

ORIGINAL ARTICLE

Fatigue level in spinal cord injury AIS D community ambulatory subjects

O Freixes¹, ME Rivas¹, PE Agrati¹, V Bochkezanian¹, SV Waldman² and LE Olmos³**Study design:** Cross-sectional study.**Objectives:** The objective of our study was to determine the level of fatigue in ASIA impairment scale (AIS) D spinal cord injury (SCI) in community ambulatory subjects and correlate fatigue with other clinical symptoms.**Setting:** Outpatient Rehabilitation Unit, FLENI Institute, Escobar, Buenos Aires, Argentina.**Methods:** We included twenty-six patients with AIS D SCI that attended therapies at FLENI Institute between 2002 and 2009. We measured the demographic and clinical characteristics of the subjects. All patients were administered the fatigue severity scale (FSS). A cut-score for over four was indicative of significant fatigue. We used the Spearman's coefficient correlation to analyze associations among the FSS with pain (Visual analog scale), depression (Beck depression inventory), and physical activity (hours per week).**Results:** The median score of the FSS scale was 2.82 (1–5). Fatigue was found in 5 individuals (19.2%). There was a significant correlation between FSS scale and the Beck questionnaire. No association was found between FSS and pain or physical activity.**Conclusion:** The findings of this study suggest that fatigue is a relevant problem for people with SCI AIS D, and is a disabling symptom when present. There is a significant relationship between fatigue and depression.**Sponsorship:** FLENI Rehabilitation Institute.*Spinal Cord* (2012) **50**, 422–425; doi:10.1038/sc.2011.175; published online 24 January 2012**Keywords:** SCI community ambulators; AIS D; fatigue; pain; physical activity

INTRODUCTION

Fatigue is a symptom frequently reported by patients with neurological disorders, which does not have a specific definition, but is often described in literature as an overwhelming sense of tiredness, lack of energy and a feeling of total exhaustion, and it is a frequent clinical symptom in people with spinal cord injury (SCI).¹ The physical consequences of fatigue can be seen in the lack of ability to participate in daily life activities and in the reduction of the quality of life of these subjects,² and may be a limitation for rehabilitation in these patients.

Fatigue has been well studied in other pathologies, such as multiple sclerosis, Parkinson's disease and stroke.^{3–6} However, there are few studies about fatigue in the SCI population.^{1,7–10}

Furthermore, fatigue in SCI has been correlated with other clinical symptoms such as pain, depression^{1,2,8–10} and the effect of medication.¹⁰ Pain is one of the most frequent factors related to fatigue in literature.^{2,6,8,9} Depression is a very common symptom that also contributes to higher levels of perceived fatigue.^{9,11}

A relationship was described among SCI wheelchair users and fatigue, describing that the higher the physical activity, the lower the fatigue severity scale (FSS) scale.¹² In addition, an association between severity of the lesion and fatigue was suggested by Fawkes–Kirby¹ *et al.*, describing higher levels of fatigue severity scale (FSS) in individuals with incomplete lesions. An explanation for these findings was that these subjects tend to use less efficient means of mobility, which would result in increasing demand on the musculoskeletal system and therefore higher perceived fatigue.^{6,13}

However, one must consider that incomplete lesions are, in fact, a functional heterogeneous population that goes from wheelchair users to community ambulators. In patients with ASIA impairment scale (AIS) C lesions, 75% of subjects are expected to be community ambulators in the first weeks of the events. In AIS D persons, this percentage rises to 95%, having a high level of social and community integration.^{14,15} This heterogeneity may explain the different fatigue perception in this incomplete lesion population.

For all of the aforementioned reasons, we chose to study the ambulatory population of the AIS D SCI community.¹⁶ To our knowledge, the level of fatigue in this particular subset of subjects has not been described in prior publications.

The objective of our study is to determine the level of perceived fatigue in AIS D SCI community ambulatory subjects and correlate fatigue with depression, pain and physical activity.

MATERIALS AND METHODS

Design

We identified AIS D patients from our database and were contacted and prospectively included for the analysis. Participation in the study was voluntary and had to meet the eligibility criteria: subjects with a AIS D SCI, and the injury occurred ≥ 12 before the inclusion, were community ambulators, aged ≥ 18 years, and were included in a rehabilitation program at FLENI Escobar Institute between 2002 and 2009. Every subject had to sign the informed consent for the study. This study was approved by the Ethics Committee of FLENI.

