

ORIGINAL PAPERS / ARTICLES ORIGINAUX

DRIVERS OF COST OF TREATMENT FOR TRAUMATIC SPINAL CORD INJURY IN IBADAN, NIGERIA

DETERMINANTS DU COUT DE LA PRISE EN CHARGE DES TRAUMATISMES MEDULLAIRES A IBADAN AU NIGERIA

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ABSTRACT

Background:

Traumatic Spinal Cord Injury (TSCI) is a costly condition in human and economic terms. Yet, studies on direct cost of treatment for TSCI in resource-constraint countries are sparse.

Objective:

To estimate the direct cost of treatment for patients with TSCI at the University College Hospital (UCH), Ibadan, Nigeria using an incidence-based costing approach.

Methods:

All new cases of TSCI admitted in the hospital from January, 2009 to December, 2013 were identified and reviewed. Direct costs of in-patient and out-patient treatments over the first year of injury were estimated.

Results:

114 individuals with TSCI (73 males; 41 females) were admitted and discharged home alive from the hospital. The largest cost driver to the patients and the National Health Insurance Scheme was cost of consultations by neurosurgeons which constituted about a third (34.4%) of the total costs of treatment. Less than a fourth (24.2%) of the total cost of in-patient treatment was spent on therapeutic interventions (surgery, drugs and physiotherapy). There was a significant relationship between the direct cost of treatment and each of the severity of traumatic spinal cord injury and length of hospital stay ($p = 0.01$). Level of injury was not significantly associated with direct cost of treatment ($p=0.89$).

Conclusion:

Direct cost of treatment for individuals with TSCI in Ibadan, Nigeria is substantial. This high cost underscores the need for novel service models with potential for minimizing cost for patients with TSCI in Nigeria.

RESUME**Contexte :**

Le traumatisme vertébro-médullaire (TVM) est une pathologie ayant un coût de prise en charge très élevé sur le plan humain, psychologique et économique. Néanmoins, les études sur le coût direct de prise en charge du TVM dans les pays à ressources limitées sont rares.

Objectif :

Mesurer le coût direct de prise en charge des malades avec TVM dans un Centre Hospitalier Universitaire (CHU) d'Ibadan au Nigéria.

Méthodes :

Tous les nouveaux cas hospitalisés de janvier 2009 à décembre 2013 ont été recrutés et examinés. Les coûts directs de traitement de l'hospitalisation et du suivi externe des patients au cours de la première année ont été évalués.

Résultats :

Au total, 114 personnes avec TVM (73 hommes ; 41 femmes) ont été admises, suivies et ont pu retourner à domicile. Le plus important inducteur de coût de prise en charge des malades dans le système de santé Nigérian était les frais de consultation des neurochirurgiens qui représentaient environ un tiers (34,4%) de l'ensemble des coûts du traitement. Moins d'un quart (24,2%) de l'ensemble des coûts du traitement du patient en hospitalisation a été dépensé sur les interventions thérapeutiques (chirurgie, médicaments et physiothérapie). Il y avait un lien statistiquement significatif entre le coût du traitement et la gravité de la lésion de la moelle épinière traumatique ainsi que la durée d'hospitalisation ($p = 0,01$). Le niveau médullaire de la lésion n'était pas associé au coût direct de prise en charge ($p = 0,89$).

Conclusion :

Le coût direct de prise en charge des personnes avec TVM à Ibadan au Nigéria est élevé. Ce coût élevé souligne la nécessité d'un modèle de service novateur avec la capacité d'atténuer le coût pour les malades et leur famille au Nigéria.

INTRODUCTION

Traumatic Spinal Cord Injury (TSCI) is a sudden, unexpected catastrophic neurological event that results in motor paralysis, sensory loss and sphincter disorder in different degrees, imposing a significant burden on the health care system (8,26). Globally, the annual incidence of TSCI ranges from 2.3 per million to 83 per million (11). In Nigeria, approximately 17.5 deaths per million people per annum are attributable to TSCI (5). TSCI exerts an extensive physical, psychosocial and economic burden on the injured individual, family caregivers, and society as a whole (17,18). Mortality is particularly high in the first year after injury (19) and is strongly affected by the capacity of the health-care system.

