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ORIGINAL ARTICLE

FUNCTIONAL HEALTH LITERACY IN INDIVIDUALS WITH SPINAL CORD INJURY TREATED AT A REHABILITATION CENTER

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Highlights:
(1) Functional health literacy was adequate in 70.6% of individuals.
(2) Age, income and having a partner: indicators of better health literacy.
(3) Rehabilitation time and education influence the results of health literacy.

ABSTRACT

This study aims to analyze the functional health literacy of individuals with spinal cord injury treated at a rehabilitation center. We conducted this analytical cross-sectional study at a rehabilitation and readjustment center, including 85 individuals diagnosed with spinal cord injury. We collected data on sociodemographic, clinical, and functional profiles. The Short Test of Functional Health Literacy in Adults (S-TOFHLA) was used to assess functional health literacy. Most participants were male, aged between 18 and 39 years, with paraplegia caused by traumatic etiology. Analysis of functional health literacy showed that 70.6% of individuals with spinal cord injury had adequate literacy levels. Better functional health literacy outcomes were associated with younger age, higher income, longer duration of rehabilitation, higher educational levels, and having a partner. In conclusion, the services provided and the organizational structure of reference centers rehabilitating individuals with spinal cord injury may contribute to improved functional health literacy. Identifying related variables and analyzing the functional dimension of health literacy by multidisciplinary teams during rehabilitation are essential tools for enhancing the health outcomes of individuals with spinal cord injury.

Keywords: health literacy; spinal cord; patient care team; health education.

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INTRODUCTION

Spinal cord injury (SCI) is characterized by damage to the spinal cord, which can cause motor, sensory, and autonomic impairments[1]. SCI results in various sequelae that significantly disrupt affected individuals' routines and quality of life, necessitating continuous learning and adaptation[2].

According to the 2019 Global Burden of Disease Study, there were an estimated 0.9 million incident cases and 20.6 million prevalent cases of SCI worldwide. The incidence has increased over the past 30 years[3]. Projections for 2030 indicate a rising trend in age-standardized incidence rates for both sexes[4].

Individuals affected by SCI require specific guidance, making it essential for them to participate in the rehabilitation process. Adherence to this process depends on collaboration between patients with SCI, their families, and healthcare professionals. Clear communication, appropriate treatment, and early initiation of rehabilitation are fundamental to restoring autonomy and decision-making control to individuals with SCI[5].

Health literacy (HL) plays a critical role in developing self-management skills, making therapeutic decisions, reducing complications, and decreasing treatment costs[6]. Initially, HL was associated with reading and understanding health materials; however, more recent definitions encompass multidimensional skills related to health promotion, influenced by social and demographic factors[7].

The level of HL can be categorized into three dimensions: functional health literacy (FHL), interactive health literacy, and critical health literacy. The first dimension involves the ability to read basic health information; the second relates to the capacity to seek and discuss more complex information; and the third pertains to autonomy in making informed health decisions[8].

The rehabilitation of individuals with SCI is a collaborative process requiring constant information exchange and the development of trust between professionals and patients[9]. Inadequate FHL can directly affect the rehabilitation process, emphasizing the need for health information to be accessible, comprehensible, and applicable to everyone, particularly to at-risk groups such as individuals with disabilities[10,11].

This study focused on analyzing FHL, which relates to the ability to read, comprehend texts, and understand numerical information in the healthcare context, enabling its application in daily life[10]. FHL encompasses the skills needed to seek, understand, and use health information to make decisions and adopt healthy behaviors, such as adhering to treatments, participating in prevention programs, and changing habits[8].

Given that FHL may impact the autonomy, independence, and readaptation of individuals with SCI to their new life circumstances[11], its assessment becomes particularly relevant. In this context, the present study aimed to analyze the functional health literacy of individuals with spinal cord injury treated at a rehabilitation center.

METHODS

We conducted this cross-sectional analytical study at a rehabilitation and adaptation center in Goiânia, the capital of Goiás state, Brazil. The Ministry of Health recognizes the center as a Specialized Rehabilitation Center (CER IV). It exclusively operates under the Unified Health System (SUS) – providing rehabilitation services for individuals with physical, auditory, visual, and intellectual disabilities – and serves as a reference center for SCI care.

The inclusion criteria were: patients undergoing treatment at the rehabilitation center, with a diagnosis of traumatic or non-traumatic SCI documented in their medical records, aged 18 years or

older, of any sex, with any level or duration of SCI, with at least one year of formal education or self-reported informal acquisition of reading skills (individuals who did not attend school but could read were considered to have one year of education), and without other associated neurological and/or orthopedic injuries.