The exclusion criteria were inability to provide informed consent, inability to read and write in Spanish or a comorbid medical disorder, such as other

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neurological or psychiatric conditions likely to be associated with clinically significant fatigue.

Data collection

All eligible persons were identified and their email addresses and phone numbers were obtained from the FLENI Institution data base. Subjects were contacted by telephone or email to participate in the study. After consent was obtained the participants were enrolled in the study and were asked to complete the self-administered questionnaires via email. The data collection took a four-month period.

Measurement

Variables collected included general demographic information (age, sex, employment status and hours worked), medical history (pain, physical activity and depression), injury-related information (ASIA classification, injury level and time of injury), and use of gait assistive devices (none, one cane, two canes and walker).

Fatigue

The nine-item FSS is a self-report scale that is used widely to assess disabling fatigue in individuals with neurological disorders. It has been shown to be valid and reliable in SCI population.⁷ The FSS assesses the severity of fatigue. The FSS requires respondents to rate each item using a seven-point scale ranging from one (completely disagree) to seven (completely agree). The items were summed and a mean score was calculated. Higher scores indicate a higher severity of fatigue. A cut off point of four is used to determine significant fatigue.¹⁷ The scale is obtained through a self-report questionnaire. A Spanish version of the FSS scale (translated by an official local translator) was used, and it showed an internal consistency using the Cronbach $\alpha=0.8134$.

Pain

The Visual analogue scale from zero (no pain) to ten (extreme pain) was used. This scale measured the average of the intensity global pain reported by the subject over the past week of the day of the questionnaire.

Employment status

The employment status was classified into employed or unemployed and the hours worked per week were also recorded.

Leisure time physical activity

Leisure time physical activity is physical activity that people choose to do during their free time, such as planning sport, exercise at fitness center, or going for a walk or wheel.^{18,19} The results of this self-reported test were converted into hours/weeks of leisure activities. Housework or work activities were not included.

Depression

The Spanish version of the Beck depression inventory was used.²⁰ It is a questionnaire that assesses the severity of depression by evaluating self-dissatisfaction, indecisiveness, work difficulty, fatigability, and suicidal ideation. This scale consists on a twenty-one question survey completed by a patient, with each answer scored on a scale of zero to three. Scores from zero to nine represent minimal depressive symptoms, scores of ten to sixteen indicate mild depression, scores of seventeen to twenty-nine indicate moderate depression, and scores of thirty to sixty-three indicate severe depression. This scale, which has been widely used and validated in the SCI population, is reliable for persons with SCI.^{16,21,22}

Functional independence measurement

The functional independence measurement (FIM) assesses the level of independence of the patients.²³ In the present study, the motor score of the FIM was used consisting of thirteen items, scored on a seventh-point scale, varying from total assistance (one) to complete independence (seven) with a maximal score of ninety one.²⁴

Data analysis

Descriptive statistics were used to analyze the subject's demographics and clinical characteristics. To indicate the level of fatigue, we calculated the median values and the total range from the fatigue scale overall and from the nine items

in particular. To assess the strength of association between the FSS scores, pain, depression and physical activity, we used the non-parametric Spearman's rank correlation coefficient, with a significance level of 0.05.

RESULTS

A total of 39 subjects with AIS D SCI were eligible for inclusion, 26 agreed to participate, 10 were not available at the time of the study, and 3 chose not to participate. Of the 26 participants included for analysis, 22 were male (84.6%); the median age was 41 years (range: 20–73). A cervical SCI was found in 16 patients (61.5%) of the subjects. The median time of injury was 32 months. Table 1 describes the clinical and demographical characteristics, FIM, gait assistance and employment status.

FSS

The FSS median score was 2.82. (range=1–5). The highest median scores were obtained in motivation (item 1) and a physical functioning (item 4) questions. Table 2 shows the median for each of the nine individual items of the scale. Significant fatigue was informed in five patients. It is important to emphasize that in these subjects patients, the items with the higher median scores were motivation and the relevance of fatigue, as disabling symptoms.

FSS correlation with clinical measurements

A statistically significant correlation was observed between the FSS and the Beck questionnaire ($r=0.59$; $P=0.001$).

There was no significant correlation between the FSS y la VAS pain score ($r=0.14$; $P=0.49$) y the leisure physical activity ($r=0.08$; $P=0.68$).

