

# Prehospital transport of spinal cord-injured patients in Nigeria

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## Summary

**Background.** Well-organised and efficient prehospital transport is associated with an improved outcome in trauma patients. In Nigeria there is a paucity of information on prehospital transport of spinal cord-injured patients and its relation to mortality.

**Objective.** To determine whether prehospital transportation is a predictor of mortality in spinal cord-injured patients in Nigeria.

**Design.** Prospective cohort study.

**Methods.** Prehospital transport-related conditions, injury-to-arrival intervals and persons who brought spinal cord-injured patients to the casualty departments at the University of Abuja Teaching Hospital, Gwagwalada, and the National Orthopaedic Hospital, Lagos, were noted. Data were analysed using descriptive statistics, the chi-square test and multiple logistic regressions.

**Main outcome measures.** Mortality within 6 weeks of admission.

**Results.** During the review period, 168 patients with spinal cord injury presented to the casualty departments. Most presented 24 hours or more after the injury (67.9%) and were brought to casualty by their relatives (58.3%). Saloon cars were the most common mode of transportation (54.2%), most patients (55.4%) lying on their back during transfer. The majority of the patients (75%) had been taken to at least one other hospital before arriving at our casualty departments. The mortality rate was 16.7%. Multivariate analysis after adjusting for age, gender and means of transportation revealed that age (odds ratio (OR) 63.41, 95% confidence interval (CI) 9.24 - 43.53), a 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 death within 6 weeks of admission.

**Conclusion.** Well-organised and efficient prehospital transport would reduce mortality in spinal cord-injured patients. Providing information on prehospital transport would also reduce mortality.

Spinal cord injury in Nigeria is associated with significant morbidity and mortality.<sup>1-8</sup> Socio-economic factors, poor care in hospital and inadequate rehabilitation of the victims after discharge may be responsible for this situation. Studies<sup>9-10</sup> have identified many risk factors<sup>11-21</sup> for morbidity and mortality after spinal cord injury, but none of these has been studied in the developing world.

Well-organised prehospital transport has contributed to reducing morbidity and mortality in victims of road traffic accidents.<sup>22</sup> Nigeria is a country without an organised prehospital transport system for trauma patients.<sup>23-24</sup> A study has showed that only 6% of injured victims were transported to hospitals in an ambulance, the remainder being taken in private cars and public vehicles.<sup>23</sup> Solagberu *et al.*<sup>24</sup> noted that victims of road traffic accidents were most commonly transported to the hospital by their relatives, and that the means of transport are generally not optimal for those with spinal cord injury.

The aim of the present study was therefore to highlight the importance of prehospital transport of spinal cord-injured patients and the contribution of these injuries to mortality in Nigeria.

## Patients, materials and methods

The records of spinal cord-injured patients seen at the casualty departments of the University of Abuja Teaching Hospital, Gwagwalada, and the National Orthopaedic Hospital, Lagos, from 1 January 2009 to 31 December 2009 and admitted for at least 6 weeks were studied.

The casualty officer collected data on a spinal cord injury proforma designed to record date of injury, age, gender, prehospital transport and related factors, time between injury and presentation, and time of death or discharge from hospital. Deaths within the first 6 weeks after admission were recorded. Three groups of people identified as commonly being involved in the prehospital transport of spinal cord-injured patients were relatives, police/Federal Road Safety Commission staff, and bystanders (terminologies defined by Solagberu *et al.*<sup>24</sup>).

Prehospital transport and related factors were recorded using percentages, crude odds ratios (ORs), 95% confidence intervals (CIs) of the ORs, and *p*-values. Univariate analysis was performed

using chi-square tests to identify categorical variables for the predictor of mortality. Multiple logistic regressions were used to estimate the adjusted ORs and their 95% CIs as measures of associations, including identification and adjustment for confounding variables. The data were analysed using Statistical Package for Social Sciences (SPSS) 17.0 (SPSS Inc. Chicago, Illinois, USA); a  $p$ -value  $\geq 0.05$  was set as significant.

## Results

During the study period, 168 spinal cord-injured patients were admitted to the casualty departments (149 males and 19 females, male/female ratio 7.8:1; age range 14 - 68 years, mean age 36.4 (standard deviation 12.7) years). The mortality rate during the first 6 weeks in hospital was 16.7%.

