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Original Article

Five-Year Retrospective Study of the Prevalence and Outcome of Traumatic Spinal Cord Injury Cases in a Rural Tertiary Hospital

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BACKGROUND: Traumatic spinal cord injury is a relatively common neurosurgical emergency. It is a significant cause of disability and mortality among the younger age and productive age group.

OBJECTIVE: The aim of this study was to determine the prevalence and outcome of traumatic spinal cord injury (TSCI) in patients managed at Irrua Specialist Teaching Hospital (ISTH.), a tertiary health institution in a rural community in Nigeria.

PATIENTS AND METHODS: This study was a 5-year descriptive retrospective study between January 2015 and December 2019.The study was carried out for the period of 18 months at Irrua Specialist Teaching Hospital (ISTH), from the time of ethical approval. Information of patients who had traumatic spinal cord injury that met the inclusion criteria were retrieved, collated and analyzed using the statistical packages for the social sciences (SPSS) (version 21, Chicago, Illinois). A test of significance of association between dependent and independent variables was done using the Chi-square. A p-value of <0.05 was considered statistically significant.

RESULTS: From the 1,945 trauma cases managed between 2015-2019, 234 patients had TSCI and 101 patients met the inclusion criteria, which shows a prevalence of 5.2%. The main age of the patients was 39.94 years. The most affected age group was 18-35 years accounting for 43.6% of cases. Result showed male to female ratio of 4.6:1. Civil servants and drivers were most commonly affected. The majority of the cases were due to road traffic accidents (RTA), accounting for 63.4%. of cases, while the least was due to gunshot injuries, accounting for just 1%. Mortality rate was 9.9%. Association between Glasgow coma scale at admission and Glasgow outcome score at discharge was not statistically significant (p=0.59).

CONCLUSION: Traumatic spinal injury has been shown to affect most commonly the productive age group. The prevalence was similar to some studies in Nigeria and lower when compared to that observed from studies in developed countries. There was no statistically significant association between Glasgow coma scale at admission and outcome at discharge.

KEYWORDS: Injury, Outcome, Prevalence, Rural, Spinal, Traumatic.

INTRODUCTION

Spinal cord injury (SCI) is a disabling injury resulting in alteration of sensory, motor and/or autonomic functions due to application of external forces, and this has a great impact on patients' physical, psychological and social well-being. Its effect goes beyond the injured patient and it extends to the caregivers and family, posing an economic burden that can be long lasting.[1] The cost (direct and indirect) of managing SCI are huge and it is largely due to a high-level of care needed in the management of TSCI, and associated multisystem secondary complications that occur in the long-term. The huge economic impact of TSCI on patients' and health providers has become an increasingly important topic among experts.[2]

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Spinal cord injury (SCI) is an insult to the spinal cord that causes temporary or permanent disturbances in its function due to external mechanical force. Clinical features results from either the loss of motor, sensory and/or autonomic function in the part of the body below the level of the injury.[3]

3 SCI can be classified based on the etiology and the severity.[4] Based on etiology it includes traumatic SCI which are commonly caused by road traffic accidents, gunshots, stab injury and falls,[2] and non-traumatic SCI which are often due to spinal cord tumors, congenital lesions, arteriovenous malformation and spondylodiscitis.[5]

Traumatic spinal cord injury is a significant public health concern, as well as to the medical practitioners. It is a foremost cause of disability, wheelchair stay and mortality in all regions of the world despite improvements in primary prevention and management.[6] The global incidence of SCI is on the rise, and it is estimated to

exceed many diseases as a significant cause of disability and death in the near future. A study reported global prevalence of SCI to be between 236 and 1,009/1,000,000 people. This was similar to another study which showed a prevalence of 110-1,120 per million.[7,8] Despite attempts by many researchers to accurately quantify the worldwide incidence and prevalence, several drawbacks have limited the accurate estimate. First, the absence of a uniform method of assessment globally. Secondly, the extrapolated figures in some studies were heterogeneous as they were obtained from either urban or rural areas, and were not representative of the figures in literature. Thirdly, the developed nations such as the United States of America provide a large amount of the prevalence data in literature with sparse information from the developing countries. Lastly, the under-reporting of events at the scene of road traffic accident and significant numbers that do not present to the emergency department contribute to all these as well.[9]

