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Impact of a spinal cord injury in employment: a cross-sectional study in a Portuguese population

Abstract

Background: Patients who have sustained a spinal cord injury (SCI) frequently face a fundamental change in their employment situation, as the demands of their previous job often exceed their remaining physical abilities.

Aim: To study which factors associated with the SCI may influence the employment status.

Design: Descriptive cross-sectional study.

Setting and population: Seventy-three individuals who had sustained a SCI, admitted in our Rehabilitation Center in 2015.

Intervention: Not applicable.

Methods: Besides clinical information, a telephone questionnaire was applied in 2019 to the patients, in order to identify demographic and injury-related status, functionality (FIM, SCIM-III, nFAC scales), and work-related information. The data was analyzed in *SPSS Statistics*® version 26, using χ^2 test for categorical variables and t test for independent samples between continuous and categorical variables.

Results: The employment rate after SCI was 27.8%. The need of a caregiver showed a significant relationship with not being employed ($p<0.001$), consisting in an independent determinant for employment (OR 5.38). Return-to-work was associated with higher functional scores, lower mean age values ($p<0.001$), previous higher education level ($p<0.001$), and pre-injury intellectual job ($p=0.009$).

Conclusion and clinical rehabilitation impact: The employment rate and factors influencing return-to-work were in line with those available in literature. Additionally, we consider that the "need of a caregiver" is essential in the evaluation of a SCI patient, as it gives a clearer understanding of the patients' work ability (*participation* domain), in contrast with functional scores, best suited in the *activity* domain of the International Classification of Functioning Disability and Health.

Keywords: Spinal cord injury, employment, comprehensive rehabilitation

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Inês Ferro,[1] César Pires,[1] Pedro C Sá,[1] Xénia Verraest,[1] Paulo Margalho,[2] Filipe Carvalho,[3] Jorge Lains[4]

[1]Resident in Physical and Rehabilitation Medicine, Centro de Medicina de Reabilitação da Região Centro, Rovisco Pais, Tocha, Portugal

[2]Senior consultant in Physical and Rehabilitation Medicine, Director of the Spinal Cord Injury department, Centro de Medicina de Reabilitação da Região Centro, Rovisco Pais, Tocha, Portugal

[3]Consultant in Physical and Rehabilitation Medicine, Centro de Medicina de Reabilitação da Região Centro,Rovisco Pais, Tocha, Portugal

[4]Senior consultant in Physical and Rehabilitation Medicine, Centro de Medicina de Reabilitação da Região Centro, Rovisco Pais, Tocha, Portugal

Correspondence: Inês Ferro, Resident in Physical and Rehabilitation Medicine, Centro de Medicina de Reabilitação da Região Centro, Rovisco Pais, Rua da Fonte Quente, Tocha, Portugal, 3060-586, Tel +351 919873391, Email ines.ferro@roviscopais.min-saude.pt

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Abbrevations: SCI, spinal cord injury; ICF, International Classification of Functioning, Disability and Health; FIM, Functional Independence Measure; SCIM-III, Spinal Cord Independence Measure;

Introduction

Work is as important part of an individual's life. Not only can it provide an income but it also gives the opportunity to interact with others, improving self-esteem and overall life satisfaction.[1] Individuals who have suffered a spinal cord injury (SCI) are often faced with a change in their job situation, because the demands of their pre-injury job often surpass their remaining physical capabilities.[2]

Employment remains one of the most important studied topics since the early 50's, when the importance of returning-to-work after SCI was acknowledged.[3] The employment rates after SCI vary internationally, because of discrepancies between countries, Health and Social politics and studies' definition of employment,[4] ranging widely from 11.5 to 74%.[5–7]

The International Classification of Functioning, Disability and Health (ICF), has become the unifying framework for Physical and Rehabilitation Medicine, as function is an intertwine of the domains *body functions and structures*, *activities* and *participation*, and *environmental and personal factors*. The ICF has the potential to contribute importantly to the quality of rehabilitation care delivery, considering all its domains.[8] Work belongs in the *participation* domain, and their factors should be considered.

In order to understand the factors that influence employment status in this population, we must ask why some SCI individuals are more often employed than others. Several aspects have been identified to interfere with the ability to return to work. Some cannot be modified (e.g. level of injury, or sex) while others can be modifiable (e.g. education level, health status, or work skills). Being male, sustain a less severe injury, having a higher functional independence, the SCI at a younger age, a higher education level, and a previously non-manual job tends to be associated with an increased chance of employment.[9–13]

The aim was to study which factors (socio-demographic, educational, associated with the spinal cord injury and work related) might later influence the employment status.

