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ARTICLE

Spinal cord injury and work challenges: an analysis of paid work status and pathways of return to work in Brazil

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Abstract

Design Retrospective cohort study.

Objectives To investigate paid work status and return to work (RTW) pathways after spinal cord injury (SCI).

Setting SARAH Network of Rehabilitation Hospitals.

Methods Participants were adults with traumatic SCI, aged between 18 and 60 years at the time of the injury, admitted between 2000 and 2017. In the first stage, socio-demographic, injury-related, and functional status data were collected from medical records. In the second stage, data on paid work, means of mobility, driving ability, return to study, ability to work, and satisfaction with the work status were collected through an online survey conducted between January and March 2020.

Results A total of 154 participants were included in the sample. Of these, 90% were working at the time of SCI and 23% were engaged in paid work at the time of the study. Three RTW pathways were identified among those who were working at the time of the injury and: did not return to work (78%); returned to a different occupation (12%) and returned to the same occupation (9%). Number of post-injury complications, returning to study, good work ability, and satisfaction with the work status were predictors of paid work. The model's adjusted coefficient was 56.5% ($p = 0.001$).

Conclusion Working-age people with SCI who underwent rehabilitation in Brazil had a low rate of paid work. Fewer complications at the time of the injury, returning to study, good ability to work and greater satisfaction with the work status increased the likelihood of being engaged in paid work.

Introduction

Return to and sustained work are important goals of rehabilitation for people with traumatic SCI. Involvement in work activities brings benefits such as economic rewards, social contact and a sense of well-being and satisfaction with life [1, 2]. However, the worldwide average work rate among people with SCI is no more than around 34–37% [3, 4]. The average current employment rate of people with SCI by continent was highest in Europe (51%) and lowest in North America (30%) [4]. This variation among countries suggests that system-level, infrastructure, cultural and policy differences may affect work outcomes [5, 6]. It is also attributed to the different work definitions adopted [3, 4].

Although there are good data on the employment rates of people with SCI in high-income countries, equivalent data for low and middle-income countries, including Brazil, are sparse [5]. The scarcity of research limits comparison with international studies and the better understanding of the factors associated with work in this population. A recent study showed a work rate of 14% in people with SCI in Brazil, representing the second worst rate among the 22 countries included in the study [7].

Brazilian disability insurance schemes allow for disability benefits and provide support for vocational retraining if indicated. There are, however, recent changes in social security legislation [8] that can influence not only the work situation of the general population, but also can make

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it difficult for people with SCI to reintegrate into the labor market.

There is evidence in the literature that factors such as younger age [5], Caucasian race [9], less severe injury [5, 10, 11], longer duration since injury [11, 12], lower physical demand in the pre-injury occupation [13], more functional independence [14, 15] and higher educational level [12, 16] are associated with a better prognosis for returning to work. Quality of life and life satisfaction are also linked to work post-SCI [17].

Previous studies have shown that returning to their pre-injury employment or starting a new occupation are the two major pathways back into paid work for persons who were working at SCI onset [16, 18]. In this context, it is important to identify not only the factors that interfere with the work of people with SCI at a specific time point but also to know the different RTW pathways after traumatic SCI. The study's specific hypothesis was that individuals with SCI of higher educational level, younger and functionally more independent are more likely to have paid work.

The aims of this study were: (1) to characterize people with traumatic SCI according to paid work status, (2) to investigate different return to work (RTW) pathways in individuals who were working at the time of the injury, and (3) to determine which factors influence paid work status after traumatic SCI.

Methods

Study design and participants

This is a single-center retrospective cohort study. In the first stage, data were collected from the electronic medical records of people with traumatic SCI admitted between January 2000 and December 2017 in a unit of the Sarah Network of Rehabilitation Hospitals and living in a large Brazilian urban center. All individuals aged between 18 and 60 years who participated in the hospital's rehabilitation program were recruited.

This age group corresponds to the economically active population in Brazil. Individuals with other associated neurological conditions including stroke, traumatic brain injury, and multiple sclerosis were excluded.