The effectiveness and efficiency of any accident prevention program depends on an adequate and up to date epidemiological database. At the moment, Nigeria does not have a comprehensive epidemiological database on spine injury, thus making it difficult to appreciate the depth of the problem in terms of scale, distribution, determinants and socioeconomic bottlenecks associated with it. This impedes the development of evidence-based strategies for the prevention of this injury, and the assessment of the success of any injury reduction strategy put in place. It is therefore necessary to carry out researches such as this in various centers with the aim of pooling it together in a meta-analysis to generate representational national figures and provide the country with a comprehensive national epidemiological data base on the various aspect of central nervous system injury.[10] To the best of the authors knowledge, a study of this nature has not been carried out in the chosen geographical location, hence the need to embark on this research in order to continue in pooling research data needed in the formulation of health policies at the local and national level to control, prevent and treat spinal cord injuries and associated outcomes.

This study has aimed to determine prevalence and outcome of spinal cord injuries in patients in a rural tertiary institution in Nigeria.

PATIENTS AND METHODS

This was a retrospective, cross sectional hospital-based study of all patients with traumatic spinal cord injury who presented to the accident and emergency (A & E) unit at ISTH. The study was carried out over 18-month period. Data were extrapolated from the case notes of all patients admitted, diagnosed and managed for TSCI between January 2015 and December 2019.

Ethical approval was obtained from Irrua Specialist Teaching Hospital (ISTH) Human Research and Ethical Committee (HREC) with protocol number -ISTH/HREC/20212903/173.

The data collected from the unit records and case notes were documented using a structured questionnaire. Data collected were patients' clinical details which include age, sex, time from scene of accident to presentation to hospital, Glasgow coma scale (GCS) on admission, blood pressure, mechanism of spinal cord injury, types of spinal cord injury, associated injuries, and Glasgow outcome score (GOS) on discharge.

Data were collected using validated structures proforma, coded and analyzed using SPSS (Version 21, Chicago, Illinois). Variables were described using frequency tables and figures. Logistic and univariate linear regression were done to ascertain which variables are independently associated with functional recovery and mortality. The association between dependent and independent variables were determined using a Chi-square test. A P-value of <0.05 was taken as statistically significant.

RESULTS

From the A & E register, trauma cases with traumatic spinal cord injury admitted between January 2015 and December 2019 who met the inclusion criteria were 101 patients, and the records of these 101 patients were reviewed. The socio-demographic variables showed that the mean age was 39.94 years with a standard deviation of 15.43 years. The majority of those with SCI were in the age group 18 – 35 years, accounting for 43.6% (n=44) of cases. The next most affected age group was 36 – 42 years with 19.8% (n=20). The least affected age group was those between 78 – 93 years accounting for 1% of cases. Males were predominantly affected with 82.2% (n=83), while females accounted for only 17.8% (n=18) of cases. This gave a male preponderance of 4.6:1.

Civil servants and drivers were the most affected, each accounting for 20.8% (n=21) of cases. This was followed by traders then students with figures of 16.8% (n=17) and 8.9% (n=9), respectively. Farmers were the least affected occupation representing 6.9% (n=7). About 69.1% were admitted to the emergency unit straight from the scene of the accident, (26.6%) presented to emergency unit from private hospital, while 4.3% were admitted following referral from primary and secondary health facilities **(Table 1).** The five-year study period showed 2019 had the highest admissions with 42.6% (n=43), while 2017 had the lowest admissions. **(Fig. 1)**. Esan people were the most commonly affected accounting for 44.6%, followed by Etsako with 16% and the least affected ethnic group were Hausa/Fulani, accounting for 3%.