Treatment for patients with TSCI is often long-term and many times, life-long. This in part explains why it is regarded as a condition that is both devastating and costly in human and social terms (18). The cost of treatment is especially enormous in the first year of injury and remains a burden to the patients and their families (14). This substantial economic burden is complicated by high rates of morbidity, premature mortality and increased health care costs (17). Such burden would be more pronounced in Low and Middle Income Countries (LMIC) such as Nigeria where the official poverty rate is approximately 60.0% (27). Lack of hospices and special treatment/ rehabilitation centers for people with TSCI in Nigeria, elongates their stay in the hospital (23). This results in high hospitalization cost which contributes significantly to the total cost of treatment. Kawu et al (14) estimated the cost of conservative treatment for acute TSCI in Nigeria to be \$1598.29 per patient and most of this is spent on hospitalization.

Cost of treatment is of increasing interest not only to patients but also to physicians, family, and the nation at large. Yet, most studies on cost of healthcare and illnesses are from developed countries (3). The data from such studies are not transferable to a resource-constrained economy like Nigeria. Studies on direct cost of TSCI in Nigeria are scarce and limited to acute care. This study was conducted to estimate the direct cost of treatment for patients with TSCI at the University College Hospital (UCH), Ibadan, Nigeria.

METHODS

Sources of Data

This retrospective study employed an incidence-based costing approach. New cases of adults with TSCI admitted into Nigeria premier tertiary health facility, the University College Hospital, Ibadan between January 2009 and December, 2013 were identified for review. The University College Hospital is the designated center of excellence in, and a major referral center for, the neurosciences in Nigeria. Ethical approval was obtained from the appropriate Institutional Health Research Ethics Committee. Only case files of patients who survived and were discharged home after in-patient care were reviewed. Patients with associated traumatic brain injury, long bone fracture and extensive soft tissue injuries requiring surgical interventions were excluded.

Information on socio-demographic variables (age, sex, marital status, level of education, and occupation) and clinical characteristics (severity of the injury, level of injury, mechanism of injury and co-morbidity) of the patients were retrieved from individual patient's case files. Severity of injury was defined according to the American Spinal Injury Association Impairment Scale (AIS). This is a standard for assessing and classifying the neurological level and extent of TSCI. The level of injury was categorized as tetraplegia for lesions above T2 and paraplegia for lesions below T2 (16).

Direct costs of treatment over the first year of injury were derived from cost associated with in-patient and out-patient treatments as documented in patients' records. The direct costs of in-patient treatment include costs of diagnostic tests and procedures, surgical treatments, physiotherapy, drugs and non-drug items and hospitalization and nursing. Unit costs of diagnostic tests and procedures, surgical treatments, physiotherapy, drugs and non-drug items and hospital admission were based on the hospital billing system for each of the years studied, while the costs of consultations by neurosurgeons were calculated from the government payer's perspective (National Health Insurance Scheme, NIHIS).

Cost of diagnostic tests, procedures, surgical treatments and investigations was obtained by multiplying the number of times each test/procedure was carried out by the relevant cost of test/procedure.

Cost of test/procedure = No of times of test/procedure x relevant cost of test/procedure.

Cost of hospitalization and nursing care was calculated using the length of hospital stay multiplied by the per diem cost of hospital bed including nursing services.

Cost of hospitalization = Length of hospital stay x per diem cost of hospital bed and nursing services.

Type of drugs and record of drug usage in terms of frequency and dosage was estimated from the drug charts in the case files. Variations in drug clusters were eliminated by taking the most commonly used drug as the drug of treatment. Subsequently, dosage and frequency of drugs used daily was calculated and the relevant unit cost applied. Other types of treatment given, including physiotherapy, and the number of treatment sessions were obtained from the case files and cost of treatments was calculated as for drugs. Cost of outpatient care was calculated based on the frequency of out-patient visits over the first year after discharge from inpatient care and the drugs and treatment taken over this period multiplied by the relevant unit cost.

