be a favorable factor in granting social security sickness benefits. Inclusion in this type of program is a resource applied to workers who have an indication for long-term leave. Takahashi, et al. (2010) refer that this is the main strategy of the Brazilian social security system to cope with work incapacity, being fundamental in reducing the duration of the benefit provided to sick workers and positioning them in new roles which respect their limitations. Therefore, workers who have more severe disabilities, who need more time away from work and who have greater difficulty in performing their work function are those who go through the *INSS* program, and are therefore more prone to social security sickness benefits.

As this study analyzed granting benefits to workers on leave due to musculoskeletal disorders, the relationship between professional rehabilitation and granting benefits is explained by the ideas of Gjesdal & Bratberg (2003), Brage, et al. (2010) and Gabbay, et al. (2011), who refer that granting long-term benefits due to severe labor incapacity in most countries of the world refer to musculoskeletal system diseases, and therefore workers affected by such diseases become the most frequently indicated for programs professional rehabilitation.

Finally, it was found that workers who were referred by *CEREST* professionals for consultations with specialists from different health areas were 3.1 times more likely to receive the B91 benefit. This relationship can be explained by the need for long-term benefits to only be granted to workers who have undergone a continuous and integrated assessment, allowing for a safe and fair decision to verify work incapacity arising from illness due to work (Miranda, 2018).

Consultation with other professionals and specialists is an important element in diagnosing WMSD. Øyeflaten, et al. (2014) state that recognizing the disease as work-related should be the result of a thorough process and considers the multifactorial nature of these changes. Nilsen, et al. (2011) and Maeland, et al. (2012) refer that the diagnosis - by itself - cannot be considered as a factor for granting benefits, and (according to these authors) the validity of this diagnosis should be periodically questioned by specialized professionals, especially for the more complex cases involving patients with subjective health complaints such as pain and limited functions.

4.1 Study limitations and perspectives

The fact that this study is based on data from a single worker assistance service stands out as a limitation of this study, because even though it is still a reference institution in providing care for this specific group of patients, it has a loco-regional reality and its results should be interpreted with caution. We also consider the small sample size as a limitation, which can be explained by the fact that the medical records which composed the current file of the Reference Center for Occupational Health were used.

Based on this, it is believed that future studies may focus on evaluating data from other services that sick workers go through such as diagnostic and rehabilitation centers, social security institutes or even data collected in the industry itself, such as those contained in medical records or even direct assessment processes with workers.

The results presented here can be used to direct collective health and work safety actions through creating measures which seek to eliminate the factors that were favorable to the workers going on leave and the benefits being granted. Even so, they can assist in the decision-making process for establishing the causal link for work-related musculoskeletal disorders both by *CEREST* and *INSS* professionals. There is also the possibility that the data presented herein can be used as a scientific basis to develop and adopt preventive and control measures regarding this group of diseases with workers in the industry.

It is further worth noting the need to expand the offer of professional rehabilitation services along the *INSS* lines, and access to diagnostic methods which bring early information about possible workers' commitments through periodic examinations during their working time in the industry. It is also recommended to implement methods of assessing personal

and biomechanical factors in the industries' work environments in order to implement effective interventions, such as rotating organizational tasks and/or institutional programs for periodic job changes, aimed at remedying short- and long-term effects of exposure to risks such as prolonged cervical flexion posture.

5. Conclusion

This study presented an analysis of the factors related to granting different types of benefits by industrial workers. The time in the current occupation, work involving cervical spine flexion, participation in the INSS rehabilitation program and referral to consultations with specialists are factors related to granting accident-related sickness benefit (B91) and performing the dismissal exam and previous work with exposure to chemical risk are related to granting the social security sickness benefit (B31). Controlling these risk factors by implementing organizational changes and intervention programs can contribute to reducing the prevalence of sick leave due to musculoskeletal disorders and social security expenses in this population.

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