Monthly distribution of TSCI cases across the five year study period showed November had 11.9% (n=12) of the cases, followed by September and October, each with 10.9% (n=11) of the cases. The least was February with 4% (n=4) **(Fig. 2)**.

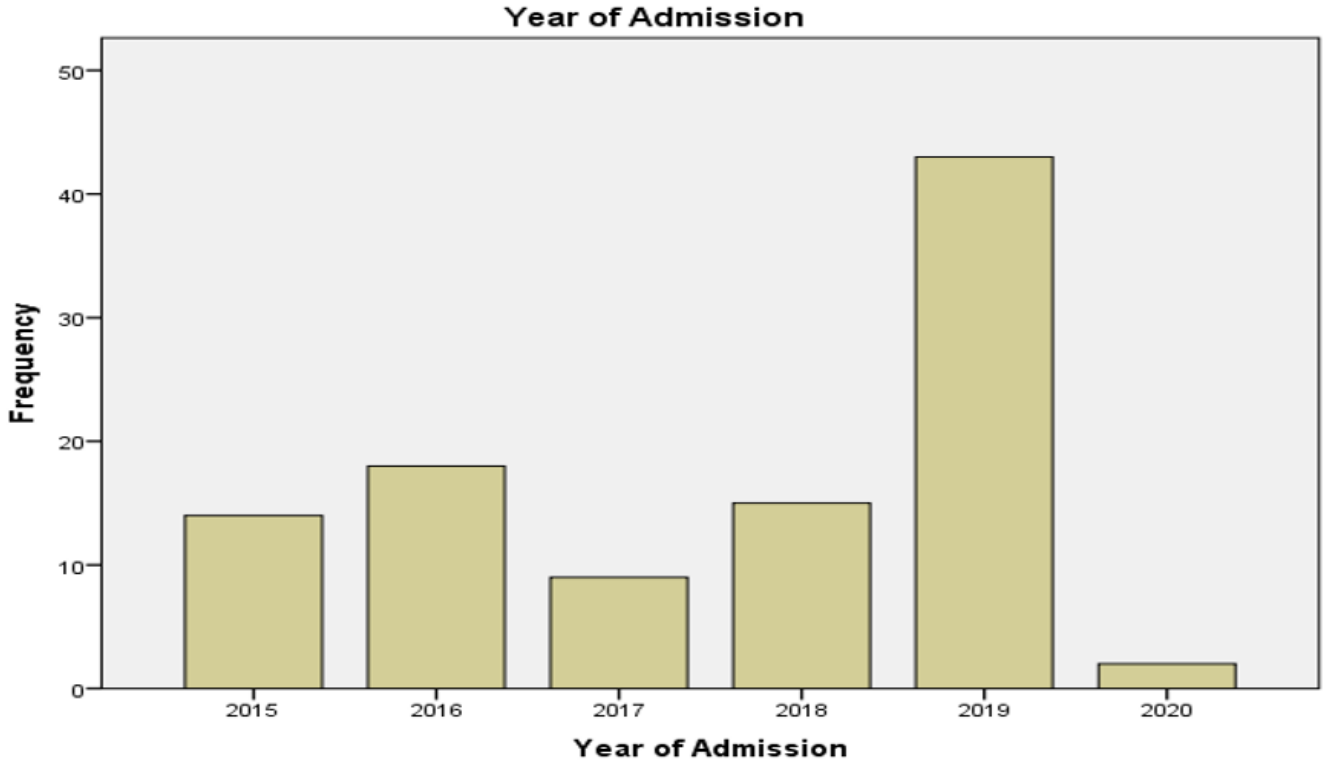

Fig 1: Yearly distribution of traumatic spinal injury.