Individuals were excluded if they had documented or reported neurological or cognitive impairments that could interfere with understanding the study instruments, severe visual or hearing impairments that could not be mitigated with assistive technologies, and incomplete medical records.

At the time of data collection, 92 patients with SCI were receiving care at the rehabilitation center. Based on the inclusion and exclusion criteria, 87 patients remained eligible, and after contact, two declined participation. Thus, 85 patients were interviewed between October 2021 and January 2022.

The research team, trained in data collection procedures, utilized the following tools: the Short Test of Functional Health Literacy in Adults (S-TOFHLA), electronic medical records for completing the clinical and functional profile form, and a questionnaire for sociodemographic characterization.

The S-TOFHLA is a shortened version of the Test of Functional Health Literacy in Adults (TOFHLA), validated and adapted to the Brazilian context[12]. This instrument consists of 36 items evaluating reading comprehension and four items assessing numeracy skills related to health topics, such as diagnostic test instructions, consent forms, appointment scheduling, and prescription labels[12,13]. The maximum time allowed for completing the tasks is 12 minutes, after which participants are asked to stop[14]. Participants are not informed of this time limit beforehand. Reading comprehension scores range from 0 to 72 points, with two points assigned for each correctly completed blank space. Numeracy items total 28 points, with seven points awarded for each correct response. The test's total score is 100 points[13].

Based on performance, participants are classified into three levels of FHL: inadequate (0-53 points), marginal or borderline (54-66 points), and adequate (67-100 points)[15].

Medical record data included injury duration, rehabilitation duration, etiology, injury level, type of impairment, and SCI classification based on the American Spinal Injury Association (Asia) Impairment Scale (AIS), categorized as A, B, C, D, and E. AIS A represents complete SCI, where no sensory or motor function is preserved below the neurological level. AIS B indicates incomplete SCI, with no motor activity below the neurological level but some preserved sensory function. AIS C and D signify reduced motor activity below the neurological level, while AIS E indicates normal sensory and motor function[16].

The sociodemographic profile questionnaire, developed by the researcher, was based on prior studies on FHL in chronic diseases and included data on sex, age group, marital status, place of origin, family income, and education level[17-19].

Patient interviews were conducted in the waiting room of the institution's adult neurofunctional physical therapy outpatient clinic, lasting 40–50 minutes. During the S-TOFHLA, reading comprehension was allocated seven minutes, while numeracy tasks had a maximum of five minutes[20].

We analyzed data using the Statistical Package for the Social Sciences (SPSS) version 26.0. Data normality was assessed using the Shapiro-Wilk test. Sociodemographic, clinical, and FHL profiles were described using absolute frequency (n), relative frequency (%), means, standard deviations, medians, and ranges for continuous variables.

Exploratory analysis of FHL and patient profiles utilized Spearman's correlation, Mann-Whitney tests, and Kruskal-Wallis tests, followed by Nemenyi post hoc tests.

We included variables with a p-value < 0.20 in the linear regression from the initial exploratory analysis to identify potential predictors. Finally, multiple linear regression analysis was performed

between the total S-TOFHLA score and predictor variables using the Stepwise method. The significance level was set at 5% ($p < 0.05$).

The study adhered to the recommendations of Resolution 466/12 of the National Health Council and was approved by the Research Ethics Committee (approval number: 5.015.904).

RESULTS

Eighty-five individuals diagnosed with SCI were evaluated, including 22 females (25.9%) and 63 males (74.1%). The majority were aged between 18 and 39 years and did not have a partner (51.8% never married and 9.4% widowed or divorced). The sociodemographic variables evaluated are described in Table 1.

Table 1 – Sociodemographic profile of 85 patients with spinal cord injury treated at a rehabilitation center, Goiânia, Goiás, 2022

N	%	%
Sex		
Female	22	25.9
Male	63	74.1
Age group		
18 to 39	46	54.1
40 to 59	31	36.5
60 to 71	8	9.4
Having a partner		
Yes	33	38.8
No	52	61.2
Place of origin (Goiás)		
Metropolitan area (Goiânia)	60	70.6
Non-metropolitan area	25	29.4
Family income		
Up to 2 minimum wages	59	69.4
2 to 4 minimum wages	21	24.7
4 to 10 minimum wages	5	5.9
Education level		
1-9 years of schooling	38	44.7
10-12 years of schooling	40	47.1
> 12 years of schooling	7	8.2

n = absolute frequency; % = relative frequency

Regarding the injury classification, a predominance of complete injuries, categorized as AIS A (42.4%), was observed. Most cases had a traumatic origin, with an average injury duration of 55.5 months and a rehabilitation duration of 38.06 months. The coefficient of variation (CV) for injury duration was 110.51%, and for rehabilitation duration, it was 97.23%, indicating considerable heterogeneity among patients in these aspects. The clinical profile of the patients is presented in Table 2.

