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Rehabilitation management of victims after Al Haouz Earthquake in Morocco

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Abstract

Objective: The aim of this study was to describe the injuries that occurred during the earthquake, and to identify the rehabilitation needs of injured victims immediately after a major earthquake, and to determine their future rehabilitation needs

Methods: It was an observational cross sectional descriptive study. Data from this study were collected through handwritten files and hospital record system in Agadir and Taroudant between September and October of 2023. All patients hospitalized at Agadir and Taroudant hospitals who were seen by the physical medicine and rehabilitation team were included in this study. We did not have any exclusion criteria. We used a questionnaire containing information about the injuries incurred, treatments received, rehabilitation needs, and occupational therapy requirements, as well as the necessary technical aids and equipment. Descriptive statistical analysis was performed. All statistical analysis was performed using JAMOVI software.

Results: Lower limb fractures and general injuries were the most found among our sample with percentages of 22.8% and 20.3% respectively, followed by pelvic fractures with 17.1%, only 9.8% had upper limb fractures. Physical therapy was required by 85.4% of patients, while 9.8% needed occupational therapy. There were high levels of need for assistive devices such as wheelchairs, crutches, walkers, arm slings, and corsets.

Conclusion: Early rehabilitation in hospitals is in great demand, and there is a subsequent need for ongoing rehabilitation services at home and in the community. This is especially crucial for injured survivors who are returning to villages with scarce resources.

Keywords: Earthquake; Rehabilitation; Injuries; Management

1. Introduction

Natural disasters can lead to catastrophic social, psychological, medical, and public health outcomes. Earthquakes, in particular, can cause extensive property damage and disrupt essential community services. Often, these disasters occur in regions with limited capabilities to handle large-scale casualties.(1) Additionally, since 1990, over 200 million people per year have been affected by natural catastrophes worldwide.(2)

On September 8, 2023. At 11:11 pm local time, a 6.8-magnitude earthquake hit central Morocco. Its epicentre was in the High Atlas Mountains, southwest of Marrakesh city (figure 1). The earthquake's depth is at 18.5 km, according to the US Geological Survey. The municipalities affected are Al Haouz, Marrakesh, Ouarzazate, Azilal, Chichaoua and Taroudant. This is considered the most powerful earthquake in a century to strike Morocco (BBC 09/09/2023; CNN 09/09/2023

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a). Hundreds of aftershocks were recorded, the strongest reached up to 5.9 magnitude. As at 10 September, the Ministry of Interior announced that at least 2,012 people were killed and 2,059 were injured by the quake, including 1,404 people in critical conditions.(3) The final outcome of the earthquake was estimated (by the Ministry of Health and Social Protection) to be more than 2,900 people killed and 5,500 people injured.(3) (4)

The aim of this study was to describe the injuries that occurred during the earthquake, and to identify the rehabilitation needs of injured victims immediately after a major earthquake, and to determine their future rehabilitation needs.