The majority were due to road traffic accidents (RTA), 63.4% (n=64). Falls accounted for 23.8% (n=24), assaults accounted for 9.9% (n=10), while gunshot injury accounted for 1% (n=1) case. Seventy-five (78.9%) out of the 101 cases with TSCI were mild traumatic spinal injury. Moderate traumatic spinal injury accounted for 14.9% (n=15). Severe traumatic spinal injury accounted for the least of cases (5.3%, n=5).

Ten patients died, accounting for a mortality rate of 9.9%. The majority had lower good recovery accounting for 35.6% (n=36), while upper good recovery was the outcome for about 24.8% (n=25) of patients. Only 1.9% (n=2) of patients had upper moderate disability and about 12.9% (n=13) of patients had lower moderate disability at the time of discharge. Upper severe disability was the outcome for 0.9% (n=1) of patients while the remaining 11.8% (n=12) of patients had lower severe disability at the time of discharge **(Table 2).**

GOS at 6 months showed that a significant number of these patients had upper good recovery at (24.8%, n=25). Lower good recovery was the outcome for about 22.8% (n=23) of patients, while 11.9% (n=12) of patients had upper moderate disability. About 15.8% (n=16) of patients had lower moderate disability extended, upper severe disability was the outcome for 13.9% (n=14) of patients, while the remaining 9.9% (n=10) of patients had lower severe disability extended at six months. **(Table 3).**

Those with GCS of 14-15 on admission had the least mortality rate of 2% and the best upper good recovery at discharge accounting for 22%. Patients with GCS of 9-13 on admission had mortality rate of 3% and upper good recovery at discharge of 4%, while those with GCS of 3-8 at admission had the highest mortality rate of 5% and these patients had the worst upper good recovery of 2%. The association between GCS at admission and outcome of TSCI was not significant (p=-0.59) as seen in **(Table 4).**

Table 1: Showing the demographic characteristics of respondent

Variables	Category	n (%)
Age range (years)	0 – 17 years	2 (2%)
	18 – 35 years	44 (43.6%)
	36 – 42 years	20 (19.8%)
	43 – 59 years	18 (17.8%)
	60 – 77 years	16 (15.8%)
	78 – 93 years	1 (1.0%)
	Total	101 (100%)
Gender	Male	83 (82.2%)
	Female	18 (17.8%)
	Total	101 (100%)
Marital status	Single	71 (70.3%)
	Married	28 (27.7%)
	Divorced	1 (1.0%)
	Widow/widower	1 (1.0%)
	Total	101 (100%)
Occupation	Civil Servant	21 (20.8%)
	Driver	21 (20.8%)
	Trader	17 (16.8%)
	Farmers	7 (6.8%)
	Students	9 (8.9%)
	Others	26 (25.7%)
	Total	101 (100%)
Year admitted	2015	14 (13.9%)
	2016	18 (17.8%)
	2017	9 (8.9%)
	2018	15 (14.9%)
	2019	43 (42.6%)
	2020	2 (2.0%)
	Total	101 (100%)
Mode of admission	Straight from scene of trauma	65 (69.1%)
	Referred from governmental hospital	4 (4.3%)
	Referred from private hospital	25 (26.6%)

Table 2: Glasgow outcome scale extended at discharge

Glasgow coma score	Frequency	%
Death	10	9.9
Lower severe disability	12	11.8
Upper severe disability	1	0.9
Lower moderate disability	13	12.9
Upper moderate disability	2	1.9
Lower good recovery	36	35.6
Upper good recovery	25	24.8

