

Functional Evolution of Spinal Cord Injury Patients Followed by the Rehabilitation Team Residing Outside the Capital of Antananarivo

Andréa Holiarisoa Raharinantenaina^{1,*}, Zoniaina Valerien Herinandrianina¹,
Synèse Joseph Bemora², and Gaëtan Duval Solofomalala³

ABSTRACT

Spinal cord injury rehabilitation is a complex and continuous process aimed at improving patients' functional capacity and quality of life. The objective of this study was to assess the progress of spinal cord injury patients followed by the rehabilitation team residing outside Antananarivo. A prospective descriptive cross-sectional study was conducted over a period of seven years, from 2015 to 2022, involving all patients who had previously consulted the Rehabilitation Department at CHU-JRA. Follow-up through telephone calls and/or during follow-up consultations was carried out. Of the 50 included patients, a male predominance of 76% was observed, with a mean age of 46 years. The majority were paraplegic (84%), with an ASIA classification predominantly in category A. Only 16% benefited from rehabilitation sessions in a specialized center, while 84% practiced exercises at home. Only 10% of patients achieved a high level of functional independence. However, 62% developed pressure ulcers and the mortality rate was 28%. The study highlights the urgent need to improve accessibility to rehabilitation services in rural areas and outside the capital, as well as the importance of mastering self-rehabilitation exercises to maintain the autonomy acquired during rehabilitation sessions at the rehabilitation center.

Submitted: April 03, 2024

Published: June 06, 2024

 10.24018/clinimed.2024.5.3.333

¹Department of Rehabilitation, CHU-JRA, Faculty of Medicine, Madagascar.

²Department of Neurosurgery, CHU-JRA, Faculty of Medicine, Madagascar.

³Department of Surgery, CHU-Anosiala, Faculty of Medicine, Madagascar.

*Corresponding Author:
e-mail: andra_rh2000@yahoo.fr

Keywords: Functional evolution, Rehabilitation sessions, Spinal cord injury.

1. INTRODUCTION

Spinal cord injury constitutes a major public health issue globally, with devastating repercussions on the quality of life of affected individuals [1]. These injuries, often caused by traumatic accidents or diseases, result in permanent or temporary impairment of motor, sensory, and autonomic function [2]. The importance of rehabilitation for spinal cord injury patients is crucial in their functional recovery process and social reintegration. This phase of specialized care aims to maximize functional independence, improve quality of life, and promote patients' autonomy [3].

Rehabilitation for spinal cord injury patients encompasses a variety of interdisciplinary services, including physiotherapy, occupational therapy, as well as medical and social interventions. These programs are designed to address the specific needs of each individual and promote their optimal recovery [4].

It is a complex process that requires a multidisciplinary and individualized approach. Firstly, from the early stages following the initial management of the spinal cord injury in the Neurosurgery or Neurology department, a comprehensive assessment is essential to determine the specific needs of each patient. This assessment considers not only the physical aspects of the injury, such as the level and severity of paralysis, but also the psychological, social, and environmental factors that may influence the rehabilitation process [5].

Once the needs are identified, a personalized rehabilitation plan is developed in collaboration with an interdisciplinary rehabilitation team according to the specific needs of the patient. This rehabilitation plan aims to maximize the patient's functional capacities, prevent secondary complications, and promote their autonomy and social integration.



Rehabilitation interventions often include physiotherapy sessions to improve muscle strength, mobility, and balance, as well as occupational therapy sessions to help patients regain their abilities to perform activities of daily living, such as feeding, grooming, and dressing.

Rehabilitation management of spinal cord injury patients is not limited to therapy sessions alone. It also involves ongoing support to help patients adapt to their new situation, overcome obstacles, and maintain motivation throughout the rehabilitation process. Additionally, rehabilitation services should be accessible and available in the long term to allow regular follow-up and adaptation of the treatment plan according to the evolving needs of the patient [5], [6].

However, it is essential to recognize that spinal cord injury patients living outside the capital city of Antananarivo in Madagascar face significant challenges in accessing rehabilitation care due to geographical, financial, and structural barriers. Medical resources and specialized facilities are often concentrated in major cities, leaving populations in peripheral regions with limited or no access to these vital services. This access disparity exacerbates the already considerable difficulties faced by spinal cord injury patients in their recovery journey.

The objective of this study was to evaluate the clinical and therapeutic evolution of spinal cord injury patients residing outside the capital city of Antananarivo in Madagascar, shedding light on the specific challenges they face in accessing rehabilitation services.

2. METHODS

A prospective descriptive cross-sectional study was conducted over a period of seven years, from 2015 to 2022, including all patients who had previously consulted the Functional Rehabilitation Department at CHU-JRA. Follow-up through telephone calls and/or during follow-up consultations was performed.

