Hagos Biluts, Mersha Abebe, Tsegazeab Laeke, Abenezer Tirsit, Addisalem Belete. *Ethiop Med J, 2015, Vol. 53, No. 2*

ORIGINAL ARTICLE

PATTERN OF SPINE AND SPINAL CORD INJURIES IN TIKUR ANBESSA HOSPITAL, ETHIOPIA

Hagos Biluts, MD, PGD, FCS[1], Mersha Abebe, MD[1], Tsegazeab Laeke, MD[1], Abenezer Tirsit, MD[1], Addisalem Belete, MD[1]

ABSTRACT

Background: *Spinal injury is a major cause of morbidity and mortality worldwide. Fall and Road traffic accident are the main etiologic factor.*

Objective: *The aim of this study was to asses local hospital patterns of spinal injury and compare them with published reports.*

Methods and Patients: *This is a hospital based cross sectional study of patterns of patients with spine and spinal cord injury seen at the Emergency OPD, Tikur Anbessa Specialized Teaching Hospital (TASTH), Department of Neurosurgery, Addis Ababa, Ethiopia in the period between April 2008 and March 2012. Data was collected using structured questionnaires. The variables included were the Socio-demographic such as age sex, distance of patients' residence area from the TAH. In addition to the above profiles, causes of injuries, Occupation, diagnosis, time spent between arrival and Admission and decision taken at OPD level. Differences in proportions were examined using Chi-square test.*

Results: *A statistically significant male predominance (84.9 %)(p, 0.0001) was observed, the mean age was 32.8 years, with range10 to 84 years. Mean duration of presentation to TASH was 4.3 days with a range 1 hour-60 days, Fall from height (P<0.001) and Road traffic collisions were the main cause of spine and spinal cord injuries in 36.4% and 32.9% of the patients respectively Most often the cervical spine was involved (33.0%), Sixty-nine (17.9%) patients had associated injuries, majority of respondents (25.5%) were farmers, Majority belonged to ASIA A grade. All the deaths, 7(8.3%) occurred in patients with complete cervical spine lesion.*

Conclusion: *Spinal injury was an important indication for neurosurgical consultations in our service. Complete cord injuries were more common than incomplete and the case incidence from fall was remarkably high.*

Key words: Spinal cord injury. Patterns, Ethiopia

INTRODUCTION

According to statistical data by the World Health Organization, injuries are generally one of the main health problems of our times. An increased incidence of injuries results from technological progress, especially the development of industrialization, motorization and a life span prolonged by 5–7 years, particularly in highly developed regions. The number of injuries also increases because of lifestyle changes, conditions of work performance, striving to move from place to place as fast as possible, lack of rest, the bad condition of roads and Road traffic accidents [1,2]

Spine and Spinal Cord Injury (SCI) is often associated with lifetime morbidity. It is estimated that the annual incidence of spinal injury in the U.S is approximately 40 cases per million population or 11000 new cases per year excluding those who die at the scene of the accident (3).

In developing countries like Ethiopia, little is known about the prevalence of spinal injuries. An understanding of the prevalence of spinal injury is very important to develop possible preventive strategies and improve our primary trauma care. In addition, it helps to identify the risk factors and causes of spinal trauma thus helping to formulate preventive measures.

[1]Department of Neurosurgery, Addis Ababa University, School of Health Sciences, Addis Ababa, Ethiopia

There are few data on spinal cord injury from Africa and no data at all from Ethiopia. The study examines the pattern of spine and SCI in Tikur Anbessa Hospital, Ethiopia. Aim of the study is an analysis of the causes of spine and spinal cord injuries.

MATERIALS AND METHODS

The material covers 385 patients hospitalized due to spine injury between April 2008 and March 2012 at Tikur Anbessa Hospital, Department of Neurosurgery, Addis Ababa University. Data was collected using structured questionnaires. The variables included were the socio-demographic such as age sex, distance of residential area from the TAH. In addition to the above profiles, causes of injuries, occupation, diagnosis, time spent between arrival and admission and/ or surgery were also collected.

Data was analyzed using computer based statistical software IBM SPSS statistics data editor version 20.0. A p-value of < 0.05 was considered significant. Ethical clearance was obtained from Institutional review Board of the College of Health Sciences, Addis Ababa University.