Materials and methods

This article was written according to the STROBE guidelines for observational studies.[14]

Study design and participants

This is a cross-sectional study. We included adult SCI individuals that were inpatients in our facility (Rehabilitation Center of the Central Region of Portugal–Rovisco Pais) in 2015, and that at the time of questionnaire (August 2019) were alive, contactable, capable and willing to participate in the study. We excluded those who were dead, not contactable or not willing to participate in the study. This defined our study sample size.

Statement of ethics

This study design was conducted according to Good Clinical Practice guidelines and the Declaration of Helsinki. Our study protocol was previously approved by the Committee of Ethics for Health of our Rehabilitation Center. Informed consent was obtained from all patients prior to the questionnaire application. Each patient was assigned with a random alphanumeric code and no personal traceable information was collected, in order to guarantee total data concealment and anonymity.

Data gathering, setting and variables

The data gathering fell into two parts. The first part included the collection of data from the files of the SCI patients admitted in 2015 in our Rehabilitation Center. Sex, educational level (primary, secondary, tertiary), age at injury and at questionnaire (in years), lesion type (paraplegia or tetraplegia), cause (traumatic or non-traumatic), and severity (complete or incomplete), need of a caregiver and functionality at discharge (evaluated by Functional Independence Measure (FIM), Spinal Cord Independence Measure (SCIM-III) and the modified Functional Ambulation Categories (nFAC)) were used as socio-demographic and injury-related stratification variables. Pre-SCI job status information was also collected from the patient admission files.

The second part of the data gathering consisted in the application of a telephone questionnaire that we elaborated before august 2019. The patients or their family members/caregivers were contacted, and if they accepted, the questionnaire was applied. The questionnaire aimed to identify present injury-related status, confirm education level, functional status regarding ambulation (nFAC), and post-SCI work-related information.

Concerning the education level at the moment of injury, we chose to divide it in: primary (7 to 12years), secondary (13 to 17 years) and tertiary levels (above 18 years). Main pre- and post-injury job titles were divided into two groups, "manual" and "intellectual" jobs, by two researchers independently. Any disagreements between the two researchers were resolved by discussion and, when necessary, arbitrated by a third researcher.

Data analysis

Data were analyzed by IBM *SPSS Statistics*® software version 26. Data are presented as mean ± standard deviation (SD) for continuous variables or frequency and percent for count variables. Evidence of a statistical difference was accepted at an $\alpha<0.05$.

Demographic, injury-related characteristics and socioeconomic variables are presented for the total sample. In order to identify differences between groups (return to work and not return to work), Pearson's chi-squared (χ^2) test or exact Fisher test were used for categorical variables and Student t test for independent samples between continuous and categorical variables.

Results

Participants

One hundred and five patients were admitted in 2015 in the spinal cord injury ward in our Rehabilitation Center. Sixteen individuals were dead by the time of questionnaire. The remaining 89 patients were all contactable, and 73 were considered for this study after the application of inclusion and exclusion criteria (16 refused to participate).(Figure 1).

Descriptive data

The general characteristics of this study sample are presented in Table 1. Participants (n=73) were mostly male (80.8%), had a mean age at injury of 47.16±16.69 years old, and at the time of questionnaire of 54.86±15.44 years old. Fifty-seven patients (78.1%) were paraplegic and 16 (21.9%) were tetraplegic. Fifty-two (71.2%) had an incomplete lesion and 21 patients (28.8%) had a complete SCI. Fifty-one (69.9%) had a traumatic injury, and 22 (30.1%) a non-traumatic SCI. As for the mean functional scores, FIM was 100.43±25.08, nFAC 2.83±2.93 and SCIM-III 63.99±22.85. Regarding the need of a caregiver, 44 (60.3%) answered yes, while 29 (39.7%) answered no. Out of our sample, after SCI 21 were employed and 52 weren't.

