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Prevalence and presentation of spinal injury in patients with major trauma admitted in Mulago hospital

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Background: ***Spinal injury is a major cause of morbidity, mortality and long bed occupancy in patients admitted in Mulago Hospital. Several studies have reported different incidence and presentations of spinal injury [1-4]. At Mulago hospital, road traffic crushes (RTC) is one of the most common causes of these injuries[5]. However the magnitude of the problem is unknown and this impacts on planning of services. The main objective was to determine the prevalence and presentation of spinal injury among patients with major trauma admitted at Mulago hospital, Kampala.***
Method: ***A Cross-sectional descriptive study was done on 669 patients with major trauma admitted in the Accident and Emergency ward of Mulago Hospital. Newly admitted patients were consecutively enrolled in the study. Data was collected using questionnaires capturing information from relevant history, physical examination and X-ray interpretation. This was done between November 2008 and January 2009. Data was entered into the Epi-data statistical programme and exported to SPSS statistical programme for analysis.***
Results: ***Of the 669 patients enrolled, 59 had spinal injury thus giving a prevalence of 8.8%. Most of the patients had Neurological involvement and Frankel A was the most common neurological sign. All patients had X-rays done and fracture was the most common radiological diagnosis and the majority of the respondents had unstable spine. Long bone fractures were the most common associated injury.***
Conclusions and recommendation: ***The prevalence of Spinal injury among the trauma patients is 8.8% with Frankel A score being the most common neurological injury, while fractures being the most common radiological diagnosis. There should be measures instituted by the policy makers to prevent spinal injury. The hospital should be fully equipped to manage spinal injury patients before they go back into the community.***

Introduction

Spinal injuries carry a dual threat of damage to the vertebral column and the neural tissues. Some degree of neurological deficit occurs in 10-20% of all patients at all levels of spine injury; 40% at the cervical spine level and 15-20% in the thoracolumbar level[6-8]. Even with the development of specialized spinal injury centers, the cost to society per patient remains staggering[9]. Patient characteristics, associated injuries, the mechanism of injury and the patterns of spinal injury sustained will determine the general outlook of these patients. A study done at Mulago hospital in 2003 showed a prevalence of 14.3% of cervical spine(c-spine) injuries in patients with head injury[5]. The common causes of these injuries include road traffic crushes, falls, and acts of violence and sports injuries.

To date, no study has been done at Mulago to assess the magnitude of spinal injury in totality. This study therefore was aimed at determining the prevalence and presentation of spinal injury among patients with major trauma admitted in Mulago hospital. It is hoped that the information obtained will enable the health administrators to plan adequately for spinal trauma patients and thus improve on their outcome. Recognizing the pattern of spinal injury will help to identify high-risk groups which will then help policy makers to design more appropriate preventive measures. It will also arouse interest for further research on this traumatizing condition.

ISSN 2073-9990 East Cent. Afr. J. surg. (Online)

Patients and Methods

This was a cross-sectional, descriptive study carried out in Mulago hospital Surgical Emergency Ward on all admitted trauma patients. Mulago hospital is a 1500 bed national referral and teaching hospital and a major research center in Uganda. The Surgical emergency ward receives all the major trauma patients within and around Kampala city, and also referrals from other upcountry hospitals. About 420 trauma patients are seen in a month giving a total of 5040 patients in a year.

Patients are first seen at the Accident and Emergency unit by the medical officer on duty where they are assessed and those requiring urgent attention are attended to and the appropriate investigations carried out. Thereafter, patients are admitted in the surgical emergency ward when stable. The following day, they are either discharged or admitted to the trauma wards depending on their condition. Patients with Spinal injury are assessed by the spinal team while in the trauma wards and then admitted to the spine ward for surgery or rehabilitation. Patients who are discharged are followed up from the surgical outpatients' department.

The patient's X-rays were done at the accident and emergency department at the time of admission. The CT- scan was done from the Radiology department of Mulago Hospital while the MRI was done from Kampala hospital, a private hospital, in Kampala. Included in this study were all trauma patients of all ages admitted at Mulago hospital Accident and Emergency ward during the study period who gave informed consent. Excluded from the study were patients on whom investigations done showed infection of the spine.