RESULTS

Between April 2008 and March 2012 there were 385 spine and spinal cord injuries at the neurosurgical department of TASH. A statistically significant male predominance (84.9%) was observed, in a male: female ratio, 5.6:1, ($p<0.0001$) The mean age was 32.8 years with standard deviation, 13.0 years ranging from 10 to 84 years. Peak age incidence was in 21-30 age groups (45.5.%), (Table 1).

Table 1. Sociodemographic characteristics of patients with spine and spinal cord injuries between April 2008–March 2010, TAH, neurosurgery unit Addis Ababa university. (n=385)

Characteristics	Number of patients	Percentage
Sex		
Male	328	85.2
Female	57	14.8
Age in years		
≤20	50	13.0
21-30	175	45.5
31-40	80	20.8
41-50	36	9.4
51-60	31	8.0
61-70	6	1.6
>70	7	1.8
Mean	32.8(St deviation 12.9) years	
Range	10-84 years	
Place of residence	**Number of patients**	**Percentage**
Addis Ababa	110	28.6
Outside Addis Ababa	195	50.6
Unknown	80	20.8

Among the studied cases, the vast majority 195 (50.6%0) were country side residents, whilst the 110 (28.6%) of the respondents were residents of Addis Ababa city (Table 2). The mean distance of travel of patients to reach TASH was 253.2 Kilometers (range 0-1050).

Most patients were seen at nearby health institution within 2 hours since time of injury (36.4%), and time elapsed to travel from first health care provider to TASH, where neurosurgical service is available was within 8 hours for most (23.6%) patients. Mean duration of presentation to TASH was 4.3 days (SD=7), range being 1 hour-60 days, 39.4%, 39.2%%, 14.3% of patients were admitted within 24 hours, 1 week and beyond one week since the injury occurrence respectively (Table 2).

Fall from height and road traffic collisions were the main cause of spine and spinal cord injuries in 36.4% and 32.9% of the patients, respectively. Three Hundred-twenty seven (85%) cases were due to unintentional injury, whilst 15% were intentional injuries such as, assault 25(5.5%), Stab 21(5.5%)/, blast 9 (2.3%) and gunshot injuries 3(0.8%)in their order of frequency. Among the patients examined, 42.9% experienced spine injury along with spinal cord injury, followed by Spinal cord injury alone in 36.3%, whereas 20.7% of the respondents experienced spine injury without spinal cord injury (Table. 3).

Table 2. Time spent to reach first aid health care, TAH, from injury to admission, and total hospitalization time. (n=385)

Time between the accident and first aid		**Time between injury and admission**	
Time	Number (%)	Time in hours	Number (%)
<2hrs	141(36.6)	<12	98(25.5)
2-5hrs	109(28.3)	12-23	53(13.8)
6-11hrs	36(9.4)	24-47	45(11.7)
12-23hrs	35(9.1)	48-71hrs	30(7.8)
24-48hrs	19(4.9)	72hrs-1wk	76(19.7)
> 48hrs	25(6.5)	> 1wk	55(14.3.)
Not indicated	20(5.2)	Not indicated	27(7.0)

Table 3. Causes of spine and spinal cord injuries between April 2008–March 2010, TAH, neurosurgery unit, Addis Ababa University. (n=385)

Causes	**Number**	**Percentage**
Fall from height	150	36.4
RTA	127	32.9
Assault/Missiles	58	15.1
Objects fall over	21	5.4
Fall off stairs	8	2.6
Pathologic	6	2.0
Land slide/building collapse	6	2.0
Injured by Animal	5	1.3
Industrial accidents	3	0.8
Sport	1	0.3
Type of injury		
Spine injury with spinal cord injury	165	42.9
Spine injury without spinal cord injury	140	36.4
Spinal cord only	80	20.7
Site of injury		
Cervical	127	33.0
Thoracic	99	25.7
Lumbar	74	19.2
Thoracolumbar segments	50	13.0
Cervicothoracic segments	35	9.1

Most often the cervical spine was damaged (33.0%), Less amount of injuries referred to the thoracic segment (25.7%) and a damaged lumbar segment comprised 19.2 % of cases. In some cases, injuries concerned two spine segments at the same time (Table3).Sixty-nine (17.9%) patients had associated injuries, the proportion of associated chest injury 26 (37.7%) was higher than all other causes followed by Musculoskeletal in 19(27.5%), head in 16(23.2%) abdominal trauma in 7(10.1%) and soft tissue injury in 5(7.2%) patients in order of frequency.