Table 1 Characteristics of the study sample

	Participants (n = 73)		**Return to work Yes (n = 21)**		**No (n = 52)**		**p**
Parameters	n	%	n	%	n	%	
Sex							
Female	14	19.2	3	15	11	21.2	0.541*
Male	59	80.8	18	85	41	78.8	
Age (years)	mean (SD)		mean (SD)		mean (SD)		
At injury	47.16(±16.69)		34.75(±15.41)		51.48(±14.63)		<0.001**
At questionnaire	54.86(±15.44)		44.50(±14.40)		58.44(±13.98)		0.001***
Type of injury							
Paraplegia	57	78.1	19	90.5	38	73.1	0.128*
Tetraplegia	16	21.9	2	9.5	14	26.9	
Cause of injury							
Traumatic	51	69.9	16	76.2	35	67.3	0.577****
Non-traumatic	22	30.1	5	23.8	17	32.7	
Severity of injury							
Complete lesion	21	28.8	5	23.8	16	30.8	0.586****

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Table Continued...

	Participants (n = 73)		Return to work Yes (n = 21)		No (n = 52)		p
Incomplete lesion	52	71.2	16	76.2	36	69.2	
Functionality scales	mean (SD)		mean (SD)		mean (SD)		
FIM	100.43(±25.0)		106.58(±28.40)		98.83(±23.51)		0.249**
N_FAC	2.83(±2.93)		3.55(±3.28)		2.61(±2.76)		0.225**
SCIM-III	63.99(±22.85)		73.22(±21.27)		61.63(±22.08)		0.057**
Need of a caregiver							
Yes	44	60.3	6	28.6	38	73.1	<0.001****
No	29	39.7	15	71.4	14	26.9	
Education level							
Primary (7-12 years)	17	23.3	1	4.8	16	30.8	<0.001*
Secondary (13-17 years)	40	54.8	9	42.8	31	59.6	
Tertiary (>18 years)	16	21.9	11	52.4	5	9.6	

* Exact Fisher test

** Student t test for independent samples

*** Non-parametric test for independent samples

**** Chi-square test

Socio-demographic factors

Although this sample had a high percentage of male patients (80.8%), there was no statistical difference between sex and return to work status (p = 0.541).

Lower mean age at injury and at questionnaire exhibited a statistically significant difference concerning return to work (p<0.001 and p=0.001, respectively). At the time of injury, the mean age of those employed were 34.75±15.41 years, and of those not working were 51.48±14.63 years. At the time of the questionnaire, the mean age of those employed were 44.50±14.40 years, and of those not working were 58.44±13.98 years.

Injury related factors

From our paraplegic population (n=57), 19 were employed after SCI and 38 weren't. Considering the tetraplegic population (n=16), 2 returned to work after SCI, while 14 didn't. Despite these results, we found no statistically significant differences between return to work and type of injury (p=0.128).

As for the cause of injury, 16 of the 51 traumatic injuries returned to work, while 5 of the 22 non-traumatic injuries returned to work. There was also no statistically significant difference between mechanism of injury and return to work (p=0.577). There was also no relationship between age and mechanism of injury (p=0.971 at the time of injury and p=0.935 ate the time of questionnaire), showing no interference of age in our previous results.

Sixteen patients who returned to work had an incomplete lesion (76.2%), and 5 a complete lesion (23.8%). Also, from the patients who didn't return to work, 16 had a complete lesion (30.8%) and 36 an incomplete lesion (69.2%). We found no statistically significant differences between return to work and the severity of injury in this population (p=0.586).

The majority of patients who returned to work mentioned no need of a caregiver (n=15, 71.4%), while the opposite was seen in the group who didn't return to work (n=38, 73.1%). There was a statistically significant difference found (p<0.001) between these variables.

Those who returned to work had higher mean functional scores at discharge: mean FIM scores were 106.58±28.40 for those who returned to work and 98.83±23.51 for those who didn't return to work; SCIM-III scores were 73.22±21.27 for those who returned to work and 61.63±22.08 for those who didn't return to work; nFAC scores were 3.55±3.28 for those who returned to work and 2.61±2.76 for those who didn't return to work. Despite this, we found no statistically significant difference among these three scales at discharge and present employment status (FIM with p=0.249, SCIM-III with p=0.057, nFAC with p=0.225). In addition, at the time of the questionnaire, we asked about the current ambulation status, using nFAC (Table 2). The mean nFAC scale score (and SD) at questionnaire for those who were employed after SCI was 3.65±3.23, while for those who weren't employed was 2.27±2.62, with no statistical significance found (p=0.099).

