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Original Research

Descriptive study of free Emergency Trauma Services and Outcomes in a Tertiary Teaching Hospital, North-Western Nigeria

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Abstract

Background: Waiting time at a trauma centre (TC) before injured patients receive treatment is critical to treatment outcomes. The study aims to find the impact of the government's free emergency services on the waiting time before treatment is initiated.

Methodology: This was a retrospective study of the admitted emergency patients at the Trauma Centre, of Usmanu Dan fodio University Teaching Hospital (UDUTH), Sokoto, Nigeria, from November 2024 to March 2025. Patients' presentation time was classified as less than 6 hours or more than 6 hours before admission and waiting time as less than 15 minutes or greater than 15 minutes. The outcome was either satisfactory or unsatisfactory. Chi-Square was used to analyse categorical data. The level of significance was set at $P<0.05$.

Results: There were 366 patients included in the study. The average waiting time before intervention (in minutes) was 10.5±0.242. Most patients (42/11.5%) had a waiting time of 7 minutes. The male-to-female ratio was 2.1 to 1. The mean age of patients was 35.87±17.20. Cases seen were fractures & dislocations (122/33.3%), gunshot wounds (62/16.9%), head injuries (43/11.7%), burns (38/10.4%), spinal cord injuries (33/9.0%), abdominal injuries (26/7.1%), urologic injuries (21/5.7%) and others (21/5.7%) include chest injuries, soft tissues, limbs gangrene etc. There were 252 (58.9%) patients who presented less than 6 hours post-injury, while 114 (31.1%) presented after 6 hours. Patients who started receiving treatment on admission <16 minutes were 298 (81.4%), and those at >15 minutes were 68 (18.6%). Associating injury duration (<6 hours vs. >6 hours) and treatment outcomes, p-value=0.0001, OR=4.90, 95% CI=2.39-10.04. At the same time, associating waiting time before treatment and treatment outcomes, the p-value=0.0001, OR=5.29, 95% CI=10.77. Following the paired sample t-test of the 2 groups between the median (10.0), the p-value was 0.0001.

Conclusion: There was an improvement in the waiting time for the initiation of treatment. This was largely influenced by the presence of free ambulance services, available free medications and surgical interventions.

Keywords: Free emergency services; Interval to intervention; Waiting Time; Trauma Centre; Federal Government of Nigeria.

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Introduction

The time interval between patients' presentation and treatment or waiting time at the Accident and Emergency Department (A&E), and Trauma Centre (TC) in tertiary hospitals is increasingly gaining attention in the practice of emergency medicine, indicating an evolving trend in the service-oriented health care delivery [1]. Waiting time is regarded as an important determinant of patient satisfaction and the outcome of treatment. The waiting time at the TC depends on numerous factors such as admission of the emergency patient, patient triage (acuity assessment), diagnosis before treatment initiation, and subsequent discharge or continued inpatient treatment [1, 2]. The waiting time plays an important role in the assessment of the quality of care in TC and is affected by various factors, including patient turnover, the type and severity of injury or disease condition, and the nature of the hospital setting. Increased waiting time adds to the morbidity and mortality of cases admitted in a Trauma centre [3]. The psychological aspects of it include increased patient and patients' relatives' frustration with a subsequent decrease in the sense of control [4]. Advanced Trauma Life Support (ATLS) protocol promotes prompt patient treatment intervention both at the site of injury, where possible and at the hospital in the emergency department. Delays in initiating emergency resuscitation of severely injured patients have contributed to the overall mortality of managed patients at the emergency department [5]. Various literatures showing morbidity and mortality associated with accident and trauma victims are directly correlated with the time interval between the time of trauma and the time of institution of emergency treatment in the hospital [6]. Aside from the time between trauma and hospital admission, prompt treatment at A&E and the trauma centre also plays an important role in overall patient outcomes following emergency management. There are many factors that contribute to in-hospital delay in treating emergency patients [7]. These have been identified as major determinants, especially in environments where there is low insurance coverage, high poverty level, low compliance with medical instruction, high rate of out-of-pocket payment for treatment, and delay in procuring the needed resuscitative drugs and materials during the purchasing process before instituting management [8]. It is this crucial time interval that the federal government, supported by the World Bank, came up with an initiative through the National Emergency Medical Services and Ambulance Systems (NEMSAS) and implemented free emergency services for patients who were admitted and managed at TC within the first 48 hours of admission including consultations, medications, surgical interventions and postoperative management [9]. There has not been any study so far that assessed the effectiveness of this governmental intervention and the impact it has on shortening the time to initiate the management of emergency patients at the TC.