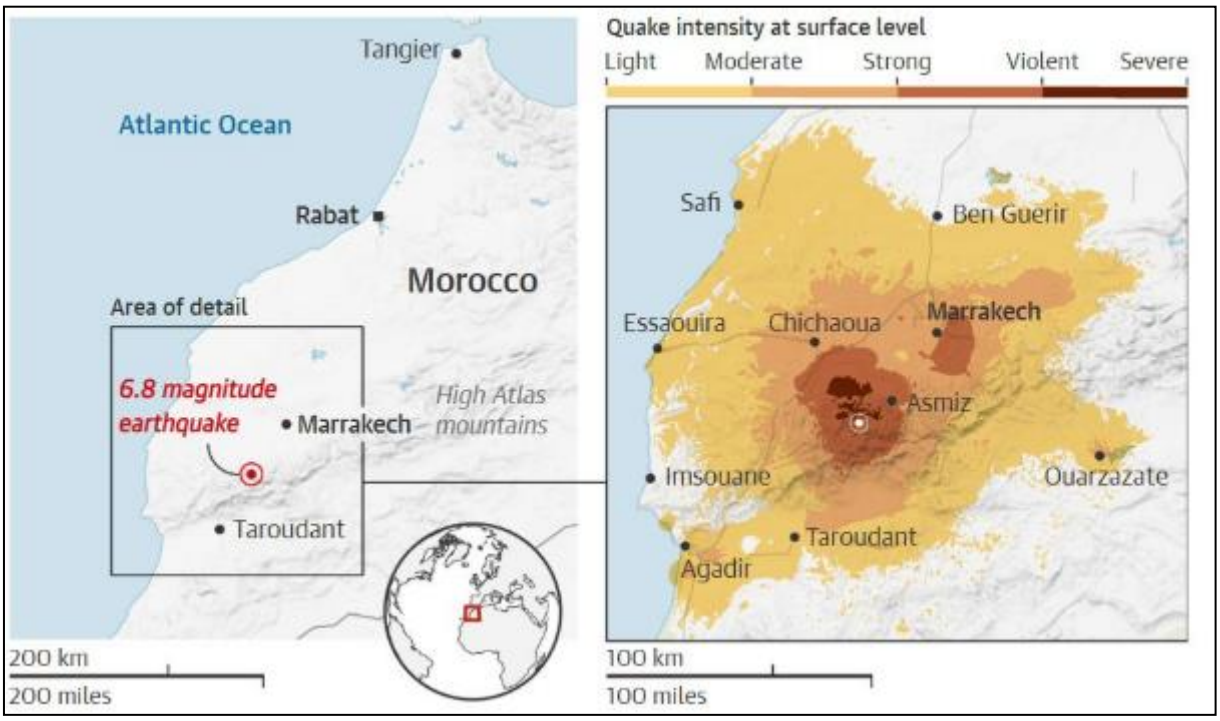

Figure 1 Map of Morocco showing the earthquake's epicentre

2. Methods

2.1. Study design

We conducted an observational cross sectional descriptive study, between September and October of 2023 in Agadir and Taroudant, MOROCCO.

2.2. Data collection

Data from this study were collected through handwritten files and hospital record system in Agadir and Taroudant. The majority of the victims were hospitalized at the Marrakech University Hospital, while the remaining individuals who were hospitalized in Agadir and Taroudant and were seen by the physical medicine and rehabilitation team were included in this study.

All hospitalised patients were included; we did not have any exclusion criteria. We used a questionnaire containing information about the injuries incurred, treatments received, rehabilitation needs, and occupational therapy requirements, as well as the necessary technical aids (wheelchairs, crutches, or walkers) and equipment (arm slings, corsets, and lumbar braces).

2.3. Ethical conditions

The data is collected based on the exploitation of patient records; all necessary authorizations have been obtained.

2.4. Statistical analysis

Descriptive statistical analysis was performed, the quantitative variables were described mean and standard deviation, the qualitative variables were described with number and percentages. All statistical analysis was performed using JAMOVI software.

3. Results

A total of 123 patients have been included (46.3% male) and (53.7% female) at 47.7±20.18 years of age (range = 2 years to 90 years) (Figure 2). 9% were children.

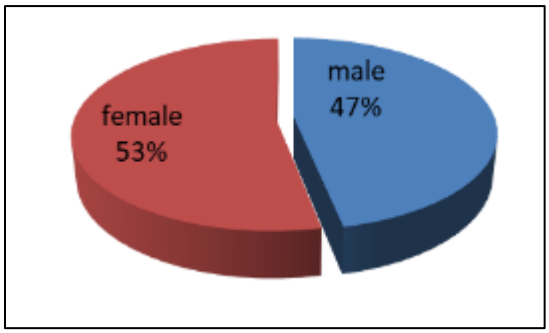

Figure 2 Distribution of sex percentage

Seven patients died during their hospitalization mostly from severe head trauma and sepsis.

A walking deficit was observed in 61.8% of the patients, and 9.7% could not move one of their limbs, 15.4% had no deficit but only pain when moving one or more of their limbs.

Lower limb fractures and general injuries were found among our sample with percentages of 22.8% and 20.3% respectively, followed by pelvic fractures with 17.1%, 11.4% had vertebral fractures (5 patients were paraplegic due to spinal cord injuries) 9.8% had upper limb fractures, and 5% had head trauma. 2 patients sustained an amputation of a limb. More details in (table 1).

Table 1 Description of patient's injuries

Body part injured	**N (%)**
Pelvic fracture	21 (17.1)
amputation	2 (1.6)
Spine injury	14 (11.4)
Upper limb fracture	12 (9.8)
Lower limb fracture	28 (22.8)
polytrauma	25 (20.3)
hematoma	2 (1.6)
Head trauma	6 (4.9)
Compartment syndrome	1 (0.8)
Ribs and chest trauma	6 (4.9)
Crush syndrome	1 (0.8)
disrepair	2 (1.6)
burn	1 (0.8)

No injury	2 (1.6)
Total	123 (100)

- Drug wise, anticoagulants were given to 47.2% of patients to prevent the consequences of bed rest.
- Pain killers were given to 93.3% of patients, and antibiotics to 95.5 of them.
- Physical therapy was required by 85.4% of patients, while 9.8% needed occupational therapy.
- Twelve patients received combined treatments of both occupational therapy and physiotherapy.
- Seventy percent of patients needed technical aids such as wheelchairs, crutches, or walkers.
- Additional equipment, such as arm slings, corsets, and lumbar braces were required by 13% of patients.