DATA ANALYSIS

Descriptive statistics of mean and standard deviation, frequency and percentages were used to summarize data. Chi square test was used to investigate the association between cost of treatment and each of severity of injury, level of injury and length of hospital stay. The level of significance was set at 0.05.

RESULTS

One hundred and fourteen adults with TSCI comprising 73 males and 41 females who were discharged home alive from the hospital during the period studied were reviewed. More than half (53.5%) of the participants were aged between 20 and 39 years with a mean age of 39.6 ± 12.1 years (Table 1). About two-thirds (66.7%) of the participants had cervical spine injury (Table 2). Road Traffic Accidents (RTAs) was the single most common cause of injury (80.7%) and the length of hospital stay ranged from 3 to 192 days with a mean of 51.4 ± 37.2 days.

The estimated total direct cost of in-patient treatment was N34,079,381.30 (\$212,996.13) [average = N303,479.75 \pm 181,508.42 (\$1896.75 at exchange rate for year 2013) per patient]. The highest driver of direct cost treatment for patients with TSCI in Ibadan, Nigeria was cost of consultations by neurosurgeons which constituted about a third (34.4%) of the total cost of treatment (Table 3). Only about a quarter (24.2%) of the total cost of in-patient treatment was spent on therapeutic interventions (surgery, drugs and physiotherapy). The total cost attributable to cervical spine injury was N310,769.40 (\$1942.31) per patient, while the cost for thoracic spine and below was N273,957.05 (\$1712.23). The total cost of treating a complete SCI was N404,219.61 (\$2526.37) per patient while an incomplete SCI incurred a cost of N242,518.21 (\$1515.73). The direct cost of out-patient treatment in the index year following in-patient discharge was N6,218,519.25 (\$38865.75). The average per person cost of in-patient treatment was approximately 27% more than the average per person costs of out-patient treatments.

There was a significant association between the direct cost of treatment and each of severity of TSCI ($p=0.01$) and length of hospital stay (Table 4). There was however, no significant association between total cost of treatment and level of injury ($p=0.89$).

DISCUSSION

This incidence-based study estimated the direct cost of in-patient treatment and out-patient treatment over the first year post-discharge for 114 patients with TSCI managed at the Nigeria premier teaching hospital in Ibadan, Nigeria. Going by the records obtained, there was an average of 22 new cases of TSCI per annum between 2009 and 2013. This is high compared to reports from earlier studies on TSCI in Nigeria (12,29). There have been growing concerns on the increasing incidence of SCIs in low and middle income countries including Nigeria (13). This along with increase in road traffic accidents might have resulted in the increased incidence found in this study. Majority of the patients were young, male adults and had tertiary education. This finding is consistent with reports from previous studies that TSCI mostly affects young male adults (1,4,20,23). According to Yip and Malaspina (28), most of the over 40 million people who suffered SCI annually are young men aged between 20 and 35 years. Road Traffic Accidents (RTAs) was the most common cause of injury among patients in this study. This is similar to reports from earlier studies from different countries that RTAs are the leading cause of TSCI (5,6,15,26). The role of RTAs in the etiology of TSCI in Nigeria is underscored by the increased urbanization and escalation in the use of commercial motorbikes for transportation by many, coupled with poor adherence to road safety measures by the operators/riders.

The most common level of injury recorded in this study was the cervical spine. This is in agreement with findings from earlier studies that most TSCI occurred at the cervical spine (21,29). Conversely, Ihegiu et al (13), reported the most common level of injury as the thoracic spine in their study. The similarity observed between our findings and those of Yongu et al (2), and Moshi et al (21), may be related to the time series in all three studies. Whilst these researchers reviewed patients seen between 2012-2014 and 2010 – 2015, we reviewed patients seen between 2009 and 2013. Though not exactly the same, these are comparable time series, which could account for the similarity in findings. Ihegiu et al (12), on the other hand reviewed patients seen between 2001 and 2005 (almost a decade earlier). Variations in etiologies and pattern of TSCI across decades and sites have been reported in literature (24).