Consecutive sampling was done. Patients who fulfilled the selection criteria were enrolled from the Surgical Emergency ward. This was done in a period of three months from November 2008 to January 2009. The entire patient's information was recorded in a questionnaire.
Patients with spinal injury were identified and the presentation of injury recorded. The neurological deficit was classified using the Frankel's grading[21]. The fracture patterns were determined from the X-rays or CT-scan or MRI; and the stability determined using the Denis' method[8]. The associated injuries were also recorded.
The study variables included:

- Socio-demographic characteristics of age, sex, occupation.
- Cause of spinal injury.
- Fracture patterns.
- Level of spine injury.
- Neurological presentation.
- Stability of the spine.
- Associated injuries.

All data was collected by the principal investigator and a trained research assistant using a pre-tested questionnaire. The data was entered into the computer and analysed using the EPI- Data soft ware and SPSS with the help of a statistician. Categorical variables were summarised using proportions, frequency tables, histogram, pie charts and bar charts.

Results

There were 669 respondents enrolled into the study over a period of three months and 59 had spinal injury thus giving a prevalence of 8.8%. More males 45(76.3%) had spinal injury compared to 14(23.7%) females. The youngest patient with spinal injury was 13 years while the oldest was 80 years (Figure 1). Most of the spinal injury patients were between the ages of 20 to 40 years. The Mean age was 35.95 years. Median age was 32 years.

ISSN 2073-9990 East Cent. Afr. J. surg. (Online)

Figure 1. Spinal injury age distribution

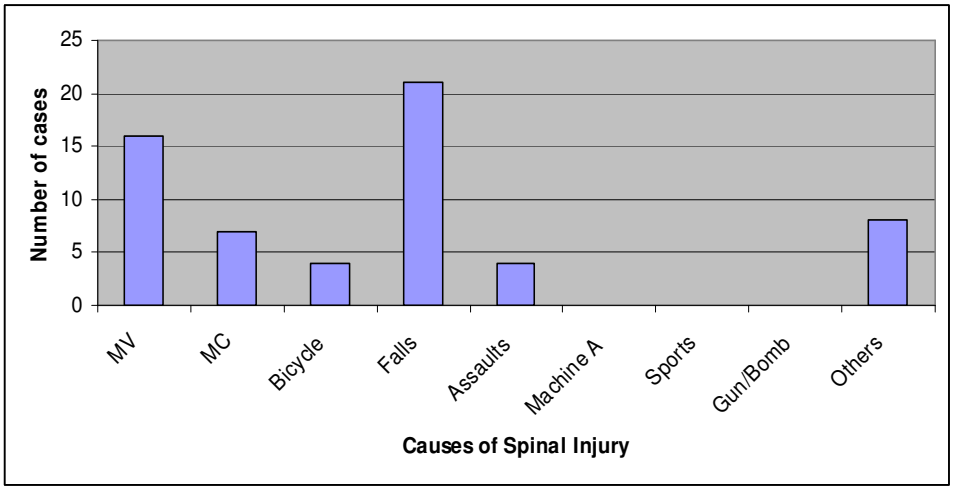

Figure 2. Cause of Spinal Injury

Table 1. Frequency of Neurological involvement: Frankel's Score

Frankel's Score	Rt. UL	Lt. UL	Rt. LL	Lt. LL	Total	Percent
A	5	5	13	14	37	45.0
B	1	1	3	2	7	8.6
C	6	5	5	5	21	25.6
D	1	1	8	7	17	20.0
Total	13	12	29	28	82	100

Rradiological diagnosis was seen in 47(79.7%) patients Most of the patientss 30(56.6%) had fractures as shown in Figure 3.

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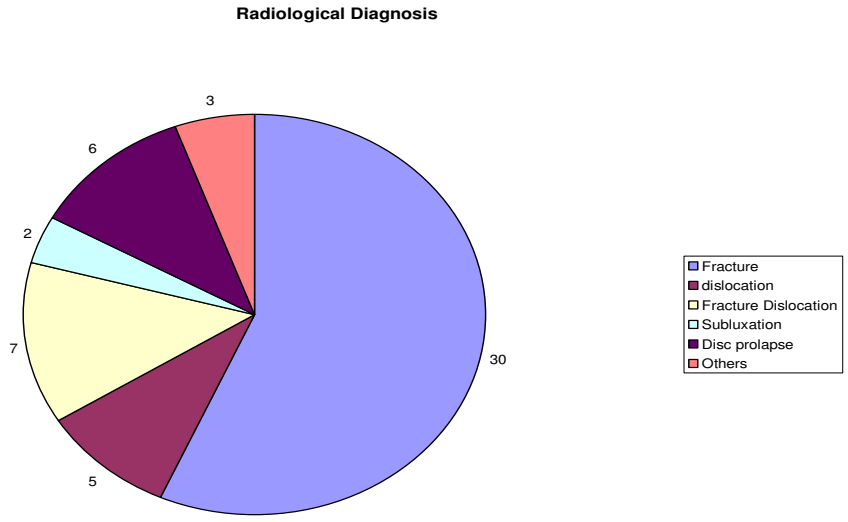