The largest numbers of respondents (25.5%) were farmers. Refer to Figure 1.Diagnosis and ASIA grading of patients with spine and spinal cord injuries is shown in Table 4. One Hundred-Three(26.7%) patients had paraplegia and majority belonged to ASIA A grade (27.8%)

In the studied period, the vast majority of patients (68.0%) were admitted to ward and ICU for further treatment and 80% of the admitted patients were treated surgically (Table 5). After completing treatment, 33.2% of the respondents were discharged with improvement, while 12.5% of the patients were in the same condition without improvement, 19% of the cases had neurological worsening and subsequently were not able to move on their own (Table 5). Seven deaths (8.3%) occurred in patients with complete cervical spine lesion.

The commonest complications encountered were, respiratory system complications (Aspiration Pneumonia, ARDS), urinary tract infections (UTI), incontinence, gastrointestinal system complications (UGI bleeding), bedsores, deep vein Thrombosis. The mean length of stay of patients with spine and spinal cord injuries was 7.6 days. The longest hospitalization was documented to be 48 days, while shortest was one day,

Figure 1 distribution of occupation of patients with spine and spinal cord injury between April 2008-March 2010,TASH, Addis Ababa University

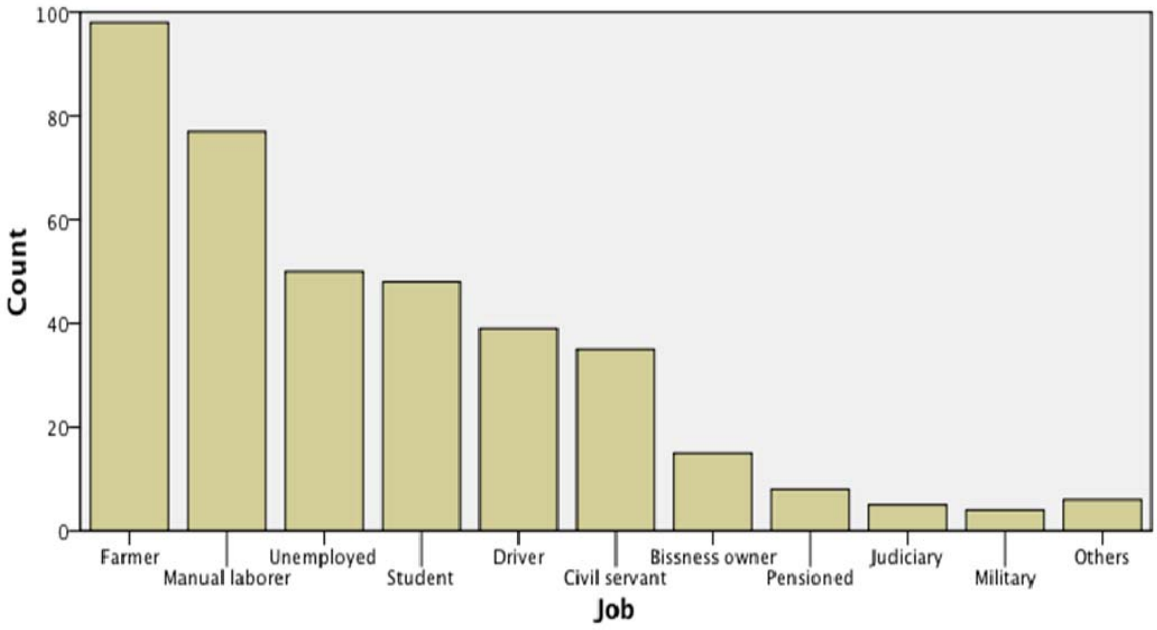

Table 4. Diagnosis and ASIA grading of patients with spine and spinal cord injuries between April 2008–March 2010, TAH, department of neurosurgery, Addis Ababa university. (n=385)

Diagnosis	Number	Percentage
Paraplegia	103	26.7
Paraparesis	69	17.9
Quadriplegia	54	14.0
Quadriparesis	56	14.5
Hemiparesis	19	4.9
Diaparesis	3	0.8
No Neurologic deficit	81	21.0
ASIA classification n=385		
A	107	27.8
B	48	12.5
C	54	14.0
D	30	7.8
E	39	10.2
Un classified	107	27.8

Table 5 Measures taken at OPD level and outcome of patients admitted to ward of patients with spine and spinal cord injury.