Table 2 – Clinical profile of 85 patients with spinal cord injury treated at a rehabilitation center, Goiânia, Goiás, 2022

	Mean ± DP	Median (Minimum - Maximum)
Injury duration (months)	55.55 ± 61.37	33.0 (1.0 - 330.0)
Rehabilitation duration (months)	38.06 ± 37.01	25.0 (1.0 - 181.0)
	N	**%**
Injury etiology		
Motor vehicle accidents	38	44.7
Shallow water diving	4	4.7
Gunshot wounds	15	17.6
Falls from heights	9	10.6
Other (non-traumatic)	19	22.4
Injury classification (AIS)		
A	36	42.4
B	7	8.2
C	23	27.1
D	19	22.4
Level of injury		
Cervical	29	34.1
Thoracic	46	54.1
Lumbar	10	11.8
Sacral	-	-
Type of impairment		
Tetraplegia	29	34.1
Paraplegia	56	65.8

n = absolute frequency; % = relative frequency; SD = standard deviation

The majority of respondents, 60 (70.6%), demonstrated adequate functional health literacy (FHL), while 13 (15.3%) had borderline FHL, and 12 (14.1%) exhibited inadequate FHL. The mean score for the total S-TOFHLA was 79.56 ± 21.34.

Regarding reading comprehension, the mean score was 58.40 ± 14.55 (range: 20.00–72.00), whereas for numeracy, it was 21.18 ± 9.44 (range: 0.00-28.00).

Among participants with inadequate FHL, nine were unable to complete the entire instrument. These participants failed to fill in all the blanks for reading comprehension, exceeding the seven-minute time limit, at which point the test was stopped.

Table 3 compares the total FHL score with the profiles of patients with SCI. A significant difference ($p < 0.05$) was observed for the variables age group, having a partner, income, and education level. Younger individuals, those with a partner, higher income, and higher education levels achieved better total S-TOFHLA scores.

Table 3 – Comparison of functional health literacy with the profile of 85 patients with spinal cord injury treated at a rehabilitation center, Goiânia, Goiás, 2022

	Total S-TOFHLA score
Age group**	**p = 0.03**
18-39	85.91 ± 16.36†
40-59	74.61 ± 21.68
60-71	62.25 ± 31.88
Sex*	p = 0.25
Female	74.36 ± 24.22
Male	81.38 ± 20.14
Having a partner*	**p = 0.04**
Yes	84.91 ± 16.98
No	76.17 ± 23.22
Place of origin (Goiás)*	p = 0.34
Metropolitan area (Goiânia)	80.70 ± 21.51
Non-metropolitan area	76.84 ± 21.13
Family income**	**p = 0.01**
Up to 2 minimum wages	74.63 ± 23.13
2 to 4 minimum wages	89.57 ± 10.87†
4 to 10 minimum wages	95.80 ± 1.79†
Education level**	**p = 0.02**
1-9 years of schooling	73.18 ± 24.96
10-12 years of schooling	83.60 ± 16.54†
> 12 years of schooling	91.14 ± 15.32†
Injury etiology**	p = 0.22
Motor vehicle accidents	81.37 ± 22.04
Shallow water diving	93.00 ± 10.00
Gunshot wounds	80.00 ± 15.38
Falls from heights	76.78 ± 23.64
Other (non-traumatic)	74.11 ± 24.42
Injury classification (AIS)**	p = 0.48
A	80.08 ± 22.09
B	76.57 ± 14.70
C	82.74 ± 21.33
D	75.84 ± 22.76
Type of impairment*	p = 0.42
Tetraplegia	76.93 ± 25.67
Paraplegia	80.93 ± 18.84

* Mann-Whitney; ** Kruskal-Wallis; † Nemenyi (Mean ± Standard deviation)

The Spearman correlation results indicated a relationship between injury duration, rehabilitation duration, and FHL. Injury duration was positively correlated with the reading comprehension component (p = 0.02) and rehabilitation duration (p = 0.03). Moreover, injury duration also showed a positive correlation with the total S-TOFHLA score (p = 0.04).