All patients with spinal cord injury admitted to the functional rehabilitation department of CHU-JRA during the study period, consenting to answer pre-established questions by telephone call or scheduled follow-up, were included in this study.

Patients who did not respond to telephone calls three times were excluded from the study.

Data were collected from medical records in the functional rehabilitation department. Additionally, patient follow-up was conducted through medical follow-up consultations and telephone interviews using pre-established questionnaires.

The questions were intentionally designed to be short and simple to increase participant numbers.

The parameters studied included patients' clinical data: age, gender, marital status, cause of spinal cord injury, ASIA spinal cord injury classification, and injury level; rehabilitation interventions received: rehabilitation sessions in the facility or at home; functional and psychosocial outcomes: functional independence according to the Barthel Index; and complications: pressure ulcer occurrence, urinary tract infections, orthopedic deformities.

Data were entered and analyzed using SPSS 21 and Excel 2019 software. Statistical analysis was performed using ANOVA test.

The study was limited by the subjectivity of responses through telephone calls, and some families were at work during the call, resulting in response limitations.

This study was conducted following ethical principles. All data were treated confidentially and anonymously, and informed consent was obtained from all participants. Measures were taken to ensure respect for confidentiality and the well-being of patients throughout the study.

3. RESULTS

The study results revealed that among the 50 included patients, there was a male predominance of 76%. The mean age of the patients was 46 years with an age range from 13 to 75 years (Table I). Of these patients, 84% were paraplegic and 16% were tetraplegic.

Regarding classification according to the ASIA (American Spinal Injury Association) scale, the results showed that the majority of patients had ASIA A classification, accounting for 72% (36 patients), followed by ASIA B category with 22% (11 patients), and ASIA C with only 6% (3 patients). No patients were classified in the ASIA D category (Table II).

Out of the 50 patients included in the study, only 8 continued rehabilitation sessions in a specialized center, representing 16% of cases. The remaining patients (84%) performed rehabilitation exercises at home with the assistance of their families, based on advice and exercises

TABLE I: SOCIO-DEMOGRAPHIC DATA OF SPINAL CORD INJURED PEOPLE

Parameters	Number	Percentage (%)
Average age	46	
Gender		
Male	38	76
Female	12	24
Marital status		
Married	15	30
Single	31	62
Widowed	2	4
Divorced	2	4
Occupation		
Working during the injury	14	28
Off work	31	62
Student	5	10

TABLE II: CLINICAL PARAMETERS

Types of lesions		
Paraplegia	42	84
Tetraplegia	8	16
ASIA classification		
ASIA A	36	72
ASIA B	11	22
ASIA C	3	6
ASIA D	0	0

TABLE III: PROGRESSION OF SPINAL CORD INJURIES AFTER FOLLOW-UP BY THE REHABILITATION TEAM

Functional independence	
Barthel index < 50/100	30 (60%)
Barthel index = 50 – 75/100	15 (30%)
Barthel index > 75/100	5 (10%)
Complications	
Pressure sore	31 (68%)
In the sacrum	27 (87,1%)
In the right/left trochanter	5 (16,1%)
Others	2 (6,5%)
Urinary infection	12 (24%)
Respiratory problems	4 (8%)
Other complications	2 (54%)
Death	14 (28%)

prescribed during their stay at the CHU-JRA rehabilitation department.

Regarding functional independence, 10% of patients (5 out of 50) had a Barthel Index equal to or higher than 85/100, indicating a relatively high level of independence in activities of daily living (Table III).

However, a significant proportion of patients, 62% (31 patients), developed pressure ulcers during their rehabilitation. Among them, 32% (10 patients) developed pressure ulcers during hospitalization, while 42% (21 patients) developed pressure ulcers after discharge from the hospital, highlighting persistent challenges in pressure ulcer prevention among spinal cord injury patients.

Finally, an alarming result lies in the mortality rate, with 28% (14 patients) of patients dying during the follow-up period. However, it is important to note that the exact reasons for death were unknown for the majority of families, emphasizing the need for better communication and thorough follow-up for these patients.

4. DISCUSSION

The results of this study shed light on several crucial aspects of rehabilitation management for spinal cord injury patients outside the capital city of Antananarivo in Madagascar. These findings raise important questions about access to specialized healthcare, quality of rehabilitation, and prevention of complications in remote regions.

The prevalence of spinal cord injuries among young adult males is of great medical and social importance. This finding is consistent with other studies conducted in similar settings, perhaps highlighting differences in exposure to spinal cord injury risks between genders and age groups. The fact that young, male individuals are more often affected by spinal cord injuries is a phenomenon observed in many studies and can be attributed to several factors [7]:

Risk-taking behaviors: Men are often more inclined to engage in risky activities such as extreme sports, reckless driving, high-speed driving, or dangerous occupational activities, which expose them to higher risks of traumatic injuries, including spinal cord injuries.