In the second stage, an online survey was conducted, with the administration of a semi-structured questionnaire, between January and March 2020. The online survey was designed using the Google Forms application.

All individuals included in the first stage were invited by phone to participate in the online survey. Those who agreed to participate received the questionnaire and consent form by e-mail or social network app, according to their preference. They were also given the option to have it sent by regular mail, but none of the participants chose this option. Questionnaires not answered within 2 weeks were sent again; if these were not answered in 7 days, the participant was excluded. The first stage of data collection and the telephone invitation were carried out by the main researcher. The research ethics committees from the Sarah Network of Rehabilitation Hospitals and the Universidade Federal de Minas Gerais approved this study. All participants signed an informed consent form prior to their participation.

Variables

The outcomes analyzed were paid work status and RTW pathways. Paid work was defined as the performance of any activity for which the payment was in cash, products or goods (housing, food, clothing, training); participants could be self-employed, employees, or employers. Housewives, students, and people who do volunteer work were classified as nonwork status in the first stage of the study. Work status information was collected at the online survey by asking the initial question: "Are you currently engaged in paid work? (Yes/No)".

The RTW pathways were identified based on information collected in the two stages of the study. Three RTW pathways were constructed considering the participants who met two criteria, that is: worked at the time of SCI, and: (1) did not RTW, (2) returned to the same occupation, (3) returned to a different occupation.

The sample's information included sociodemographic data (gender, age, marital status, number of children, educational level, and occupation), injury-related factors (cause, age at onset, neurological level and extent of injury, secondary complications, SCI duration and date of admission to rehabilitation), lifestyle habits (use of alcohol, tobacco, and drugs) and functional data. These data were collected from the electronic medical records on enrollment in the rehabilitation program.

Occupation at the time of SCI was coded according to the Brazilian Occupation Classification (Classificação Brasileira de Ocupações—CBO) [19]. Neurological level and extent of injury were classified according to the American Spinal Injury Association (ASIA) criteria using the ASIA Impairment Scale. Neurological level of injury was categorized as paraplegia (<T1) or tetraplegia (≥T1). Extent of injury was categorized as either motor complete SCI (ASIA A and B) or motor incomplete SCI (ASIA C and D) [20]. Secondary complications related to SCI included bladder and bowel dysfunction, spasticity, pressure injury, heterotopic ossification, and pain. Pain was quantified using the Numeric Pain Scale [21]. Functional limitations were evaluated using the Functional

Independence Measure (FIM) motor score at the time of discharge from the rehabilitation program. Higher scores indicate greater functional independence [22]. These instruments have been translated and adapted to the Portuguese language, have good psychometric properties, and are widely used in people with SCI [23, 24].

The questionnaire used in the online survey was divided into question blocks. Each participant was directed to one of the blocks according to their paid work status. Block 1: working (time until start to work, occupation, hours worked, use of assistive technology, and evaluation of current work); Block 2: not working (reason for not working, if they had worked post-SCI and for how long, and if they had sought work in the last year). Block 3 included questions for both groups, such as primary means of mobility, driving ability, SCI duration, return to study after SCI, social security benefits, vocational rehabilitation, income, self-perceived ability to work, and satisfaction with the current work status. Social security benefits include disability retirement and sick leave benefits. Such benefits are offered by the Brazilian government to workers who are partially or totally disabled for their work activities. The self-perceived ability to work is rated on a 5-point Likert scale ranging from 1 (very poor) to 5 (very good). For the statistical analyses, this variable was further dichotomized as "completely able to work (good work ability)" and "complete inability to work (bad work ability)". Satisfaction with the work situation at the time of the survey was assessed according to a 10-point scale, with 0 being very dissatisfied and 10 very satisfied.

Statistical analysis

Statistical analysis was performed in four phases. First, demographic, and injury-related data were compared between individuals who participated in the online survey and those who did not, to determine whether the sample was representative. Second, descriptive statistics were used to describe the status of the sample's current job; also, the workers and non-workers' groups were compared in relation to the study variables. Third, participants who worked at the time of SCI were grouped and the three RTW pathways were compared with regard to the study variables. Analysis of categorical variables used the chi-square test. Quantitative variables were tested for normal distribution and then compared using independent *t*-test (variables with normal distribution) or Mann–Whitney U test (variables with non-normal distribution) with α set a 0.05.