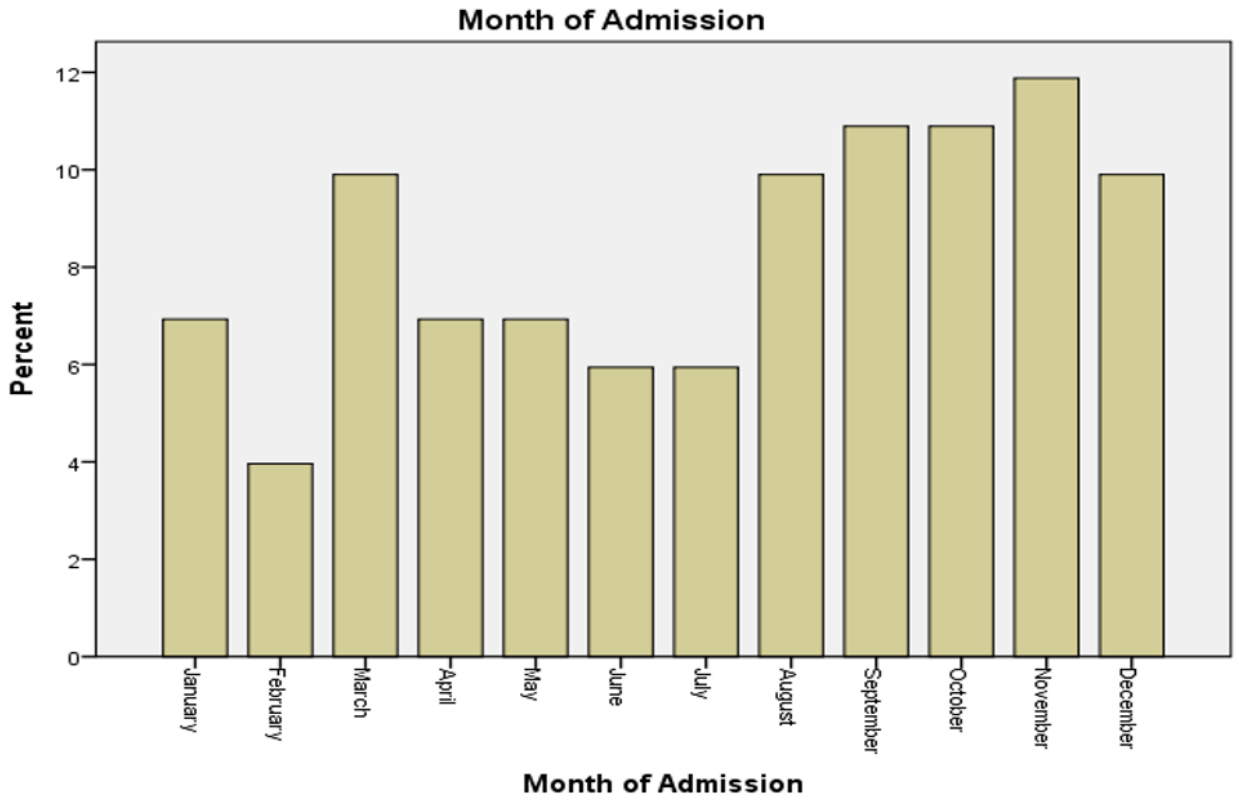

Fig 2: Monthly distribution of traumatic spinal injury.

Table 3: Glasgow outcome scale extended at 6 months

Glasgow coma score	Frequency	%
Death	10	9.9
Lower severe disability	10	9.9
Upper severe disability	14	13.9
Lower moderate disability	16	15.8
Upper moderate disability	12	11.9
Lower good recovery	23	22.8
Upper good recovery	25	24.8

Table 4: Association between GCS at admission and outcome at discharge

GUC	Death	Lower Severe disability	Upper severe disability	Lower moderate disability	Upper moderate disability	Lower good recovery	Upper good recovery	X^2	P
Mild	2 (2%)	9 (9%)	1 (1%)	9 (9%)	9 (9%)	18 (18%)	22 (22%)	19.806	0.59
Moderate	3 (3%)	2 (2%)	0 (0%)	4 (4%)	2 (2%)	2 (2%)	4 (4%)		
Severe	5 (5%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)	2 (2%)		
Total	10 (10%)	12 (12%)	1 (1%)	13 (13%)	11 (11%)	22 (22%)	28 (28%)		