Occupational exposure: Some work environments, such as construction, industry, and emergency services, pose

an increased risk of serious injuries, including spinal cord injuries. Since men are often overrepresented in these sectors, they are more likely to be exposed to occupational risks.

Sports activities: Men are often more involved in high-risk sports activities such as rugby, American football, combat sports, etc. These sports activities can result in serious injuries, including spinal cord injuries.

Understanding the risk factors for spinal cord injuries among young males can guide prevention and awareness efforts to reduce the incidence of these serious injuries.

The ASIA (American Spinal Injury Association) classification is a standard system used to assess and document spinal cord injuries based on their level and severity. This classification helps determine the degree of preserved sensory and motor function in patients with spinal cord injuries, which is essential for guiding clinical management and rehabilitation care.

In the context of this study, the majority of patients were classified in the ASIA A category, indicating a total absence of sensory or motor function below the level of the spinal cord injury. This classification is associated with complete paralysis of the lower limbs and, in many cases, the upper limbs, which can lead to significant loss of functional independence and profound impairment of quality of life.

For patients classified in the ASIA A category [8], rehabilitation needs are often complex and require a multidisciplinary approach to maximize functional outcomes. Rehabilitation interventions may include physiotherapy to maintain muscle flexibility and strength, occupational therapy to develop adaptation and independence skills in activities of daily living, and training in the use of assistive devices and transfer techniques to facilitate mobility and social participation.

Limited access to specialized rehabilitation in rural areas, as revealed by this study, raises important concerns regarding equity and effectiveness of healthcare for spinal cord injury patients. This situation highlights several challenges and underscores the urgent need to improve accessibility to rehabilitation services in these regions.

The result of this study differs from those in industrialized countries [9], [10]; access to rehabilitation for patients in rural areas is generally better due to several factors. These countries often have more advanced healthcare infrastructure, greater availability of specialized healthcare professionals, and larger financial resources to support rehabilitation services in rural areas. Additionally, these countries often implement policies and programs aimed at reducing health disparities between urban and rural areas, which may include financial incentives to attract healthcare professionals to remote regions and grants to improve healthcare infrastructure.

However, in some African countries [11], [12], the situation of inaccessibility to rehabilitation care is considerable. Barriers to access include several factors such as geographical distance, lack of public transportation, financial costs associated with travel and care, as well as insufficient awareness and education about the importance of rehabilitation after a spinal cord injury. These obstacles can make it difficult, if not impossible, for many patients from

rural areas to reach specialized centers to receive the care they need.

Common challenges include inadequate healthcare infrastructure, shortage of trained healthcare professionals, as well as financial constraints limiting individuals' ability to afford specialized services. However, some countries are also implementing innovative initiatives to improve accessibility to rehabilitation services in rural areas, such as using tele-rehabilitation and strengthening local capacities [13].

Another approach involves intersectoral collaboration among health authorities, government agencies, non-governmental organizations, and local communities to develop policies and programs that promote accessibility and equity in rehabilitation in rural areas. This could include initiatives to improve healthcare infrastructure, provide financial support to low-income patients, and raise public awareness about the importance of rehabilitation after a spinal cord injury.

A small percentage of patients demonstrated a relatively high level of independence in daily activities, while a significant proportion developed pressure ulcers during or after their rehabilitation.

This study on the evolution of spinal cord injury patients living outside Antananarivo highlights several critical aspects of the care of this vulnerable population, including functional evolution, the occurrence of pressure ulcer complications, and the high mortality rate. The results of this study revealed diversity in the functional evolution of spinal cord injury patients. It is well established that functional evolution after a spinal cord injury is complex and can vary considerably from one individual to another based on factors such as the level and severity of the injury, the presence of comorbidities, and access to specialized rehabilitation services.

It is important to note that the functional evolution of spinal cord injury patients can be influenced by several factors, including the level and severity of the injury, the presence of medical complications, access to specialized rehabilitation services, as well as social and familial support [14].

A significant proportion of patients developed pressure ulcers after returning home, highlighting persistent challenges in preventing complications in spinal cord injury patients. Pressure ulcers are a frequent and debilitating complication in people with spinal cord injuries, resulting from prolonged pressure on the skin due to immobility and loss of sensation [15].

An alarming result of our study is the high mortality rate among patients, with 28% of patients dying during the follow-up period. While the exact reasons for death are unknown to most families, it is likely that medical complications related to the spinal cord injury, such as respiratory infections, urinary infections, or cardiovascular complications, contributed to this high mortality rate [16], [17].