The estimated direct cost of in-patient treatment for TSCI for the five-year period was N34,079,381.30 (\$212,996.13 at exchange rate for year 2013) with the mean cost of treatment being N303,479.75±181,508.42 (\$1896.75). This is enormous in view of the federal minimum wage of N18,000 per month (\$120/month). Moreover, majority of the citizens have no healthcare coverage under the National Health Insurance scheme and paid for treatment out of pocket. The implication of this is that most patients could not afford needed care, which leads to increased morbidity and mortality among these patients. Kawu et al (14) had earlier reported the average cost of conservative management for SCI in Nigeria as \$1598.29. This is significantly less than the average cost of \$1896.75 obtained in this study. This is despite that the cost estimated by Kawu et al (14), included income loss by the patients. The difference between our findings and that of Kawu and colleagues may be because they estimated only the cost for the acute phase of treatment spanning six weeks of hospital admission whereas we estimated the cost of treatment for the entire duration of in-patient care.

Across the five years, the cost associated with consultations/reviews by neurosurgeons was higher than all other direct costs of treatment and accounted for about a third of the total cost of treatment. Dryden et al (7), reported that hospitalizations including cost of acute care and in-patient rehabilitation accounted for the highest expenditures. Munce et al (22), on the other hand, separated the costs of acute care and inpatient rehabilitation and found the costs of rehabilitation to be more than three times the costs of acute care. These authors did not specify what constituted acute care and inpatient rehabilitation. We estimated cost of treatment based on services and procedures received during in-hospital care. We found that patients received all needed care including rehabilitation practically on a daily basis throughout hospitalization and are billed accordingly. Some of these services are not routinely required particularly when patients are stable and there are no complex or life threatening health issues. The frequency/cost of visits by neurosurgeons during in-patient care has impact on the cost of treatment borne by patients. It has been suggested that it is best to maintain the injured individual in a rehabilitation setting, and bring in the appropriate medical or surgical specialist if complications arise during inpatient rehabilitation (9). The high cost of care for TSCI has resulted in patients and/or their relatives requesting to be discharged home against medical advice (DAMA). This informs the need to review current treatment models and seek for cost-saving models for patients with TSCI.

Cost of diagnostic investigations is another important factor associated with increase direct costs of treatment for patients with TSCI in Ibadan, Nigeria. This may be due to replication and repetition of imaging and laboratory investigations. Often times, a big time lag exists between when investigations such as laboratory tests are requested by surgeons and when they are paid for by patients, usually due to financial constraints. Many times, requested investigations are done piecemeal as funds are available to the patients. This, coupled with delays in processing investigation results, limit the usefulness of such result. This may necessitate a request for a repeat of such investigations to indicate the current state of the patient. In addition, some investigations are associated with high cost in Nigeria. For instance, Magnetic resonance imaging (MRI), though the gold standard for imaging the spinal cord and related soft tissues (25), is quite expensive for most patients. This is particularly important, considering that the majority of the patients with TSCI are in the low-income group (14). The high overhead on diagnosis reduces the fund available for therapeutics on the long run.

The direct cost of out-patient treatment in the index year following in-patient discharge was quite low compared to cost of in-patient treatment. Out-patient treatment amounted to about one-sixth of the total cost of in-patient treatment. This is not surprising as majority of the patients admitted for treatment in the hospital did not report for follow-up visit. This could be because the hospital is a major referral center in Nigeria, receiving patients from different parts of the country. Patients who do not reside in the hospital environ often continue rehabilitation in their localities. The issue of cost and distance to location of hospital from their usual residence may also account for the observed reduction in out-patient visits. Some patients would rather stay home or seek help from alternative therapies which are sometimes cheaper and give false hope of recovery to the patient. Consultation fee was still the leading cost of out-patient treatment for TSCI during the study period.