The study aims to determine whether the Nigerian government's free emergency service intervention shortens the period between the time of admission and the time of institution of emergency treatment and also improves patients' outcomes at the TC of the Usmanu Dan fodio University Teaching Hospital, Sokoto, Nigeria. The specific objectives were to determine the prevalence of admitted patients at the trauma centre within the study period, determine the sex and age of patients admitted and managed at the trauma centre, assess the type of cases admitted and managed at the trauma centre, measure the time interval from injury to admission, and from admission to commencement of emergency management, and their association with patients' management outcomes.

Materials and Methods

This was a hospital-based retrospective study of the admitted emergency patients at the Trauma Centre of Usmanu Dan fodio University Teaching Hospital (UDUTH), Sokoto, Nigeria, from November 2024 to March 2025. Ethical approval (Ref No, UDUTH/HREC/2025/1510/V1) was issued by the health research and ethics committee, UDUTH. The inclusion criteria comprise all patients admitted to the trauma centre who were eligible for the federal government's free medical services. As part of the free medical service, the patients were conveyed by the dedicated ambulance, which usually carries the injured patients from the injury sites, the referring centre or the site of residence. The exclusion criteria were walking-wounded

patients**,** Patients brought in dead (BID), patients who signed against medical advice (SAMA), patients who were discharged the same day, and those with incomplete records. Out of the admitted 392 patients, there were 366 patients who fulfilled the study criteria, as data recording inaccuracy, especially regarding the interval to intervention time, was missing in some collected data, in addition to those who immediately underwent SAMA. Patients transferred from the trauma centre after 24 hours of initial resuscitation and management to various surgical wards, and to know the patient's progress and outcomes of treatment were also included. Information on the admitted patients was entered into a questionnaire. Demographic information such as age and sex, information on the duration of trauma, mechanism of injury, injury type, time of admission, interval between admission time and intervention/resuscitation and outcome of patient treatment at a trauma centre and the various surgical wards were recorded.

The injury duration was set at less than 6 hours or more than 6 hours before admission into the trauma centre, while the interval between admission and initiation of resuscitation/treatment was recorded at either less than 15 minutes or greater than 15 minutes. This usually includes the triage time and treatment initiation from the provided treatment materials and human resources. The outcome was either satisfactory or unsatisfactory and included those who were either managed non-operatively or operatively. Satisfactory outcomes include any patient who was clinically stable and was either discharged home or remained in the ward in a stable condition. Unsatisfactory outcomes include deceased patients following the commencement of treatment, patients in critical condition despite days of treatment and those discharged or referred elsewhere due to an incapacitating condition because of initial injury.
The data analysis was by SPSS version 23.0. Descriptive statistics were used to calculate the mean, median, mode and standard deviation of the numerical variable data. Student t-test was used to determine whether there was an association between the means of the interval between admission and the time of initiating treatment intervention. This means was obtained after the waiting times were dichotomized to their medians, and then the longer waiting times were considered as more than the median. Chi-Square was used to analyse categorical data. The level of significance was set at $P<0.05$.

Results

Over the period from November 2024 to March 2025, 366 patients were included in the study. The average waiting time before the treatment intervention (in minutes) was 10.5±0.242. Most patients (42/11.5%) had a waiting time of 7 minutes. There were 249 (68%) males and 117 (32%) females with a ratio of 2.1 to 1. The mean age of patients was 35.87±17.20, and the majority (152/41.5%) fell within the age range 20-40 years (Table 1).