Measures taken at EOPD	**Frequency**	**Percent**
Admitted to Neurosurgical ward/ICU	261	68.0
Treated at ER and sent home	76	19.8
Referral, reason for referral	26	7.0
Sent home with an appointment	20	5.2
Condition on discharge, n=261		
Improved	128	49.0
Same	51	19.5
Deteriorated	75	28,7
Death	7	2.7
Overall mortality	7/385	1.8

DISCUSSION

Spinal cord injury is an important public health concern. The pathology affects primarily young adults and has important and significant effects on independence, social and physical function, resource allocation, and considerations regarding long-term care. (14-18)

According to sources and our own research, most often men are subject to spine injuries[6-10,13]. Peter J (2005) and other authors also reported that, in adolescents and adults, males are more commonly affected than females (14,18) Since 2000, the percentage of Spinal cord Injuries that occur among men is 78.2%, this 4:1 ratio of male to female SCIs has remained consistent over time (18)

Average age at the time of injury varies from 26.8 years in a study from Turkey (22) to 55.5 years in Oklahoma, USA (23). In accordance with most authors our review revealed that more spine injuries are being recorded among youth aged between 21-30, with mean age of 32.8 years (4-8,13),which is related with a more dynamic motor and vital activity. Fortunately children< 15 years old compose less than 5% of the spinal injury population An adult most frequently experiences spine and spinal cord injuries as result of falls from height followed by road traffic accidents, and this is due to the booming construction industries of the country (4-7). Fortunately children compose less than 10% of the spinal injury population 926-28.

More spine /spinal cord injury patients were residents outside Addis Ababa probably from rural communities, this is explained people move from place to place to find work or better living conditions and fast Urbanization of the country but very little awareness and legal enforcement of work place and road safety precaution. Similarly, Dryden DM reported, the risk of traumatic spinal cord injury is 2.5 times higher in rural than in urban areas (25). This finding is also supported by the fact that proportionally farmers were most commonly affected segment of societies.

There is a paucity of information on work-related SCI in the medical and occupational health and safety literature internationally. Rosenberg et al. (1993) reported that 13% of SCIs in Colorado were work-related. In Australia, 18% of SCI cases were working for income at the time of injury. In our review, 20% of SCIs were work-related injuries (manual laborers) that has occurred at work place in construction industries

Sixty-five percent of the patients with spine/Spinal cord injury had received some form of precaution either to prevent further damage or form of conservative management at the nearest health institution. Significant proportion of patients, 74.5%, were admitted within the time exceeding 12 hours since the injury occurrence (P<001)this was higher to the report by T. Joanna Rosińczuk and et al., who reported 58.5% of their patients were admitted after 12 hours since the injury occurred (8).

Most of the available epidemiologic data and figures related to SCI are collected in developed countries and nations. On a global level, traffic accidents involving motor vehicles, bicycles, or pedestrians account for the greatest number of SCIs, typically 50% of all injuries (14,20), According to the 2004 report from the National Spinal Cord Injury Statistical Center (NSCISC), in Birmingham, AL, USA, NSCISC Database overall reveals that automobile crashes accounted for 34.5% of SCIs reported, followed by falls (22%) (14), The research conducted has shown that the most common cause of spine injuries are falls from height and road traffic accidents in 36.4% and 32.9% respectively. Kiwerski [6] also mentions that the most common reasons are falls from a height (44.5%) and traffic collisions (33.7%). The vast majority of cases (93%) were due to unintentional injury.

Among the patients examined, 42.9% experienced spine injury along with spinal cord injury, whereas 36.4% of the respondents experienced spine injury without spinal cord injury, which is in sharp contrast to the finding by T. Joanna Rosińczuk who reported 15.4% and 84.6 % respectively. High diagnostic rate of spinal cord injury was made possible because majority of the patients had combined MRI and CT scan done unlike the study conducted by J.K.C. Emejulu (2009) in Nigeria in a new neurosurgical center without CT scan and MRI facility.