DISCUSSION

In our study, we found fatigue, measured by the FSS, in 19. 2% of AIS D SCI subjects.

Table 1 Characteristics of subjects (n:26)

Characteristic	Median (range)
Age (years)	41 (20–73)
Gender (male)	22 (84.6%)
Time of injury (month)	32 (12–98)
FIM (motor)	85.5 (75–91)
Beck inventory	5 (0–18)
Physical activity (hours per week)	3 (0–15)
Pain (VAS)	1.5 (0–9)
Occupation (hours per week) ^a	32.5 (8–105)
	<i>n (%)</i>
<i>Level of injury</i>	
Cervical	16 (61.5)
Thoracic	2 (30.8)
Lumbar	8 (7.7)
Occupation (yes)	20 (76.9)
<i>Use of assistive devices for walking</i>	
None	13
One cane	6
Two canes	7

Abbreviation: FIM, functional independence measurement.

Table 2 Median score and ranges for the total and individual FSS items

		Median	Range
Item 1	My motivation is lower when I am fatigued	4	1–7
Item 2	Exercise brings on my fatigue	3	1–7
Item 3	I am easily fatigued	2	1–6
Item 4	Fatigue interferes with my physical functioning	5	1–7
Item 5	Fatigue causes frequent problems for me	2	1–6
Item 6	My fatigue prevents sustained physical functioning	2.5	1–6
Item 7	Fatigue interferes with carrying out certain duties and responsibilities	1.5	1–6
Item 8	Fatigue is among my three most disabling symptoms	2	1–7
Item 9	Fatigue interferes with my work, family or social life	1	1–6
Overall average FSS score (<i>n</i> : 26)		2.82	1–5

Abbreviation: FSS, Fatigue severity scale.

Although only one in five of the subjects referred fatigue, in this population significant fatigue was associated with disabling symptoms and depression (item 8 FSS).

The explanation for the lower percentage of fatigue in our population, compared with other studies, might be associated to the fact that the aforementioned studies included persons with both incomplete and complete spinal cord injuries, thus a higher percentage of perceived fatigue.

Fawkes-Kirby¹ suggested that higher levels of fatigue are present when the injury is more incomplete. In our study, we found that 20% SCI AIS D subjects had high levels of fatigue. This difference may have been related to characteristics of our sample, such as, a high FIM motor score (median=85.5%), low level of pain (median VAS=1.5), high percentage of reintegration to work (77%). We found the same results as Fawkes-Kirby¹ in the FSS scale items related to motivation (item 1) and physical functioning (item 4) with the highest scores on both items. On the other hand the item related to work, family and social life showed the lowest score. This could have been due to the high levels of ambulation, low levels of depression and high percentage of subjects employed. Although, in our study, we did not measure the social life, this low score in the FSS scale might have been associated to a high level of community and social integration that this subset of subjects with SCI are expected to have.²⁵

Regarding the correlation between fatigue and other studied measurements, we only found that there was a statistical significance in the correlation between fatigue and depression (Beck questionnaire). Depression is a common symptom after a SCI¹¹ and this correlation has been studied in previous studies.^{1,26}

In our study, we did not consider the use of medication as a variable, because this needs to be studied individually for each subject to be able to understand the influence of the use of medication in the level of fatigue in this subset of subjects.

One of the limitations of the current study is the relatively high number of male subjects in the survey sample. This factor could have influenced our result. Another limitation is the small size of our sample (26 patients).

The fact that we needed to translate the FSS scale into Spanish and this Spanish version had not been validated may be considered as a limitation of our study. However, we assessed the Spanish FSS scale internal consistence obtaining an α cronbach de 0.81 and it was similar to that shown previously by the English version.⁷ Finally, there is another limitation of this study, that is, the FSS scale is only valid for complete motor SCI. We used this scale for subjects with an incomplete motor SCI, because many other authors had used the FSS scale to measure fatigue in the incomplete SCI population.^{1,10} Further

research is required to address the validity of the FSS scale for incomplete SCI subjects and the relationship between lesion level, injury and fatigue.

CONCLUSION

The findings of this study suggest that fatigue is a relevant problem for people with SCI AIS D, and is a disabling symptom when present. There is a significant relationship between fatigue and depression.

DATA ARCHIVING

There was no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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