There was a significant association between direct cost of treatment and each of severity of TSCI and length of hospital stay. This suggests an increase in the cost of treatment with increased severity of injury. It has been demonstrated that more severely injured trauma patients incurred significantly higher cost than their less severely injured counterparts (2). This may be related to the tendency for patients with more severe injury staying longer in the hospital and their likelihood of developing complications that will also require treatment. There was however, no significant association between the direct cost of treatment and the level

of injury. This is contrary to the findings of Dryden et al (7), and French et al (10). These researchers reported that the cost of care was higher for patients with tetraplegia than for paraplegics. Kawu et al (14) also reported a high cost for tetraplegics than for paraplegics. It could be that there are other factors other than level of injury that contribute to cost of care. It has been suggested that severity and/or completeness of SCI plays a role in cost of treatment. According to Dryden et al (7), complete SCIs are associated with more cost of treatment than incomplete SCIs. Our study comprised mostly patients with incomplete injury (about two-thirds). The outcome could have been different in the absence of this unintended bias.

This study has provided the first comprehensive estimate of direct cost of treatment for patients with TSCI in Ibadan, Nigeria. However, it has some limitations. Cost estimation was based on recorded information. Accuracy of documented information could not be ascertained. This and the small sample size could result in under or over estimation of cost. In addition, direct costs incurred by patients for over-the-counter drugs, mobility and assistive technologies that were obtained outside of the hospital were excluded from cost estimations. This could be substantial and results in underestimation of cost of care for patients with TSCI in Ibadan, Nigeria.

CONCLUSIONS

Estimated direct cost of treatment for TSCI in Ibadan, Nigeria is substantial. These findings highlight a need to evaluate treatment processes and diagnostic procedures in the care of individuals with TSCI. There is a huge potential for minimizing cost through government investment in comprehensive rehabilitation units into which patients can be discharged for in-patient rehabilitation after acute management. This may reduce the cost of treatment and encourage appropriate utilization of scarce healthcare resources among patients.

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Conflict of interest: None declared

Footnote: \$1 was equivalent to N160 at 2013 exchange rate.

Table I: Socio-demographic Characteristics of Patients with TSCI

Variable	Frequency (n)	Percentage (%)
Sex		
Male	73	64.0
Female	41	36.0
Age Group (years)		
<19	2	1.8
20-29	27	23.7
30-39	34	29.8
40-49	28	24.5
50-59	16	14.0
60-69	6	5.3
70-79	1	0.9

Mean Age: 39.6± 12.1years		
Level of Education		
Primary	20	17.7
Secondary	28	24.8
Tertiary	65	57.5
Marital Status		
Single	38	33.4
Married	73	64.0
Widowed	3	2.6

Table II: Clinical Profile of Patients with TSCI

Variable	Frequency (n)	Percentage (n)
Level of Injury		
Cervical spine	70	61.4
Thoracic spine	33	28.9
Lumber spine	11	9.7
Severity of Injury		
Frankel A	43	37.7
Frankel B	7	6.1
Frankel C	4	3.5
Frankel D	20	17.5
Frankel E	35	30.7
Not documented	5	4.5
Mechanism of Injury		
Road Traffic Accidents	92	80.7
Fall	17	14.9
Gunshot Injury	3	2.6
Others	2	1.8

Table III: Direct Cost of In-patient and Out-patient Treatment

Variable	In-patient care(N)	Out-patient (N)	Total Cost (N)
Investigations	6,823,880.00	2,402,640.00	9,226,520.00
Neurosurgeon visits	11,723,750.00	2,752,500.00	14,476,250.00
Hospital Stay	5,591,000.00	—————	5,591,000.00
Drugs	938,622.12	533,879.25	1,472,501.37
Non-drug items	1,570,061.00	—————	1,570,061.00
Surgical interventions	5,205,000.00	—————	5,205,000.00

Physiotherapy	2,100,000.00	529,500.00	2,629,500.00
Service charge	127,068.18	—————	127,068.18
Total	34,079,381.30	6,218,519.25	40,297,900.55

Table IV: Association between cost of treatment and each of severity of injury, level of injury and length of hospital stay

Variable	χ^2	p-value
Severity of injury	59.08	0.01*
Level of injury	19.44	0.89
Length of Hospital Stay	126.03	0.01*

*significant at <0.05

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