Finally, a logistic regression model identified the predictors of paid work status. The independent variables were chronologically divided into 3 blocks: (1) pre-SCI factors, such as marital status (with a partner/no partner), educational level (elementary/secondary/post-secondary school), and drug use (yes/no); (2) factors related to SCI, including age at onset of SCI, cause (traffic/violence/other accidents), neurological level of injury (paraplegia/tetraplegia), extent of injury (motor complete/incomplete), number of secondary complications, and FIM motor score at rehabilitation discharge; (3) post-SCI factors, such as mobility (wheelchair/gait), driving ability (yes/no); vocational rehabilitation (yes/no), return to study after injury (yes/no), satisfaction with the work status (0: very dissatisfied to 10: very satisfied), and self-perceived ability to work (bad/good). We added variables that had a P value ≤ 0.2 in the univariate analysis or had known to be related to paid work status. The statistical model for the prediction of paid work was composed of all significant variables ($p \leq 0.05$) considered simultaneously with the work status, using the method backward of variable entrance. Analysis was undertaken using SPSS version 21.0 (IBM Corp., Armonk, NY, USA).

Results

Demographic and clinical characteristics of the participants

Of the 263 individuals who met the inclusion criteria, 56 were not located, 15 did not agree to participate in the online survey, and 38 did not respond within the established deadline. The final sample included 154 individuals. The median age at the time of SCI was 30 years (range 18–55 years), with most of the participants being male (81%), single (55%), parents of one or more children (54%), and with incomplete elementary school (38%). Only 7% of the sample had post-secondary school. The most common occupations were those related to the production of industrial goods and services (32%), including building construction laborers, motorcycle drivers, and general service assistants. The participants' mean injury time was 7.6 years (4.3). The main cause of SCI was traffic accident (41%), followed by violence (25%). More than half of the participants had complete motor paraplegia (56%). The most common secondary complications were bladder and bowel dysfunction (95%), pain (71%), and spasticity (64%). As for life habits, 61% of the participants reported alcoholism, 25% smoked, and 23% used drugs. The median motor FIM at discharge from the rehabilitation program was 79 (range = 63–82), which represents high independence.

There were no statistically significant differences in sociodemographic and functional variables among respondents and non-respondents to the online survey, except for educational level, with a greater number of individuals with higher education among those who responded to the survey ($X^2 = 9.7$; $p = 0.008$). Sample description and comparison of individuals who responded to the survey and those who did not are shown in Table 1.

Table 1 Comparison between respondents and non-respondents to the online survey.

Respondents				
Total ($n = 263$)	No ($n = 109$)	Yes ($n = 154$)	p value	Chi-square
Categorical variables n (%)				
Sex				
Female	18 (16.5%)	30 (19.5%)	0.74	0.74
Male	91 (83.5%)	124 (80.5%)		
Educational level				
Elementary school	64 (58.7%)[a]	66 (42.9%)[b]	0.01	0.01
Secondary school	40 (36.7%)[a]	65 (42.2%)[a]		
Post-secondary school	5 (4.6%)[a]	23 (14.9%)[b]		
Marital status				
Married	44 (40.3%)	70 (45.4%)	0.52	0.52
Unmarried	65 (59.6%)	84 (54.5%)		
Level of injury				
Paraplegic	78 (71.6%)	99 (64.3%)	0.29	0.29
Tetraplegic	31 (28.4%)	55 (35.7%)		
Extent of injury				
Complete motor	92 (78.0%)	114 (74.0%)	0.67	0.67
Incomplete motor	26 (22.0%)	40 (26.0%)		
Numeric variables	Median (Q1–Q3)	Median (Q1–Q3)		Median (Q1–Q3)
Number of children	1 (0–2)	1 (0–2)		0.59
Age at injury (years)	27 (22–37)	30 (24–38)		0.15
FIM motor score	76 (61–85)	76 (63–82)		0.77

[a,b]Equal letters in the comparisons indicate that the two groups behave in the same way in relation to the analyzed variable ($p > 0.05$).