Table 2 nFAC at questionnaire and present employment status

	nFAC at questionnaire Mean (SD)	p
Returned to work	3.65 (3.23)	0.099*
Didn't return to work	2.27 (2.62)	

* Student t test for independent samples

In order to explore the actual impact of functionality, a linear regression was performed for mean functional scores, and a binary logistic regression was performed for the need of a caregiver (categorical variable). The correlation between mean functional scores and employment status was low (MIF=R 0.104; SCIM-III=R 0.170; nFAC at injury=R 0.121; nFAC at questionnaire =R 0.193). In contrast, there was a high correlation between the need of a caregiver and employment status (OR 5.38), making it an independent determinant of employment in our study.

Education and previous work-related factors

The biggest parcel of our population had a secondary level education (54.8%), followed by primary level (23.3%) and tertiary level education (21.9%). Considering those who returned to work, 11 patients (52,4%) belonged to the tertiary level education at the time of injury, 9 (42.8%) had a secondary level education and 1 (4.8%) a primary level education. Of the 52 patients who did not return to work, only 5 (9.6%) had a tertiary level education, 16 (30.8%) had a primary level education, and 31 (59.6%) had a secondary level education. The level of education and present employment status showed a statistically significant difference (p<0.001).

As showed in Table 3, previous to the SCI, 2 patients were students (2.74%), 52 were employed (71.23%), and 19 were retired (26.03%).

Of the 52 patients reporting pre-SCI employment, 39 worked in a manual job (75%) and 13 in an intellectual job (25%).

Table 3 Frequency distribution of the reported pre- and post-SCI employment status

	Employment status			
	Before SCI		After SCI	
	n	%	n	%
Employment status				
Student	2	2.74	0	0
Employed	52	71.23	21	28.8
Retired	19	26.03	35	71.2

After SCI, and by the time of questionnaire, only 21 patients returned to work (28,8%) and 52 were retired (71.2%). From the previously non-retired population (n=54), after SCI 32 retired, 3 were in the process of retirement (2 of those were still working), and 19 were not retired and still working. Out of the 21 patients who were employed after SCI, 11 had a manual job and 10 an intellectual job (Table 4). As for those who didn't return to work, 28 previously had a manual job (90.3%) and 3 had an intellectual job (9.7%). The previous work category influenced the return-to-work rate in our sample, with a statistical difference (p = 0.007) – those with an intellectual job had higher return to work rates (10 in 13 patients, in contrast with 11 in 28 patients who previously had a manual job).

Table 4 Previous work category and present employment status

	Manual	Intellectual	p
	n (%)	n (%)	
Returned to work	11 (52.4)	10 (47.6)	0.007*
Didn't return to work	28 (90.3)	3 (9.7)	
*Chi-square test			

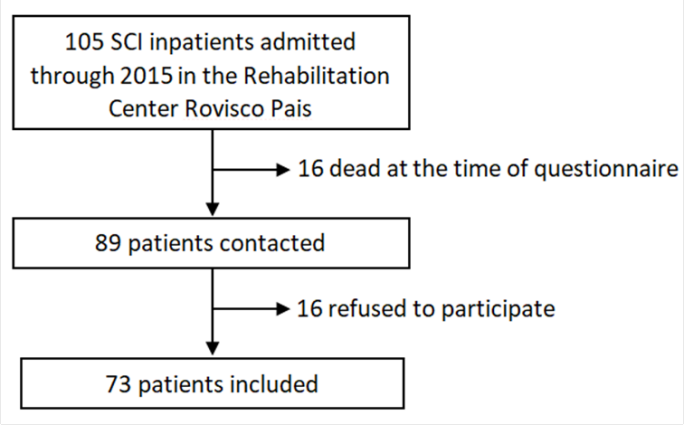

Figure 1 Patient selection for this study.

Discussion

This study provides a snapshot to contextualize employment within about four years after sustaining a SCI and being an inpatient in a Rehabilitation Center in Portugal. The majority of our sample (n=52, 71.23%) was employed by the time of injury. However, less than a third (n=21, 28.8%) were employed at the time of questionnaire. This is in line with the employment rates internationally reported.[5,6] We found no National data on employment in this particular population.