The proportions of high (cervical) and low (thoracic or lumbar-sacral) injuries vary in different studies. From China, it is reported that 5% of the patients have sustained high injuries (21), compared to 92 % in Turkey (22). According to Ślusarz [4] and, Peter O'Connor (24), the most commonly injured spinal cord segments were cervical segment followed by thoracic and lumbar. Spinal injuries were distributed

along the spine as follows: cervical 33%, thoracic 25.7%, and lumbar 19.2%. Multiple spinal levels were involved in 21.1% of patients. This agrees well with the above reports and to document by Farhad Pirouzm (2010) on spine and spinal cord injuries in the largest Canadian adult trauma center over 2 decades, who reported cervical 29%, thoracic 21%(20).

The frequency of head injuries varies from 26 % to 74 % in various patient populations with traumatic spinal cord injuries (29,30). A prospective study found that 34 % of those who had a traumatic spinal cord injury also had a mild head injury, and 26 % had a serious head injury (29). In contrary to the afford mentioned reports chest injury was most common concurrent injury in patients with spine and spinal cord injuries, this could be due to multifactorial reasons, such as relatively greater number, 184 (51.4%) of injuries involved thoracic, thoracolumbar and Cervicothoracic injuries, and assault (fighting), stab were also compounding factors considerably.

Those who are injured in traffic accidents and falls run a particular risk of sustaining a concomitant head injury. Concomitant head injuries were especially associated with cervical spinal cord injuries. More than half of cord injuries are thought to be incomplete (31,32), similarly our study revealed, about 59.2% (228/385) patients had incomplete injury or no neurological deficit at all. Only 27.8% of the patients with Sis and/or SCIs had ASIA scale. In accordance to the above reports, Peter O'Connor from Australia concluded that the most common neurologic category was incomplete tetraplegia (24).

The average time of hospitalization for spine injuries along with spinal cord damage was 106.7 days, by Jarmundowicz (4), 18.4 days by Joanna Rosińczuk-Tonderys (4). In the research carried out, this value was much smaller 7.4 days. This difference may result from awareness and emerging rehabilitation facilities and progress in the scope of diagnostic techniques and methods of surgical treatment.

Recommendation: Arguably, prevention should be focused on reducing the incidence of SCI due to and falls and motor vehicle crashes, as these causes are responsible for the largest proportion of the most severely injured We believe that the improved availability of pre-hospital treatment should be strengthened.

ACKNOWLEDGMENTS

I would like to thank the department of surgery and the staff members of the Emergency OPD and wards for allowing me to conduct the study.

REFERENCES

1. Kalinowski P, Czerska B: Epidemiologia urazów wśród hospitalizowanych w 2006 roku w 6. Szpitalu wojskowym w Dęblinie, (Dok. elektr.) 2009, 7, 12–13. [2http://www.phie.pl/pdf/phe-2007/phe-2007-4-455.pdf
2. Haftek J Injuries of (resentments of) backbones and core kręgowego. State medicine literature publishers, warsaw 1986.
3. National Spinal Cord Injury Statistical Center. Spinal cord injury: facts and figures at a glance. Birmingham: National Spinal Cord Injury Statistical Center, University of Alabama; 2001
4. Berny W, Jarmundowicz W, Rutowski R: Urazy kręgosłupa, rdzenia kręgowego i nerwów obwodowych. Wrocław 2009, 7, 12–13.
5. Kalinowski P, Czerska B: Epidemiologia urazów wśród hospitalizowanych w 2006 roku w 6. Szpitalu wojskowym w Dęblinie, (Dok. elektr.) http://www.phie.pl/pdf/phe-2007/phe-2007-4-455.pdf
6. Kiwerski JE: Epidemiologia urazów kręgosłupa. Prew Rehab 3/2005, p. 2, (Dok. elektr.) http://www.zus.pl/files/ PR032005.pdf
7. Ślusarz R: Wybrane standardy i procedury w pielęgniarstwie neurochirurgicznym. Warszawa 2007
8. Joanna Rosińczuk-Tonderys1, Rafał Załuski2, Małgorzata Gdesz1, Aleksandra Lisowska. Spine and Spinal Cord Injuries – Causes and Complications. Adv Clin Exp Med 2012, 21, 4, 477–4
9. Gdesz1, Aleksandra Lisowska. Spine and Spinal Cord Injuries – Causes and Complications, dv Clin Exp Med 2012, 21, 4, 477–485