FIM Functional Independence Measure, *Q1* lower quartile, *Q3* upper quartile.

Paid work status

Of the 154 participants, only 36 (23%) were working at the time of the survey. Of these, 18 (50%) had an informal job. The average time to start a paid job after SCI was 2.3 (2.1) years, with a range of 0–10 years. Only three individuals used assistive technology in their professional activity. The average weekly working hours was 31 (16). While evaluating their current job, 64% reported receiving the help needed in difficult situations, 72% were free to decide how to do their work, 97% had opportunities to learn new things at work, and 50% considered their salary appropriate. Of the 154 individuals, 20% participated in a vocational rehabilitation program.

Of the 118 participants who indicated not having been engaged in paid work, over half (58%) did not want work and only 10% had sought work in the last year. The main reason for not working was the fact that he/she received disability retirement or assistance benefits (83%), followed by the severity of SCI (6%). The main source of income was disability retirement or benefits (84%) and 55% of participants reported a decrease in individual monthly income compared to before the SCI.

Table 2 presents a comparison between participants who were engaged in paid work and those who were not. Cause of injury, marital status, gender, and driving ability did not differ significantly between the two groups. Participants who were engaged in paid work had higher educational levels, fewer children, shorter durations between the injury and the beginning of rehabilitation, incomplete SCI, and higher FIM motor score. Returning to study was also a predominant finding among the individuals who were working.

RTW pathways

Of the 138 participants who were engaged in paid work at the time of SCI, 108 (78%) did not RTW, 17 (12%) returned to a different occupation, and 13 (9%) returned to the same occupation. The median time of RTW was 12 (6–17) months for those who returned to the same occupation and 36 (16–55) months for those who returned to a different occupation.

Table 3 presents a comparison among the three pathways. The group that returned to the same occupation had a higher educational level, incomplete SCI, ability to walk

Table 2 Comparison between workers and non-workers groups.

Work paid status				
Total ($n = 154$)	No ($n = 118$)	Yes ($n = 36$)	p value	Chi-square
Categorical variables n (%)				
Sex				
Female	27 (22.9%)	3 (8.3%)	0.05	0.74
Male	91 (77.1%)	33 (91.7%)		
Educational level				
Elementary school	57 (48.3%)[a]	9 (25.0%)[b]	0.001	14.15
Secondary school	50 (42.4%)[a]	15 (41.7%)[a]		
Post-secondary school	11 (9.3%)[a]	12 (33.3%)[b]		
Marital status				
Married	57 (48.4%)	13 (36.1%)	0.28	2.27
Unmarried	61 (51.7%)	23 (63.9%		
Cause of SCI				
Violence	33 (28.0%)	6 (16.7%)	0.32	2.27
Traffic accidents	48 (40.7%)	15 (41.7%)		
Others accidents	37 (31.4%)	15 (41.7%)		
Level of injury				
Paraplegic	74 (62.7%)	25 (69.4%)	0.55	0.55
Tetraplegic	44 (37.3%)	11 (30.6%)		
Extent of injury				
Complete motor	92 (78.0%)[a]	22 (61.1%)[b]	0.04	4.08
Incomplete motor	26 (22.0%)[a]	14 (38.9%)[b]		
Primary means of mobility				
Manual wheelchair	80 (67.8%)[a]	16 (44.4%)[b]	0.001	18.12
Powered wheelchair	11 (9.3%)[a]	1 (2.8%)[a]		
Gait with locomotion aid	22 (18.6%)[a]	10 (27.8%)[a]		
Gait without locomotion aid	5 (4.2%)[a]	9 (25.0%)[b]		
Self-perceived ability to work				
Good	17 (14.4%)[a]	21 (58.3%)[b]	0.001	28.64
Bad	101 (85.6%)[a]	15 (41.7%)[b]		
Driving ability				
Yes	28 (23.7%)	15 (41.7%)	0.050	4.41
No	90 (76.3%)	21 (58.3%)		
Return to study after injury				
Yes	18 (15.3%)[a]	19 (52.8%)[b]	0.001	21.20
No	100 (84.7%)[a]	17 (47.2%)[b]		
Numeric variables	Median (Q1–Q3)	Median (Q1–Q3)	Median (Q1–Q3)	
Number of children	1 (0–2)	0 (0–1)	0.003	
Age at injury (years)	30 (23–39)	30.5 (24–35)	0.73	
Age at survey (years)	39.5 (34–47)	40 (31–45)	0.62	
Time since SCI and admission (days)	136.5 (68–306)	84.5 (47–120)	0.008	
FIM motor score	73 (52–79)	78 (68–82)	0.01	
Satisfaction with the work status	4 (0–6)	8 (5–9)	0.001	

