Prehospital transport of patients with spinal cord injury in Nigeria

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Background: A well-organized and efficient prehospital transport is associated with improved outcome in trauma patients. In Nigeria, there is paucity of information on prehospital transport of patients with spinal cord injury (SCI) and its relation to mortality.
Objective: To determine if prehospital transportation is a predictor of mortality in patients with SCI in Nigeria.
Design: Prospective cohort study
Methods: Prehospital transport related conditions, injury arrival intervals and persons that brought patients with SCI to the casualty were noted. Data analyzed using descriptive statistics, the chi-square test and multiple logistic regressions.
Main Outcome Measures: Mortality within 6 weeks on admission
Results: 168 patients with SCI presented in the casualty during this review period. Majority (67.9%) presented after 24 hrs of the injury. Majority (58.3%) were conveyed into the casualty by their relatives. Salon car (54.2%) was the most common mode of transportation where majority (55.4%) laid on their back during the transfer. Majority (75%) of the patients had multiple hospital presentation before reporting in our casualty.

The mortality observed was 16.7%. Multivariate analysis after adjusting for age, gender, and means of transportation revealed that age (OR= 63.41, 95% CI= 9.24-43.53), crouched position during transfer (OR= 23.52, 95% CI= 7.26-74.53), presentation after 24 hrs (OR=5.48, 95% CI=3.20-16.42) and multiple hospital presentation (OR= 7.94, 95% CI= 1.89-33.43) were associated with mortality within 6 weeks of admission.
Conclusion: A well-organized and efficient prehospital transport would reduce mortality in spinal cord injured patients. Public enlightenment campaign on factors that could reduce road traffic injury would help reduce mortality.

Keywords: Nigeria, Spinal cord injury, Prehospital transport, Mortality, Univariate, Multiple logistic progressions

Introduction

In Nigeria, spinal cord injury (SCI) is associated with significant morbidity and mortality.[1–8] The socio-economic realities, inadequate immediate attendant care, and the near-absent rehabilitation of people with SCI may be responsible in the developing countries. Studies[9,10] have identified many risk factors[10–22] for morbidity and mortality in SCI, but none of these risk factors has been studied in the developing world.

Nigeria is a country without an organized prehospital transport system for trauma patients.[23,24] Only 6% of injured individuals were transported to hospitals by ambulance whereas other 94% were taken in private cars and public vehicles.[23] Solagberu *et al.*[24] noted that people injured in traffic accidents were transported to the hospital most commonly by their relatives and that transfer of individuals with SCI was not optimal. This may contribute to the high mortality[1–8] following SCI.

A well-organized prehospital transport would reduce morbidity and mortality after traffic-related injuries.[25] This has also been documented in the literature.[23–27] The aim of the present study is to highlight the challenges of prehospital transport of people with SCI and its contribution to mortality in Nigeria.

Patients, materials, and methods

The details of patients with SCI, seen at the casualty of the University of Abuja Teaching Hospital Gwagwalada and National Orthopaedic Hospital Lagos, Nigeria

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Table 1 Mode of transport

Mode of transport	*N* (%)
Salon car	91 (54.2)
Commercial bus	41 (24.4)
Open truck	23 (13.7)
Ambulance	9 (5.4)
Motorcycle	4 (2.4)
Total	168 (100)

from 1 January 2009 to 31 December 2009 and admitted for 6 weeks, were prospectively recorded.

The casualty officer collected data on a SCI proforma designed for date of injury, age, sex, prehospital transport and related factors, time between injury and presentation, and time of death or discharge from hospital. Mortality was recorded within the first 6 weeks of admission. Three groups of people were identified in the prehospital transport of patients with SCI: relatives, the Police/Federal Road Safety Commission staff, and bystanders (terminologies defined by Solagberu *et al.*[24]). Crouch position is defined as near full flexion at the trunk.

General linear model analysis was performed to test the hypothesis that prehospital transportation is a predictor of mortality in patients with SCI, controlling for the following confounding factors that are not affected by mode of transportation to the hospital: age, gender, mechanism of injury, and cause of injury. Multiple logistic regressions were used to estimate the adjusted odds ratios and their 95% CI of OR as measures of associations, including identification and adjustment for confounding variables. Data were analyzed using Statistical Package for Social Sciences (SPSS) 17.0 (SPSS Inc. Chicago, IL, USA); P value ≤ 0.05 was set as significant.

Results

There were 168 patients with SCI evacuated to the casualty during this period; 149 males and 19 females, M:F ratio 7.8:1. The age range was 14–68 years with mean age of 36.4 ± 12.7 years. Mortality was 16.7% within the first 6 weeks of admission.