Table 1 shows the mode of transportation of the victims to casualty. One hundred and fourteen patients (67.9%) presented more than 24 hours after injury. The distribution of groups involved in the prehospital transport of spinal cord-injured patients within the first 24 hours and afterwards are set out in Table 2. Ninety-three patients (55.4%) were transported lying flat on their back, and 60 (35.7%) in a crouched position; the remaining 15 patients (8.9%) were seated. Forty-two patients (25%) presented directly to casualty, while 126 (75%) were taken to more than one hospital.

## Predictors of mortality

Univariate analysis showed the following prehospital transport and related factors to be significantly associated with mortality within 6 weeks of admission (Table 3): age, gender, transfer by

bystanders, commercial bus transport, a crouched position during transfer, presentation after 24 hours, and attending more than one hospital ( $p < 0.05$ ). Multivariate analysis after adjusting for age, gender and means of transportation revealed that a 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 being taken to more than one hospital (OR 7.94, 95% CI 1.89 - 33.43) were associated with mortality.

## Discussion

The majority of the spinal cord-injured patients treated in our casualty departments were young men. This has been noted in many reports<sup>2-11</sup> reviewed. These are economically active people whose disability and death causes socio-economic problems in a developing country like Nigeria.

Nigeria is a country without an organised prehospital transport system for trauma patients.<sup>23-24</sup> This is reflected in our finding that only 5.4% of spinal cord-injured patients were transported to the hospital in an ambulance, a figure similar to the 6% reported by Adeyemi-Doro *et al.*<sup>23</sup> The majority of our patients were transported to casualty in a saloon car. This differs from the findings in Ghana<sup>25</sup> and Kenya,<sup>26</sup> where commercial vehicles were reported to be the most common mode of transport of trauma patients, perhaps because in our study relatives represented the largest category of people who conveyed spinal cord-injured patients to hospital, usually using their own vehicles (mostly saloon cars).

We found that bystanders were the largest category that conveyed spinal cord-injured patients to hospital within the first 24 hours, probably because they are the first contact with the patient. Relatives represent the largest category that conveyed patients to hospital after 24 hours. Solagberu *et al.*<sup>24</sup> noted a similar finding. This may be because they are contacted later, when they would arrange transfer of the patients to the hospital of their choice. Relatives form the largest category that conveys spinal cord-injured patients to hospital in overall, probably because they are usually responsible for the hospital bills during the first few weeks after an accident, and the communal nature of Nigerian society means that family plays a fundamental role in the lives of individuals.

**TABLE 1. MODE OF TRANSPORT**

Mode of transport	(N (%))
Saloon car	91 (54.2)
Commercial bus	41 (24.4)
Open truck	23 (13.7)
Ambulance	9 (5.4)
Motorcycle	4 (2.4)
Total	72 (100)

**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.

The present study shows that prehospital transport-related variables such as age, a crouched position during transfer, presentation after 24 hours and attendance at more than one hospital were associated with mortality within 6 weeks of admission in spinal cord-injured patients. Age is known to predict poor prognosis in these patients,<sup>20-21</sup> but a crouched position during transfer, presentation after 24 hours and multiple hospital presentation have not previously been described as significant risk factors.

Patients going from hospital to hospital and presenting after 24 hours can indicate poor trauma care in a country. In Nigeria many hospitals do not have trauma centres, and where centres do exist they often have obsolete facilities, inexperienced and overworked staff, and no dedicated trauma team. Patients may go from one health care centre to another because they do not receive adequate care. In addition, no organised prehospital transport system exists in Nigeria, so patients often present to a trauma centre late and therefore with a poor prognosis.<sup>23</sup> This factor may account for the high mortality rate in our study.

Our mortality rate was 16.7%. An acceptable rate in patients with spinal trauma is 5 - 10%,<sup>17</sup> so our rate is unnecessarily high and indicates the poor state of our trauma centres and care in Nigeria.

Transferring patients in a crouched position may further compromise the damaged neurons in the spinal cord. In an injury above the third cervical vertebra, this could cause paralysis of the diaphragm with resultant respiratory distress that could lead to death.

## Conclusion

Well-organised and efficient prehospital transport would reduce mortality in spinal cord-injured patients. Disseminating information on prehospital transport would also reduce mortality.

**Authorship.** All the authors contributed equally to this work.

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