5. CONCLUSION

This study provides an important insight into the situation of spinal cord injury patients residing outside the

capital of Antananarivo in Madagascar. The results reveal several major challenges faced by these patients, including access to rehabilitation, prevalence of pressure ulcers, and high mortality rate. The evaluation of patients' functional evolution shows diversity in the results, with a limited number of patients achieving a relatively high level of functional independence in daily activities. However, a significant proportion of patients exhibit significant dependence, emphasizing the need for continuous and specialized care to optimize their autonomy. The identification of a high prevalence of pressure ulcers among patients highlights the urgent need for prevention and management interventions, including strengthening patient and caregiver education, improving access to prevention devices, and providing regular medical follow-up. Furthermore, the high mortality rate among patients underscores the importance of close monitoring and early intervention to prevent serious complications and improve long-term outcomes. Strategies to improve communication and patient follow-up, as well as coordination of care among different healthcare providers, could help alleviate this burden. Overall, this study highlights the persistent challenges faced by spinal cord injury patients in areas outside the capital of Antananarivo in Madagascar, while emphasizing the need for targeted interventions and strategic healthcare policies to improve their care and quality of life. These results call for concerted action by health authorities, healthcare professionals, and stakeholders to ensure quality care and better social integration for this vulnerable population.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

REFERENCES

- [1] World Health Organization. *International Perspectives on Spinal Cord Injury*. Geneva: WHO Press; 2013.
- [2] Thompson C, Mutch J, Parent S, Mac-Thiong JM. The changing demographics of traumatic spinal cord injury: an 11-year study of 831 patients. *J Spinal Cord Med*. 2015;38(2):214–23.
- [3] Van den Berg ME, Castellote JM, Mahillo-Fernandez I, de Pedro-Cuesta J. Incidence of spinal cord injury worldwide: a systematic review. *Neuroepidemiol*. 2010;34(3):184–92.
- [4] Post MWM, van Leeuwen CMC. Psychosocial issues in spinal cord injury: a review. *Spinal Cord*. 2012;50(5):382–9.
- [5] National Institute of Neurological Disorders and Stroke. Spinal cord injury: hope through research. 2021. Retrieved from: <https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Hope-Through-Research/Spinal-Cord-Injury-Hope-Through>.
- [6] World Health Organization. *Rehabilitation in Health Systems*. Geneva: WHO Press; 2020.
- [7] Muhammad K, Jones S, Darain H, Iram H, Raqib A, Butt AA. Factors influencing the community integration of patients following traumatic spinal cord injury: a systematic review. *J Pak Med Assoc*. 2019;69(9):1337–43.
- [8] Truchon C, Fallah N, Santos A, Vachon J, Noonan VK, Cheng CL. Impact of therapy on recovery during rehabilitation in patients with traumatic spinal cord injury. *J Neurotrauma*. 2017;34(20):2901–9.
- [9] Maayken EV, Castellote JM, Cuesta JD, Mahillo FI. Survival after spinal cord injury: a systematic review. *J Neurotrauma*. 2020 Aug;27(8):1517–28.
- [10] Joseph C, Delaney KH, Haider AH. Global burden of traumatic spinal cord injury: a systematic review. *J Neurotrauma*. 2019;36(8):1077–83.
- [11] Lam CY, Koljonen PA, Chun Hei Yip C, Yuen Wang Su I, Yong H, Wong YW, et al. Functional recovery priorities and community

- rehabilitation service preferences of spinal cord injury individuals and caregivers of Chinese ethnicity and cultural background. *Front Neurol*. 2022 Aug;13(3):941256.
- [12] Burns AS, O'Connell C. The challenge of spinal cord injury care in the developing world. *J Spinal Cord Med*. 2012 Jan;35(1):3–8.
- [13] Cook AD, Ward JG, Chapple KM, Akinbiyi H, Garrett M, Moore FO 3rd. Race and rehabilitation following spinal cord injury: equality of access for American Indians/Alaska natives compared to other racial groups. *Inj Epidemiol*. 2015;2(1):17.
- [14] Dorjbal D, Prodinger B, Zanini C, Avirmed B, Stucki G, Rubinelli S. Living with spinal cord injury in Mongolia: a qualitative study on perceived environmental barriers. *JSCM*. 2020;43(4):518–31.
- [15] Dorjbal D, Zanini C, Tsegmid N, Stucki G, Rubinelli S. Toward an optimization of rehabilitation services for persons with spinal cord injury in Mongolia: the perspective of medical doctors. *Disabil Rehabil*. 2021 Jul;43(15):2200–12.
- [16] Smith KM. Access to specialized healthcare services for individuals living with spinal cord injury in rural areas: a systematic review. *J Rural Health*. 2019;35(1):108–18.
- [17] Driver SR, Noorani S, Callender L, Bennett M, Monden K. Utilization and access to healthcare services among community-dwelling people living with spinal cord injury. *J Spinal Cord Med*. 2017;40(3):321–8.