Based on the initial exploratory analysis, variables with a p-value < 0.20 (injury duration, rehabilitation duration, age group, having a partner, income, and education level) were selected for multiple linear regression analysis.

Table 4 presents the multiple linear regression analysis results between the total S-TOFHLA score and the predictor variables. Together, these variables explained 41% (r^2) of the total FHL score.

In the multiple linear regression model, age was negatively associated with FHL, indicating that younger individuals demonstrated higher FHL levels. On the other hand, higher income, longer rehabilitation duration, and higher education levels were positively associated with FHL. Additionally, having a partner significantly contributed to higher FHL levels in this sample (Table 4 and Figure 1).

Table 4 – Results of the multiple linear regression analysis (Stepwise Method) between the total S-TOFHLA score and predictor variables for 85 patients with spinal cord injury treated at a rehabilitation center, Goiânia, Goiás, 2022

	r^2	*Beta*	Standard error	*T*	*p*
Income		0.28	3.26	3.04	0.00
Age		-0.43	0.14	-4.82	0.00
Rehabilitation duration (months)	0.41	0.22	0.05	2.57	0.01
Education level		0.20	3.04	2.25	0.03
With a partner		0.20	3.96	2.19	0.03

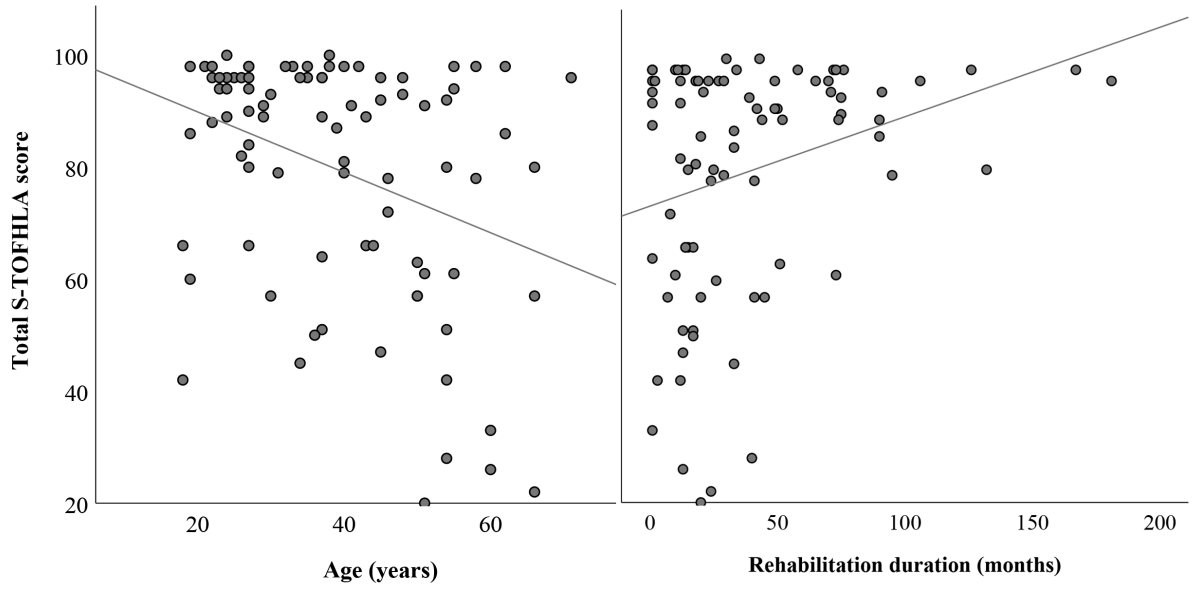

Figure 1 – Scatterplots of the total S-TOFHLA score and the predictor variables age and rehabilitation duration for patients with spinal cord injury treated at a rehabilitation center, Goiânia, Goiás, 2022.

DISCUSSION

FHL among individuals diagnosed with SCI attending the outpatient clinic of a rehabilitation reference center was adequate in 70.6% of participants. Since these patients were undergoing rehabilitation, we opted to evaluate FHL using the S-TOFHLA. This instrument measures an individual's ability to utilize reading, writing, and numeracy skills necessary for completing specific tasks or acquiring new knowledge, aspects that are essential in the rehabilitation process for individuals with SCI[12].

Functional independence following SCI is one of the primary goals of patient care. Identifying FHL levels is particularly important for adapting treatment strategies provided by healthcare professionals and empowering patients to participate in the planning and implementation of therapeutic processes involved in their care[21].