[a,b]Equal letters in the comparisons indicate that the two groups behave in the same way in relation to the analyzed variable ($p > 0.05$).

SCI Spinal Cord Injury, *FIM* Functional Independence Measure, *Q1* lower quartile, *Q3* upper quartile.

Table 3 Return to work pathways comparisons.

Pathways					
Total ($n = 138$)	A ($n = 108$)	B ($n = 13$)	C ($n = 17$)	p value	Chi-square
Categorical variables n (%)					
Sex					
Female	22 (20.4%)	2 (15.4%)	1 (5.9%)	0.340	2.15
Male	86 (79.6%)	11 (84.6%)	16 (94.1%)		
Educational level					
Elementary school	50 (46.3%)[a]	2 (15.4%)[b]	6 (35.3%)[a,b]	0.003	16.03
Secondary school	49 (45.4%)[a]	5 (38.5%)[a]	8 (47.1%)[a]		
Post-secondary school	9 (8.3%)[a]	6 (46.2%)[b]	3 (17.6%)[a,b]		
Marital status					
Married	53 (49.0%)	9 (69.2%)	4 (23.5%)	0.15	9.27
Unmarried	55 (50.9%)	4 (30.8%)	13 (76.47%)		
Cause of SCI					
Violence	30 (27.8%)	1 (7.7%)	3 (17.6%)	0.48	3.44
Traffic accidents	46 (42.6%)	6 (46.2%)	8 (47.1%)		
Others accidents	372 (29.6%)	6 (46.2%)	6 (35.3%)		
Level of injury					
Paraplegic	67 (62.0%)	8 (61.5%)	14 (82.4%)	0.25	2.7
Tetraplegic	41 (38.0%)	5 (38.5%)	3 (17.6%)		
Extent of injury					
Complete motor	82 (75.9%)[a]	6 (46.2%)[b]	11 (64.7%)[a,b]	0.04	5.54
Incomplete motor	26 (24.1%)[a]	7 (53.8%)[b]	6 (35.3%)[a,b]		
Primary means of mobility					
Manual wheelchair	74 (68.5%)[a]	5 (38.5%)[b]	9 (52.9%)[a,b]	0.002	20.45
Powered wheelchair	11 (10.2%)[a]	0 (0.0%)[a]	1 (5.9%)[a]		
Gait with locomotion aid	18 (16.7%)[a]	3 (23.1%)[a]	5 (29.4%)[a]		
Gait without locomotion aid	5 (4.6%)[a]	5 (38.5%)[b]	2 (11.8%)[a,b]		
Self-perceived ability to work					
Good	14 (13.0%)[a]	9 (69.2%)[b]	8 (47.1%)[b]	0.001	27.83
Bad	94 (87.0%)[a]	4 (30.8%)[b]	9 (52.9%)[b]		
Driving ability					
Yes	27 (25%)[a]	9 (69.2%)[b]	5 (29.4%)[a]	0.004	10.87
No	81 (75%)[a]	4 (30.8%)[b]	12 (70.6%)[a]		
Return to study after injury					
Yes	16 (14.8%)[a]	4 (30.8%)[a,b]	11 (64.7%)[b]	0.001	21.56
No	92 (85.2%)[a]	9 (69.2%)[a,b]	6 (35.3%)[b]		
Numeric variables*	Median (Q1–Q3)	Median (Q1–Q3)	Median (Q1–Q3)		
Number of children	1 (0–2)[a]	1 (0–2)[a,b]	1 (0–2)[b]	0.04	
Age at injury (years)	30 (23–40)	35 (32–43)	30 (24–34)	0.07	
Age at survey (years)	39,5 (34–48)	42 (39–47)	39 (29–47)	0.24	
Time since SCI and admission (days)	136.5 (66–318)[a]	70 (45–104)[b]	94 (65–246)[a,b]	0.04	
FIM motor score	73 (52–79)[a]	82 (69–87)[b]	77.5 (73–79)[a,b]	0.02	
Satisfaction with the work status	4 (0–5)[a]	9 (7–9)[b]	7 (5–8)[c]	0.001	