Table 2 Rehabilitation Treatment received during hospitalization

treatment	**n (%)**
Physiotherapy	105 (89)
Occupational therapy	12 (12.6)
Prosthesis and orthotics	16 (13)
No treatment received	13 (11)

4. Discussion

In the majority of developing countries, rehabilitation is frequently limited to the use of physical modalities and passive mobilization aimed at alleviating pain and reducing physical impairment.

It is axiomatic that natural disasters result in a significant number of disabilities. The role of the physical and rehabilitation medicine (PRM) physician is to identify, treat, and above all, strive to minimize the perceived disability of the patient and integrate them into society in the most appropriate manner.

Experiences from earthquakes in Pakistan, Sichuan (China), and Haiti, along with Hurricane Katrina in the United States, have underscored the importance of integrating rehabilitation services into the initial emergency medical response.(5)

Our mean ± standard deviation of patient's age 47.7±20.18 was within the range of the age of patients described in many studies: (50.85 ± 21.72) Adhikari et al(6), (40.6 ± 15)Li et al(7), (46.0±12.5)Yorulmaz et al(8)

the majority of injuries were fractures 65%, with mostly pelvic and lower limbs affecting the patients mobility which is comparable to most studies(6) (7)

5% of patients had head and face injuries, almost the same results percentage was found in the study made by Awais and Saeed in an article published in July 2013 reporting about the earthquake in Pakistan and Kashmir(9), and also by Li Tsang et al in 2013 reporting about the quake of Ya'an China(10).

Patients needed a lot of technical aids, this resulted from the fact that lower limb fractures were the predominant injuries observed among the surveyed victims in this study. Such fractures frequently led to restrictions in the movement of the knees and ankles. Given the elevated prevalence of fractures and injuries to the lower limbs, the necessity for splints, walking aids, exercise regimens, and wheelchairs becomes apparent as essential tools to enhance patients' functional independence.

We had 14 patients with spine injuries, 5 of them were paraplegic with a grade (A) on ASIA scale. Two patients, in particular a 14-year-old girl regained active mobility in her lower limbs with a muscular strength of 3/5 in muscle testing, after surgery and an early and well-maintained rehabilitation program during one month.

Anticoagulants were administered to patients undergoing surgery for fractures, particularly in the spine or pelvis, and in the lower limbs, whether through procedures like arthrodesis or other osteosyntheses such as intramedullary nailing, plates, screws, and external fixators. The use of anticoagulants, along with rehabilitation and early mobilization, has

contributed to reducing the incidence of thrombophlebitis, and even preventing it entirely in patients bedridden after surgery.

4.1. Early mobilization and rehabilitation have also helped prevent skin issues, especially bedsores, in bedridden patients.

The establishment of an assessment and a quick understanding of patients' injuries allowed for the development of a well-elaborated and comprehensive rehabilitation program, commencing within the first 72 hours following the disaster. In the acute phase, the focus was on pain relief, followed by physiotherapy sessions aimed at preventing pressure ulcers, avoiding joint stiffness, restoring mobility, joint ranges, and muscle strength, especially in the pelvis and lower limbs. Occupational therapy was prescribed to promote the recovery of near-normal functioning in patients with trauma to the upper limbs.

4.2. The final phase of the program aimed to achieve autonomy identical or very close to that of patients before the earthquake, enabling their effective long-term reintegration into society.

Note that the majority of the population affected by the earthquake originates from a mountainous area that is difficult to access and lacks infrastructure for the proper integration of people with disabilities. Additionally, they are Amazigh, and thus, the medical staff faced significant communication challenges with the patients. The socio-cultural context further hindered the rehabilitation program as many of them underestimated the role of rehabilitation following surgical procedures or orthopedic treatments, the competent authorities placed the patients in a hostel far from the hospital to continue their rehabilitation program. Unfortunately, several of them did not complete the program and left the hostel to reunite with their families. Conversely, many completed the program but had nowhere to go afterward, as their homes had been destroyed. This delayed their social reintegration.

5. Conclusion

This study assessed the physical condition and facilitated the implementation of an appropriate rehabilitation program for 123 victims of the Al Haouz earthquake. A significant number of the injured individuals exhibited residual physical and psychosocial disabilities. The results highlight the patients' need for early physical rehabilitation. Additionally, due to their precarious living environment, it is essential to make modifications at home or in the community to enable these patients to achieve better recovery and reintegrate into society.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed verbal consent was obtained from all individual participants included in the study.

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