Most participants were male, young, and never married, which aligns with epidemiological data on this condition[22,23]. Studies indicate that men exhibit significantly higher SCI rates, which can be explained by more frequent risk behaviors, such as exposure to hazardous work environments and engagement in high-risk activities[3].

Predictors of higher FHL levels included younger age, higher income, greater educational attainment, having a partner, and longer rehabilitation duration. In the literature, other factors have also been associated with FHL, including sex, skin color, life satisfaction, and self-rated health status[6,24].

Age was negatively associated with FHL, indicating that younger individuals exhibited better FHL. Conversely, higher income, greater educational attainment, and longer rehabilitation duration were positively associated with FHL.

Multiple linear regression analysis between the total S-TOFHLA score and predictor variables revealed that age was the strongest determinant of FHL levels in this population, consistent with findings from studies on other chronic conditions[25-27].

According to the literature, among vulnerable groups – those more likely to exhibit low levels of FHL—older individuals stand out as a key demographic[28,29]. Older adults may process information at a slower pace, and their reduced cognitive abilities can limit their capacity to engage with and understand health-related information[30]. Additionally, older patients tend to struggle more with tasks requiring reasoning or deductions about presented information, suggesting a higher prevalence of low FHL in advanced age groups[31].

Regarding income, higher income levels were associated with better total S-TOFHLA scores. A cross-sectional study conducted in China with 1,000 participants also found that higher income correlated with improved FHL[32].

The associations observed between FHL and variables such as age, socioeconomic status, and skin color reinforce the principle that FHL is shaped by complex social structures beyond educational attainment alone[33].

Individuals with lower income often face greater challenges in accessing healthcare services and receiving health information, which results in poorer FHL levels and clinical outcomes[27].

In a study involving 107 outpatient SCI patients, 86% demonstrated adequate HL[15]. The authors noted that the observed FHL levels exceeded expectations, likely because the study was conducted in a private clinic with economically disadvantaged minorities but with higher educational levels.

Greater educational attainment among SCI patients was associated with better FHL scores. While the relationship between education and FHL has been demonstrated in other chronic diseases[6,34], it is important to note that higher educational levels do not guarantee adequate FHL. Even individuals with advanced education may struggle with medical terminology and procedures[36].

Patients and their families must comprehend the guidance healthcare professionals provide to make decisions that promote effective self-management of their condition. A qualitative study involving patients and caregivers in a rehabilitation setting identified that spouses often led efforts to obtain information about rehabilitation[18].

Patients assisted by their partners may find it easier to understand instructions from healthcare professionals[36], which aligns with our findings, where patients with partners exhibited better FHL. The association between marital status, being married or having a partner, and higher FHL may be related to the transfer of therapeutic responsibilities to the spouse.

FHL was not statistically associated with most clinical characteristics of patients, except for rehabilitation duration, which emerged as a significant predictor of adequate FHL. This finding corroborates other studies showing that clinical characteristics, such as injury level, were not associated with FHL[17,24].

Educating individuals with SCI to understand their health self-care needs is critical. They require specialized attention and guidance to prevent complications and improve functionality. During the initial phase of physical rehabilitation, SCI patients may feel overwhelmed by their circumstances and struggle to process the large volume of information provided[36].

Longer rehabilitation durations increase exposure to health information, enhance organizational and management skills, and improve disease knowledge, positively impacting FHL outcomes. Clinical complications among SCI patients could be mitigated by assessing FHL levels prior to providing professional guidance, enabling personalized education programs to enhance rehabilitation outcomes and improve health results[24].

Although the FHL outcomes in SCI patients were satisfactory, this study has a limitation: it was conducted at a single rehabilitation center, which is a public facility specializing in SCI care. This context may limit the generalizability of the findings.

CONCLUSION

In the analysis of functional health literacy, the results were adequate for the majority of patients with spinal cord injury. In this study, younger age, higher income, greater educational attainment, longer rehabilitation duration, and having a partner were predictors of better FHL outcomes.

The quality of care provided, as well as the organizational structure of specialized and reference centers for SCI rehabilitation, can enhance outcomes related to FHL.

Identifying associated variables and analyzing the functional dimension of health literacy by multidisciplinary teams during rehabilitation are essential tools for improving patient health. However, it is important to acknowledge that assessing health literacy is complex due to its broad construct.

We recommend that future studies analyze the multidimensional aspects of health literacy in patients with SCI undergoing rehabilitation.

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