Figure 3. Radiological Diagnosis

Table 2. Injury Location by site

Location	Frequency	Percentage of Responses
Cervical spine	15	36.6
Cervico-thoracic junction	1	2.4
Thoracic spine	5	12.2
Thoraco-lumbar junction	3	7.3
Lumbar spine	15	36.6
Lumbosacral	2	4.9
Total responses	41	100.0

The salaried employees were the most affected among the spinal injury patients 17(28.8%) while the motor cyclists were least affected 1(1.7%). The overall commonest cause of spinal injury was due to road traffic injuries i.e. motor vehicle, motorcycle and bicycle combined 27(45.7%). Falls from height was the most common single cause of spinal injury 21(35.6%), followed by motor vehicle accidents 16(27%) (Figure 2). There were 32 patients (54.2%) who had neurological signs with Frankel's score A being the most common with a frequency of 37(45%) of all limb neurological injury while Frankel's score B 7(8.6%) was the least (Table 1). The lower limb had more neurological deficits compared to the upper limb.

The cervical spine and lumbar spine were equally involved and each accounted for 15(36.6%) and were the most commonly affected (Table 2). The commonest type of fracture was compression fracture which accounted for 19(46.3%). Lateral mass and others were least affected with 3(7.3%) and 2(4.9%) respectively. Of the dislocations, bilateral facet dislocation was the commonest observed in 5(55.6%) of the cases. Some patients had spine injury in more than one location; two column involvement was recorded in 19 (47.5%) of our cases, followed by three column occurred in 12(30.0%) and one column in 9(22.5%) of the patients.

The commonest associated injuries were limb fractures (6 patients), then head injury (5 patients) and other injuries (4 patients). Long bone fracture especially fracture of the femur was commonest among the fractures.

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Discussion

The prevalence of spinal injury seen in this study of 8.8% of spinal injury among patients with major trauma admitted in Mulago hospital is quite high given that almost one out of every eleven patients with major trauma had spinal injury. In literature most of the prevalence studies done are population based studies ranging from 11 to 112 per 100,000 populations[12]. This study is hospital based and therefore not quite comparable to other studies. In one study, however, a prevalence of 6% of spinal injury in trauma patients was reported[11]. In another study were pooling of data from 65 publications (281,864 patients) that met criteria for review was done, the overall prevalence of cervical spine injury among all trauma patients was 3.7% [22]; while another study reported about 6% of more than 2,400 blunt trauma patients seen at a trauma center over the course of a year had thoracolumbar (TL) spine injuries [23].

In our community many people are prone to trauma due to trespass of the traffic regulations by both the drivers or cyclists and the pedestrians, thus many are prone to road traffic injuries, and also trespass of the construction laws thus many construction workers are prone to getting injuries as a result of collapsing buildings. The likelihood of one getting spinal injury is therefore increased and this could explain the high prevalence of spinal injury observed in this study.
The major strength of this study is that it was a hospital based study where the principal investigator enrolled all the trauma patients admitted in the emergency ward and then identified those with spinal injury, thereby guaranteeing consistency and accuracy of the data. The large sample size also increased on the significance of the study.

The major weakness of this study is the short duration of the study of only three months. A longer duration of study for about one year or more would have given a more accurate representation of the prevalence and presentation due to the possibility of capturing all types of spinal injury.

The most common cause of Spinal injury was RTC i.e. motor vehicle, motorcycle and bicycle combined. This is similar to what is found in literature where a number of studies show road traffic injuries as the most common cause of spinal injury [10, 12, 13-15]. Falls was the second most common cause of spinal injury. Among the falls most were from other causes like slippage, fall into pits, objects falling on respondents etc while the rest were from trees and buildings respectively. In a study done in Nigeria on 39 patients, falls from trees (kola nut) accounted for 23% spinal injury[13].

Spine injury among the trauma patients occurred most commonly between the age group of 20-40 years, with males more involved than the females. Other studies done also show males to be more affected than females and the injuries between the second and third decades of life[1,11,17].
Basing on the fact that the major cause of spinal injury was road traffic accidents followed by falls, and the occupation of most of the respondents were salaried employee followed by the business persons and others, it can be explained that most frequent road users are within the most productive age groups as they go to work or to do their personal business. Some of these are construction workers who further have risks of falls from building, while others fall from trees in the course of picking fruits.