Cases seen and managed included fractures & dislocations (122/33.3%), gunshot wounds (62/16.9%), head injuries (43/11.7%), burns (38/10.4%), spinal cord injuries (33/9.0%), abdominal injuries (26/7.1%), urologic injuries (21/5.7%) and others (21/5.7%) include chest injuries, soft tissues, limbs gangrene etc.

Those who presented less than 6 hours from the injury were 252 (58.9%), while those who presented more than 6 hours were 114 (31.1%). Patients who started receiving treatment on admission <15 minutes were 298 (81.4%), and those at >15 minutes were 68 (18.6%). Associating injury duration (<6 hours vs. >6 hours) and treatment outcomes, p-value=0.0001, OR=4.90, 95% CI=2.39-10.04. While associating waiting time before treatment and treatment outcomes, the p-value=0.0001, OR=5.29, 95% CI=10.77 (Table 2). The median of waiting for intervention was 10.0 and following the paired sample t-test of the 2 groups between the median, the p-value was 0.0001 (Table 3).

Table 1: Socio-demographic, time to presentation and waiting time variables

Study Variables	
Variables	**Frequency (%)**
Age range (years)	
<20	66 (18.0)
20-40	152 (41.5)
41-60	97 (26.5)
>60	51 (13.9)
Sex	
Male	249 (68.0)
Female	117 (32.0)
Duration of Injury	
<6 hours	252 (58.9)
>6 hours	114 (31.1)
Interval time	
to Intervention	
<15 minutes	298 (81.4)
>15 minutes	68 (18.6)
Injury Type	
Fractures	122 (33.3)
Gunshots wounds	62 (16.9)
Head Injury	43 (11.7)
Burns	38 (10.4)
Spinal cord Injury	33 (9.0)
Abdominal Injury	26 (7.1)
Urological Injury	21 (5.7)
Others	21 (5.7)
Clinical outcomes	
Satisfactory	329 (89.9)
Unsatisfactory	37 (10.1)

Table 2: Outcomes vs. Injury duration and Waiting time to intervention

	Variables	Frequency (%)	Outcomes		p-value	OR	95% CI
1	**Duration of Injury**		Satisfactory	Unsatisfactory			
	<6 hours	252 (58.9%)	239 (65.3%)	13 (3.6%)	0.0001	4.9	2.39-10.04
	>6 hours	114 (31.1%)	90 (24.6%)	24 (6.6%)			
2	**Interval time to Intervention**						
	<15 minutes	298 (81.4%)	279 (76.2%)	19 (5.2%)	0.0001	5.29	2.60-10.77
	>15 minutes	68 (18.6%)	50 (13.7%)	18 (4.9%)			

Table 3: Paired Sample t-test comparing waiting time

		Mean	N	Standard Deviation	Standard Error Mean	95% Confidence interval of the difference		p-value
Pair	**Group_1**	6.6940	183	1.79263	0.13252			
	Group_2	14.3443	183	3.21168	0.23741	Lower	Upper	
	Grp_1-Grp_2	-7.65027		1.61996	0.11975	-7.88655	-7.41399	0.0001