Return to paid work pathways: A—never returned to paid work; B—returned to pre-injury work; C—started with a new work.

[a,b]Equal letters in the comparisons indicate that the two groups behave in the same way in relation to the analyzed variable ($p > 0.05$).

SCI Spinal Cord Injury, *FIM* Functional Independence Measure, *Q1* lower quartile, *Q3* upper quartile.

*Kruskal–Wallis test for comparison of the three groups.

Table 4 Logistic regression model for paid work status.

Variable	B	Wald	OR	*p* value	95% confidence interval
Constant	−0.98	1.00	1.38	0.317	
Number of secondary complications	−0.97	11.72	0.38	0.001	0.22–0.66
Satisfaction with the work status	0.33	12.12	1.38	0.001	1.15–1.66
Return to study after injury (Yes)	1.83	9.78	6.22	0.002	1.98–9.56
Self-perceived ability to work (Good)	1.76	9.32	5.84	0.002	1.88–18.10

Nagelkerke $R^2 = 56.5\%$.

OR odds ratio.

without assistance, higher FIM motor score, and drove their own car. Those who returned to the same occupation were also more satisfied with the job. The group of individuals who started a new work had a higher proportion of persons returning to study than the other two groups. Self-perceived ability to work was significantly worse among individuals who did not RTW.

Predictors of paid work status

The final model (Table 4) indicated the following variables as predictors of paid work: fewer secondary complications (odds ratio (OR) = 0.37; $p = 0.001$; 95% confidence interval (CI): 0.21–0.66), return to study after SCI (OR = 0.62; $p = 0.001$; 95% CI:1.98–19.56), greater satisfaction with the work status (OR = 1.38; $p < 0.001$; 95% CI:1.15–1.66), and good self-perceived ability to work (OR = 1.38; $p < 0.001$; 95% CI: 1.88–18.10). The model explained 56.5% of the total variance in paid work status.

Discussion

This study investigated paid work after traumatic SCI from the perspective of work status and three different RTW pathways. The results showed a low rate of paid work in this sample and the influence of secondary complications, return to studies and perception of ability and satisfaction in work status.

The participants from this study had sociodemographic characteristics similar to other studies [5, 25]. On the other hand, only 7% had post-secondary school, which represents a low rate compared to other studies [13, 14].

The rate of RTW after SCI in the present study was lower than the mean rate of return reported by previous studies [3, 4, 10]. Most studies show data from developed countries [4], but variations are observed even in developing countries [16, 26]. Post et al. [7] showed an average employment rate of 38% in a worldwide survey among people with SCI, but with a wide variation across countries (10.3–61.4%) [7]. Although employment rate is the "gold standard" in research on SCI, comparisons must be contextualized and interpreted in light of the methodological particularities of the different studies [26]. Moreover, apparently good rates of paid work may obscure factors such as income, underemployment, informal work, and job dissatisfaction [3].

The main reason for not returning to the labor market was the fact that some participants received disability retirement or assistance benefits from the Brazilian government. Other studies have found that receiving benefits is associated with lower rates of RTW [10, 27]. Although government aid is important to assist people with SCI financially and socially during their rehabilitation, the maintenance of this aid for a long period must be associated with effective incentive programs aimed at reintegrating the individual into the labor market.