Several factors have been identified in the literature to interfere with the ability to return to work after an event like a SCI. A comprehensive understanding of employment following SCI is critical to restoring community reintegration. The Spinal Cord Injury Research Evidence (SCIRE) professional project is a known resource for current and credible information, in review format, regarding multiple aspects of SCI patients. According to SCIRE, studies suggest that being male, being younger at the time of injury, higher education level pre-injury (being that people with tertiary education prior to injury were up to 8 times more likely to be employed post-SCI), having a lower physical demand job pre-injury are non-modifiable personal factors that positively influence employment opportunities after SCI. In contrast, a higher and more severe the injury are non-modifiable factors that negatively influence employment after SCI. Higher functional independence is a modifiable factor that positively influences employment opportunities after SCI.[15,16]

Most of our results are in line with those in the literature, some of them with statistical significance. However, there are some data, like sex, which does not. Women with a disability are less likely to be employed in most developed economies.[4] More than eighty percent of our sample were males, but the distribution between sexes and return or not to work were similar, showing no statistical significance.

Individuals who sustained an SCI and returned to work tended to be younger (either at the time of injury and at the time of questionnaire), have a higher education level pre-injury, and have an intellectual job before SCI (versus a manual one), with statistically significant results. Higher education level increases the chances to remain employed after SCI.[10,17] Intellectual jobs could have a better chance of being employed after SCI than manual jobs, due to more job autonomy and perhaps flexibility, making it easier to continue working in the same profession despite the reduction in physical ability.[11]

Plus, and as previously mentioned, patients who returned to work have a tendency to have non-traumatic, incomplete and paraplegic injury characteristics but, in our sample, we did not find significant statistical differences.

No characteristics of the SCI by itself showed statistical significance, although most patients who returned to work were paraplegic, had an incomplete lesion, and a non-traumatic etiology, as denoted in some studies.[5,13,16]

Regarding functionality, higher mean scores were seen in patients who did return to work, in all three scales considered, as represented in the literature.[10] However, we cannot assume an association, as none showed a significant statistical difference. Interestingly, the need of a caregiver was associated with a lower return to work rate, with statistical significance, meaning there was an association between independence and employment status post-SCI. The International Classification of Functioning Disability and Health (ICF) is a widely used classification of health and health-related domains, describing body functions and structures, activities and participation, and a list of environmental and personal factors.[8] Considering the different dimensions in the ICF, work belongs in the "Participation" domain, as functional limitation belongs in the "Activity" domain. In this line of thought, the authors consider that these functional metrics were, perhaps, not adequate in order to establish this functionality impact (return to work). We propose that the "need of a caregiver" may additionally be considered in the evaluation of the SCI patient, as it gives as a clearer understanding of our patients' participation ability - return to work. This fact may explain why, in our results, functional scales had no statistical significance while the need of a caregiver did. Plus, when we evaluated a possible correlation, the need of a caregiver showed to be an independent determinant for the employment status.

One of the limitations of this manuscript is the fact that this is an observational study with cross-sectional data, and lacks longitudinal follow-up, only allowing us to identify associations between variables, not causal relationships. Although our response rate was high (69.5%), our data only comprised individuals who were once inpatients in a Rehabilitation Center from Portugal, and may not be representative for all people with SCI in Portugal. Additionally, the fact that only previous inpatients from a Rehabilitation Center were enrolled in this study is a selection bias, as tendentiously they have a more severe presentation, and employment estimates in the outpatient population may differ.

Conclusion

The employment rate found in our study was in line with the international literature. There is no information specifically about the Portuguese population.

Despite improvements and innovations in technology, robotics, environmental designs, the attenuation of prejudices and the job opportunities, employment rates for those with SCI have changed very little over the last 30-40 years.[15] This reveals the complexity of the process of returning to work and the diverse contexts regarding health and social politics in different countries.

ICF is a widely used classification of health and health-related domains. Work ability belongs in the "participation" domain. Therefore, the authors propose that the "need of a caregiver" may be considered in the evaluation of the SCI patient, as it gives a clearer understanding of our patients' participation capability (return to work), in contrast with functional scale scores, that are best suited in the "activity" domain.

Employment after SCI showed no significance with injury etiology or mean scores in functional scales. It showed to be associated with higher functional scores, no need of a caregiver (an independent determinant), lower mean age values (with a statistically significant difference), previous higher level of education (with a statistically significant difference), and previous professional category (manual versus intellectual job, also with a statistically significant difference).

A comprehensive multidisciplinary rehabilitation program, focused on education, vocational goals, improvement in functionality, and community and environmental access is essential for the success of employment outcomes, with the goal of maximizing patients' activity and participation, minoring their personal and environmental barriers, contemplating the ICF reasoning.

Conflicts of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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Author's contribution

All authors contributed equally to the manuscript, and read and approved the final version of the manuscript.

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