In our social setup, males are regarded as the major income earners therefore they are more involved in many activities than the female and therefore more prone to acquiring trauma, thus spinal injury.

The clinical signs and symptoms observed in the patients corresponded to the area of the injury. Frankel's score A was the commonest neurological involvement. The five patients who had Frankel A in both the upper limbs were quadriplegic. There are inconsistent findings on the extent of

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neurological injury in literature. In a study by Mohammed et al. who evaluated and reviewed pediatric cervical injuries and factors affecting outcome, they found overall, 42 (41%) of the 102 patients were neurologically intact at admission. Fourteen patients (14%) had sustained complete SCI (Frankel Grade A), and 46 patients (45%) had incomplete injuries: 18 were Frankel Grade D, 22 were Grade C, and six were Grade B[19]. In another study on 21 patients, (81.0%) were neurologically intact[16]. The Frankel's grading in this study is similar to a study done in Pakistan where complete paraplegia (Frankel's A) was the commonest presentation both in males and females[17]. The severe neurological injuries sustained by a number of the patients in this study indicate that the nature of injury in these patients was of high energy. Such patients therefore needed early management and initiation of rehabilitation programs so as to improve on their prognosis and therefore their productivity when they are discharged, from hospital, back into their communities.

The most common radiological diagnosis was fracture of the spine while fracture dislocation was the second commonest radiological diagnosis .The cervical spine and lumbar spine were the most affected compared to the thoracic spine. The rib cage provides splintage to the thoracic spine and thus less prone to rotational injuries compared to the cervical and the lumbar spine which are mobile. This could explain the frequency of radiological presentation seen in the cervical and lumbar spine. The commonest type of fracture in this study was compression fracture followed by burst fractures.

In a study done in Pakistan on 78 patients, in most of the patients (59.8%) trauma resulted in SCI at low thoracic (T7-T12) level. Cervical lesions were the next common followed by high thoracic (T1-T6) lesion. Fracture dislocation was the commonest type (31.3%) of bony injury followed by burst and compression fracture[17]. In another study burst fractures were the most common fracture, followed by anterior compression fractures. The thoracolumbar spine was the most common site of injury while the C-7 vertebra was the most common site of cervical injuries. There were four sacral fractures observed[18] .

The nature of the fracture and dislocations observed in this study show the severity of spinal injury and therefore the need for urgent attention in these patients. It is however important to note that x-ray alone has limitation in detecting soft tissue injury thus risk of missing unstable and fatal injuries which have undergone spontaneous reduction (whiplash injuries). Few patients had MRI and CT-scan done and therefore some other injuries of the spine may have been missed. As pertains to spinal stability in this study the majority of the patients had a radiologically unstable spine and therefore needed proper immobilization at the time of admission.
The associated injuries seen in this study is similar to what is seen in literature.

In a study done on 214 patients by Zubia Masood et al in Pakistan, they found isolated long bone fracture as the commonest associated injury. It was present in 52 patients (24.3%). This was followed by multi traumatic injuries including head, maxillofacial, orbital, dental, thoracic and abdominal and other orthopedic injuries[34]. In another study on 39 patients the commonest associated injury in all groups was head injury, suffered by 24.9%. Chest injury showed a more consistent relation with spinal injury; 11.4%[13].

It is usually difficult to fully asses an unconscious patient for the degree of spinal injury especially if there are no obvious radiological diagnosis and this may delay the definitive management of such a patient. For one with an associated long bone fracture and spinal injury, the fracture should be managed early so as to enhance the rehabilitation of the patient. Associated injuries should therefore be attended to urgently to improve on the outcome of the spinal injury patient.

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Conclusions

The prevalence of spinal injury in patients with major trauma admitted in Mulago Hospital is 8.8% thus a serious problem. More than 50% of the respondents had neurological injury and Frankel's score A had the highest frequency and most common radiological diagnosis was fractures followed by fracture dislocations These injuries are found in the most economically productive age group of 20 to 40 years therefore a big socioeconomic burden to the nation. There should be measures instituted by the policy makers to prevent spinal injury and the hospital should be fully equipped to manage spinal injury patients before they go back into the community

Road safety measures should be enforced by the Police, Ministry of works and transport, so as to prevent road traffic injuries. Similarly construction regulations should be followed so as to prevent injuries during construction work. The ministry of health and the hospital administration should appropriate adequate resources for the management of Spinal injury patients, both at the emergency level and for definitive management. A Spinal rehabilitation center should be set up for patients with spinal injury in Mulago hospital, both in terms of infrastructure and trained personnel. Further studies should be done on spinal injury among the patients admitted in Mulago hospital with major trauma.