DISCUSSION

The hospital trauma register showed that there were 1,945 cases of trauma patients between 2015 and 2019. Out of these cases, 243 were traumatic spinal injury and only 101 met the inclusion criteria for this study. This showed a TSCI prevalence of 5.2%. This prevalence was similar to that of a study done in Lagos Nigeria which had a prevalence of 6%.[5] This is lower as compared to another study conducted in the United States where the prevalence was 20%.[3] The variation in the prevalence of TSCI may be due to variations in the inclusion and exclusion criteria. Higher incidence in developed countries may be due to industrialization and use of automobiles.

In our study, the majority of the patients were males accounting for 82.2%, compared to females which made up 17.8%. This gave a male-to-female ratio of approximately 4.6:1. Male predominance was consistent with other studies done across the globe. In a study carried out in Lagos Nigeria, males were found to be more affected than females with a ratio of 2:1.11 A similar study was conducted in India which showed a 75% male involvement, and 25% female involvement. In the United States, there are more males who had TSCI compared to females with a ratio of 2.25:1.[12] The reason for this may be due to the fact that males are more likely to be involved in road traffic activities, transportation, crime, and other risky behaviors that could predisposes the male gender to TSCI.[13,14]

In our study, Esan people were mostly affected compared to other tribes accounting for 44.6%. This was followed by Etsako with 16%. The least affected ethnic group were Hausa/Fulani, accounting for 3%. The reason for this was largely due to the geographical area of the research which is mostly inhabited by the Esan-speaking people.

In our study civil servants and drivers were the most commonly affected among the various occupations accounting for 20.8% of cases each. This was followed by traders then students with 16.8% and 8.9%, respectively. Farmers were the least affected, accounting for 6.8%. The high incidence among the drivers and civil servants is because of the centers' specific location which is located along a major travel and work route. Occupational distribution was not widely analyzed in reviewed literature.

In our study, 2019 had the highest distribution of TSCI across the five years studied with hospital admission of 42.6%, followed by 2016 accounting for 17.8%. The least was 2020 accounting for 2%. Monthly distribution of TSCI cases across the five years study period showed November had 11.9% followed by September and October accounting for 10.9% each. This might be the result of so many automobile movements associated with the end of the year, before and during the festive period.

In our study, 10 patients died giving a mortality rate of 9.9%. Most of the patients (35.6%) had lower good recovery. Upper good recovery was the outcome for about 24.8% of patients, while 1.9% of patient had upper moderate disability. About 12.9% of patients had lower moderate disability at the time of discharge. Only about 9.9% of patients had lower severe disability extended at 6 months.

Our study revealed that age group 0-17 years, only 1.1% had mild TSCI. Severe TSCI is commonest among those in the age group 18-35. The association between age and type of TSCI was not statistically significant. Similarly, the association between the GCS at admission and the GOS at discharge was not statistically significant.

Limitation of the study

It was a retrospective study we required us use secondary data source hence relying on others for accurate documentation and good record keeping.

CONCLUSION

From our study males were most commonly affected. The age group between 18 to 35 years who are either civil servants or drivers were by far the most individuals to suffer from a TSCI. The RTA was by far the most common etiology of TSCI. In summary, the prevalence was similar to some studies in Nigeria and lower when compared to that observed from studies in developed countries. There were no factors with statistically significant association with the outcome of TSCI patients.

List of abbreviations

A & E: Accident and Emergency.
GCS: Glasgow coma scale.
GOS: Glasgow outcome score.
HREC: Human Research and Ethical Committee.
ISTH: Irrua Specialist Teaching Hospital.
RTA: Road traffic accident.
SCI: Spinal cord injury.
SPSS: Statistical packages for the social sciences.
TSCI: Traumatic spinal cord injury.

Disclosure

The authors report no conflict of interest in the materials or methods used in this study or the findings specified in this manuscript.

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