While work status evaluates the situation at a single point in time, the return-to-work pathways identify a temporal process that may involve faster or slower reintegration, as well as the stability of the work status. Our finding that individuals who returned to the pre-injury occupation took less time to start working is consistent with the literature [11, 16, 28]. The shorter return time for this subgroup can be explained by their higher pre-injury educational level. Returning to a different occupation usually involves the need for re-education and training, increasing the time off from work [29].

Returning to study showed a positive association with work. More specifically, individuals who returned to study were 6.2 times more likely to engage in paid work than those who did not return to study. Krause et al. (2009) suggested that educational level is less predictive of employment after injury than post-injury educational attainment [29]. This is perhaps because returning to work after SCI requires additional qualification. Although post-injury education is important, these findings may be explained by the fact that people who invest in their qualification after injury are more motivated to work [10].

The greater number of secondary complications identified at the beginning of rehabilitation was associated with a decrease in the likelihood of being engaged in paid work. Previous studies have also shown a negative association between secondary complications and return to or retention at work [6, 10]. As secondary complications are modifiable

factors and occur early after SCI, they should not be neglected in the rehabilitation process [30].

Satisfaction with the work status and a good self-perceived ability to work were predictors of paid work. Although evidence shows a positive relationship between satisfaction with life and work [5], few studies have evaluated satisfaction with the work status as a key result [3]. However, caution is needed before affirming that greater satisfaction with work status and a positive perception of work ability are predictors of paid work owing to the possibility of reverse causality. In other words, individuals who are engaged in paid work are more satisfied and consider themselves more capable than those who are not involved in work activities.

The results of the present study differ from previous studies that consistently demonstrated that age at the time of SCI, severity of the injury, FIM, and pre-injury education are strong predictors of work after injury [14, 29, 30]. The low variability in the ages of our participants may have interfered in the association between age at the time of injury and work status. In the univariate analysis, the highest FIM motor score showed a positive association with paid work. Likewise, greater injury severity (complete) showed a negative association with paid work. However, these variables were not significant predictors in the multivariate analysis. These results confirm that the work status outcome is complex and multifactorial. Thus, although injury and functional aspects are known to be important, they can be influenced by social and personal factors, especially in people with SCI from developing countries.

It is noteworthy that only 20% of our sample participated in a vocational rehabilitation program. People with SCI can benefit from vocational rehabilitation in the job placement and reintegration process [15]. Vocational rehabilitation is a valuable strategy for the inclusion of this population, with guaranteed rights, equal opportunities, and the possibility of expanding participation at work.

This study has some limitations. First, the sample was restricted to a single rehabilitation center and it is not known whether it is representative of the general population of people with traumatic SCI. Second, data were self-reported with potential for retrospective recall bias. This problem may be overcome using a prospective design whereby participants are asked to diarize work related events. Third, we lacked information on crucial aspects such as occupation and psychological components such as locus of control. Fourth, work status is highly context-dependent [7] and, thus, the results of this study cannot be readily generalized to other countries with different disability policy and benefit systems. Finally, long-term follow-up studies are needed to more accurately trace information on the labor participation of people with SCI. Bloom et al. (2018) proposed broader measures of work including retention, income and hours worked. These measures can help evaluate and improve the quality of paid work for people with SCI [3]. The results of this study may contribute to the design of timely and person-centered interventions to improve the vocational potential after SCI.

Conclusion

Individuals of working-age with SCI who underwent a rehabilitation program in Brazil had a low rate of paid work. Fewer complications at the time of the injury, returning to study, a good work ability, and greater satisfaction with the work status increased the likelihood of being engaged in paid work.

Data availability

Anonymized data will be shared by request from any qualified investigator.

Author contributions FGO: design the work, acquisition of the data and interpretation of the results. FCMSD: design the work and interpretation of the results. RAR: Drafted and revised the paper. MCM: Drafted and revised the paper; RFS: design the work, interpretation of the results and approved the final version.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

Ethical approval The Research Ethics Committees of the Universidade Federal de Minas Gerais (UFMG), and Sarah Network of Rehabilitation Hospitals approved this study number: 08882319.1.3001.5149 and 08882319.1.0000.0022 respectively. We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research.

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