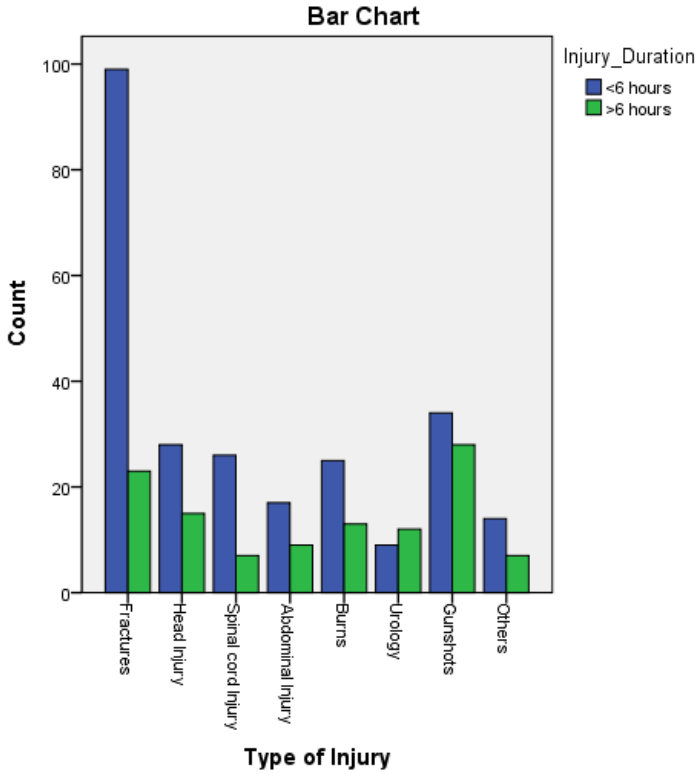

Figure 1: Injury types vs. Injury duration before admission.

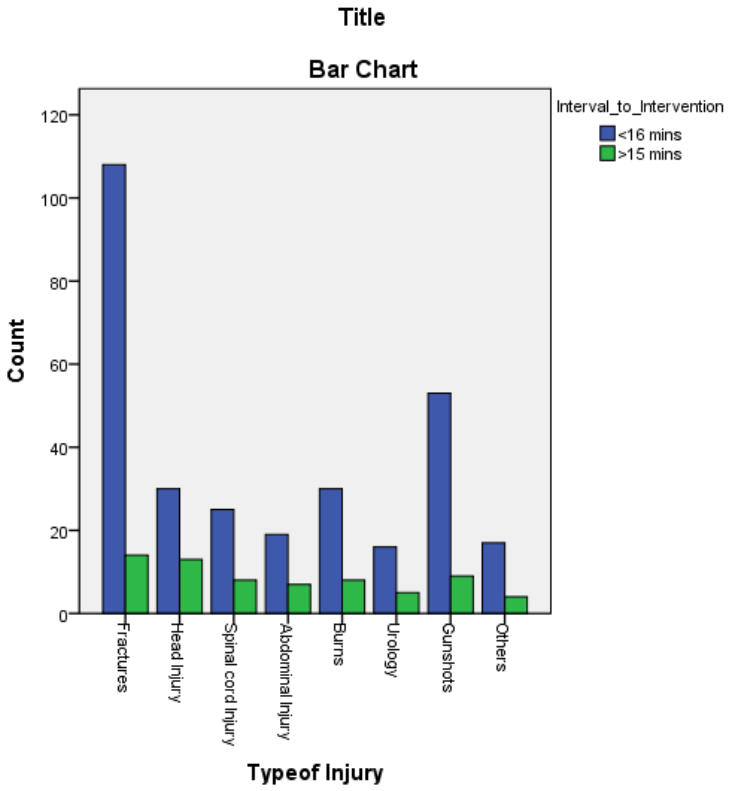

Figure 2: Injury types vs. Interval to intervention (waiting time).

Discussion

The waiting time in this study comprises time intervals before the implementation of emergency management, which includes triage time by the trauma centre (TC) personnel and time to initiate resuscitation and stabilisation at the trauma centre. Most patients had 7 minutes of waiting time, with a minimum of 3 minutes and a maximum of 21 minutes. This was like an average 10-minute triage time in a study on waiting time for patients at the accident and emergency department in a developing country [10]. The use of ambulance services and the presence of available human and material resources that go along with the free federal government intervention had played critical roles in shortening this important lifesaving interval [9]. In a study to improve the triage waiting time in the emergency department, the concept of plan, do, study, act (PDSA) was introduced with the aim to refine triage over 1-year duration, and its implementation thereafter resulted in a shorter period of triage waiting time from 18 to 13 minutes [11]. Although our study did not further classify patients into those who were in urgent or immediate need of resuscitation and those who were in stable condition, the shortened interval still matters, irrespective of the patients' clinical status, because the psychological aspect of treating even the most clinically stable patients early at the emergency department also contributes to overall patient treatment satisfaction. The culture of attending to severely injured patients is also vital to maintaining a seamless standard of trauma patient management.