Table 1 shows the mode of transportation. One hundred and fourteen (67.9%) patients presented more than 24 hours after injury, whereas 54 (32.1%) presented within the first 24 hours. The relative distribution of groups involved in the prehospital transport of patients before and after 24 hours after injury is presented in Table 2. Ninety-three (55.4%) patients were transported lying flat on their backs, 60 (35.7%) were in crouch position, and the other 15 (8.9%) patients were seated. Forty-two (25%) patients presented directly to our casualty and 126 (75%) patients had multiple prior hospital visits.

Predictors of mortality

The following prehospital transport and related factors were significantly associated with mortality (Table 3): univariate analysis revealed age, gender, transfer by bystanders, commercial bus transport, crouched position during transfer, presentation after 24 hours, and multiple hospital presentations were significantly associated with mortality within 6 weeks of admission ($P < 0.05$). Multivariate analysis after adjusting for age, gender, mechanism of injury, and cause of injury, which are not affected by mode of transportation, revealed that crouched position during transfer (OR = 23.52, 95% CI = 7.26–74.53), presentation after 24 hours (OR = 5.48, 95% CI = 3.20–16.42), and multiple hospital presentations (OR = 7.94, 95% CI = 1.89–33.43) were associated with mortality.

Table 2 Group of persons involved in prehospital transport

Group of person	Within 24 hours *N* (%)	After 24 hours *N* (%)	Total
Relative	9 (5.3)	89 (52.9)	98 (58.3)
Police/FRSC staff	16 (9.5)	Nil	16 (9.5)
Bystander	29 (17.3)	25 (14.9)	54 (32.2)
Total	54 (32.1)	114 (67.9)	168 (100)

Table 3 Multivariate analysis of predictor of mortality

Variables	*n*/*N* (%)	RR	95% CI	*P* value
Crouched position	16/60 (26.7)	23.52	7.26–74.53	0.001
Presentation after 24 hours	19/114 (16.7)	5.48	3.30–16.42	0.001
Multiple hospital presentation	21/126 (16.7)	7.94	1.89–33.43	0.001

RR – relative risk, CI – confidence interval.

Discussion

Majority of the patients with SCI, who presented in our casualty, were young men. These are economically active people with attendant socio-economic problems in a developing country like Nigeria. This finding, consistent with findings in many other reports,[2–11] indicates the need to develop more effective prevention measures, especially for this population group.

In this study, the mortality recorded was 16.7% within the first 6 weeks of SCI. This rate corresponds to the findings of Furlan *et al.*[10] and O'Connor[22] in the developed countries and Kawu *et al.*[1] and Udosen *et al.*[8] in the developing countries, who noted similar mortality figures within the first 6 weeks of SCI.

Nigeria lacks an organized prehospital transport system for trauma patients.[23,24] Ambulance conveyed 5.4% of patients with SCI in this study, which was consistent with the 6% of trauma patients transported by this method as reported by Adeyemi-Doro *et al.*[23] In this study, majority of the patients were transported in a salon car to the casualty. This contradicts the findings in Ghana[26] and Kenya[27] where commercial vehicle was the most common mode of transport. The reason may be that relatives, who represent the largest category to convey patients to the hospital, usually do so in their vehicles, which are usually salon cars.

Bystanders are the largest category that conveys the patients with SCI to the hospital within the first 24 hours and this may be due to their being the first contact with the patients. Relatives represent the largest category that conveys patients with SCI to the hospital after 24 hours. This agrees with the findings of Solagberu *et al.*[24] 1. The relatives of these patients are contacted much later after the patients have been evacuated to primary healthcare facilities and on arrival they often request transfer of such patients to other facilities of their choice which may explain why patients are present in our institution after 24hrs. Relatives form the largest category that convey patients to health facilities in Nigeria overall because they are mostly responsible for the initial hospital bills and also because of the communal nature of our society, where family plays a fundamental role.

The present study shows that prehospital transport-related variables such as age, crouched position during transfer, presentation after 24 hours, and multiple hospital presentations were associated with mortality within 6 weeks of admission. Age is a known risk factor for adverse prognosis in patients with SCI.[10,20–22] However, crouched position during transfer of patients, presentation after 24 hours, and multiple hospital presentations have not been described previously as significant risk factors.

Multiple hospital presentations and presentation after 24 hours can be an indicator of quality of trauma care in a country. In Nigeria, the trauma centers are non-existent and where services are available facilities are obsolete; the staff is inexperienced and overworked and there is a lack of a dedicated trauma team. This leads to multiple transfers among health-care centers that lack adequate specialized care. In addition, organized prehospital transport systems are non-existent in Nigeria. Patients often present late to an inadequately equipped trauma center with attendant poor prognosis.[23] This may account for the higher mortality seen in this study.

Conclusion

Organizing a prehospital transport system in Nigeria would help reduce mortality. Injury prevention education for high-risk adolescents and young adults should be instituted using public media. Enforcement of the use of safety measures in vehicles and upgrading of the transport system would reduce the number of traffic injuries. Further studies would highlight other agenda items necessary for change in a country like Nigeria.

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