10. Haftek J: Urazy kręgosłupa i rdzenia kręgowego. PZWL, Warszawa 1986.
11. Weiss M: Zasady postępowania w urazowych uszkodzeniach rdzenia kręgowego, PZWL, W
12. Lindsay KW, Bone I and Callander R. Spinal trauma. Neurology and Neurosurgery Illustrated 2nd ed, 1992; 399-402.
13. J.K.C. Emejulu, O.C. Ekweogwu, Timothy Nottidge. Patterns of spinal injury in a new neurosurgical centre: A 2-year prospective study. *East and Central African Journal of Surgery Volume 14 Number 1– March/April 2009;96-80*
14. Sekhon LHS, Fehlings MG: Epidemiology, demographics and patho- physiology of acute spinal cord injury. Spine 26:2-12, 2001 (suppl)
15. Bracken MB, Freeman DH Jr, Hellebrand K: Incidence of acute trau- matic hospitalized spinal cord injury in the United States, 1970-1977. Epidemiology 113:615-622, 1981
16. Kraus JF, Silberman TA, McArthur DL: Epidemiology of spinal cord injury, in Benzel EC, Cahill DW, McCormack P (eds): Principles of Spinal Surgery. New York, NY, McGraw-Hill, 1996, pp 41-58
17. Marshall LF: Epidemiology and cost of central nervous system injury. Clin Neurosurg 46:105-212, 2000
18. DeVivo MJ: Epidemiology of spinal cord injury, in Lin VW (ed): Spinal Cord Medicine, Principles and Practice, New York, NY, Demos Medical Publishing, 2003, pp 79-85.
19. J.K.C. Emejulu1, O.C. Ekweogwu1, Timothy Nottidge. Patterns of spinal injury in a new neurosurgical centre: A 2-year prospective study, East and Central African Journal of Surgery Volume 14 Number 1– March/April 2009
20. Farhad Pirouzmand. Epidemiological trends of spine and spinal cord injuries in the largest Canadian adult trauma center from 1986 to 2006,J Neurosurg Spine 12:131-140,2010
21. Li J, Liu G, Zheng Y et al. The epidemiological survey of acute traumatic spinal cord injury (ATSCI) of 2002 in Beijing municipality. Spinal Cord 2011; 49: 777–82.
22. Dincer F, Oflazer A, Beyazova M et al. Traumatic spinal cord injuries in Turkey. Paraplegia 1992; 30: 641–6.
23. Price C, Makintubee S, Herndon W et al. Epidemi- ology of traumatic spinal cord injury and acute hospitalization and rehabilitation charges for spinal cord injuries in Oklahoma, 1988–1990. Am J Epidemiol 1994; 139: 37–47.
24. Peter O'Connor. Incidence and patterns of spinal cord injury in Australia. Accident Analysis and Prevention 34 (2002) 405–15.
25. Dryden DM, Saunders LD, Rowe BH et al. The epidemiology of traumatic spinal cord injury in Alberta, Canada. Can J Neurol Sci 2003; 30: 113–21.
26. Wang MY, Hoh DJ, Leary SP, et al: High rates of neurological improvement following severe traumatic pediatric spinal cord injury. Spine 29:1493-1497, 2004.
27. Kewalramani LS, Tori JA: Spinal cord trauma in children: neurologic patterns, radiologic features and pathomechanics of injury. Spine 5:11-18, 1980
28. Vogel LC, Betz RR, Mulcahey MJ: Spinal cord disorders in children and adolescents, in Lin VW (ed): Spinal Cord Medicine, Principles and Practice, New York, NY, Demos Medical Publishing, 2003, pp 851-84
29. Macciocchi SN, Bowman B, Coker J et al. Effect of co-morbid traumatic brain injury on functional outcome of persons with spinal cord injuries. Am J Phys Med Rehabil 2004; 83: 22–6.
30. Tolonen A, Turkka J, Salonen O et al. Traumatic brain injury is under-diagnosed in patients with spinal cord injury. J Rehabil Med 2007; 39: 622–6.
31. Young, J. S., Burn, P. E., Bowen, A. M. *et al:* Spinal Cord Injury Statistics: Experience of the Regional Spinal Cord Injury Systems. Phoenix, Good Samaritan Medical Center, 1982.
32. Young, J. S. and Northrup, N. E.: Statistical information pertaining to some of the most commonly asked questions about spinal cord injury. *Spinal Cord Injury Digest* 1979.