References

1. Segun, T. Dawodu. Spinal Cord Injury: Definition, epidemiology and pathophysiology. 2007 .Article available from the E-medicine website; (Cited 9/6/2008)
2. Ergas, A. Spinal Cord Injury in the United States: A statistical update. Center For Nervous System Trauma 1985; 2:19-32.
3. Stover, SL; Fine, P.R. Spinal Cord Injury: The Facts and Figures. Birmingham, AL: The University of Alabama; 1986 (Unpublished article).
4. Thurman, D.J.; Burnett, C.C.; Jeppson, L.; et al. Surveillance of Spinal Cord Injuries in Utah; USA. . Paraplegia. 1994; 32:665-9.
5. Patrick Sekimpi. The prevalence and presentations of cervical spine injuries in patients presenting with head injury. Kampala: Mulago Hospital 2003 (Dissertation for M Med in Orthopedic Surgery, Unpublished).
6. Benson, D.R.; Keen, T.L.; Antony, J. Unsuspected associated findings in Spinal Fractures. J Orthopaedic Trauma. 1989;3:160.
7. Bohlman H.H. Acute Fractures and Dislocations of the Cervical spine. J Bone Joint Surgery. 1979;61A:1119-42.
8. Denis F. The three-column spine and its significance in the classification of acute thoracolumbar spinal injuries. Spine. 1983;8:817-31.
9. Devivo, M.J.;Kartrus, P.L.; Stover, S.L.; et al. Benefits of early admission to an organised spinal cord injury care system. Paraplegia. 1990;28:545-55.
10. Francisco, de Assis Aquino.; Godmin.; Spinal cord trauma and related diseases. 2007 ; Article available from the E-medicine website(cited 1/10/2008).
11. Suraj Bajracharya; Mahipal Singh; Girish Kumar Sing. Clinical-epidemiological study in a predominantly rural population of Eastern Napal: A 10 years analysis. Indian Journal of Orthopaedics 2000, 41(4) 286-289.
12. Charles, E. Blumer.; Susan, Quine. Prevalence of Spinal Cord Injury: An International comparison. Neuroepidemiology. 1995;14:258-68.
13. Solagberu, B.A. Spinal Cord Injuries in Ilorin, Nigeria. West African Journal of Medicine. 2002;21(3):230-232.
14. B. W. Martin.; E.Dykes.; F. E Lecky. Patterns and risks in Spinal Trauma. Achives of diseases in childhood. 2004;89:860-5.

ISSN 2073-9990 East Cent. Afr. J. surg. (Online)

15. Muzumdar .D. Ventureyra,E.C. Spinal Cord Injuries in Children. J Pediatric Neuroscience. 2006;1:43-8.
16. Stephen ,T. Hearns.; Mathew, H. Fraser.; David,B. Allan.; et al. Spinal Injuries in Scottish Mountaineers. Wilderness And Environmental Medicine.17(3):191-4.
17. M. Farooq Azam Rathore,; Saquib Hanif,; Fereeha Farooq,; et al.Traumatic Spinal Cord Injuries at a tertiary care rehabilitation Institute in Pakistan. Journal Of Pakistan Medical Association. 2008 58:53.
18. Fadi Terazi,; Mercel F.S Dvorak,; Peter C Wing. Spinal injuries in Skiers and Snow boarders. The American Journal Of Sports Medicine. 1999; 27: 177-180.
19. Mohammed A Eleraky, Nicholas Theodore, Mark Adams et al. Pediatric crvical spine injuries. Spineuniverse. Jan 2000; 92,Number 1.
20. Masood, Zubia.; Ghulam Mustafa, Ashraf J. . Spinal Injuries: Experience of a local neurosurgical centre. Pak J Med Sci 2008;24(3):368-71.
21. Frankel HH, D.O.; Hyslop, G. The value of postural reduction in the initial management of closed injuries to the spine with paraplegia and tetraplegia. Paraplegia. 1969;7:179-92.
22. Milby AH, Halpern CH, Guo W, Stein SC. Prevalence of cervical spinal injury in trauma.: Neurosurg Focus 2008;25(5):E10.
23. James F. Holmes, Paul Q. Miller, Edward A. Panacek, et. al. Academic Emergency Medicine. September 2001 8, pp. 866-872.