The demographic pattern in the study followed the usual male preponderance over females as the injury victims with an average age of 35 years, mostly affecting the age range of 20 to 40 years, as found in other studies [12,13]. This reflects the frequent and dominant use of motorcycles as a means of transport in middle-income countries, especially with the violation of traffic rules and avoidance of the use of appropriate personal protective devices [13]. Although the mechanism of injury has not been accounted

for in this study, the nature of the injuries with the most affected patients presented with limb fractures and dislocations, head injuries, burns and spinal cord injuries were well captured in the study. Others included gunshot wounds, abdominal, urologic, chest and other injuries. The cases of burns fluctuated depending on the fire incidence that may happen, as, during the study period, a fire outbreak occurred at the local gun market, which led to an increased incidence of these cases in our reports. The majority of the overall cases (252/58.9%) presented within less than 6 hours after the injury and may reflect the accessibility of the free ambulance service in conveying the injured patients. However, the high number of cases of gunshot wounds in the study was due to banditry and terrorism occurring in the North-western region of the country, and this has contributed to a delay in presentation by these victims, which fell mostly within more than 6 hours of injury time because the activity largely occurred in the remote villages (Figure 1). The relatively high number of delayed presentations of more than 6 hours among the fracture cases was mainly due to the preference for TBS treatment before consideration for hospital fracture treatment by the patients in our region. This is also a common phenomenon in some parts of Nigeria, as reported by Jibo AM et al. [14]. Meanwhile, the treatments of all the injury types commenced at roughly equal intervals (Figure 2). The outcomes (satisfactory or unsatisfactory) were evenly distributed across all cases, with most cases (329/89.9%) having satisfactory outcomes. The favourable outcomes with respect to shortened waiting times at the emergency department were also reported in other literature [1,2].While delay in initiating prompt treatment was associated high rate of morbidity and mortality, especially in low-income countries [6,8].This study did not report the specific cases based on their respective outcomes, but those with poor outcomes were either presented late or severe enough to predict poor prognosis despite the immediate treatment intervention.

The hallmark of government intervention is to increase emergency service efficiency by decreasing waiting time to receive treatment at the TC and ensuring full management coverage of the injured patient within the first 48 hours of admission. This shortened period of delay before institutions of emergency treatment has a tremendous effect on patients' outcomes in terms of morbidity and mortality associated with severely injured patients requiring urgent intervention [15]. Factors contributing to delay in initiating treatment at TC include admission process, patient triage, and diagnosis before proceeding to treatment [2, 16, 17]. Although emergency patients have a general rule for resuscitation which takes precedence over any other action, knowing the diagnosis constitutes a major pillar of success to initial and subsequent definitive treatment [18]. The time taken to make a diagnosis may be lengthened by investigations such as plain radiographs, computer tomographic scans, and magnetic resonance imaging, among others. These are usually done after initial resuscitative measures but are often needed for further treatment even if the patient is clinically unstable for a precise diagnosis and appropriate management. In addition to delaying by the aforementioned factors, the provision of the necessary drugs and other consumables by the patients and payment of investigations and fees for emergency surgical intervention may pose a great obstacle in commencing prompt treatment and offering patients the needed definitive management due to financial difficulties and other logistics of procuring the needed items for treatment [19, 20]. Consideration of targeting treatment and upgrading the standard of A&E services through free service provision to accident victims is highly justified because most of the injury-associated deaths occur at the emergency department and are mainly attributed to preventable factors, including delay in treatment, availability of working materials, presence of adequate personnel and patients' financial affordability to treatment costs [21].

The shortening of time and availability of all the necessary treatment materials by the government intervention has decreased the waiting time and made available all the other financial needs of patient management, thereby improving efficiency and overall patient outcomes [22]. The criterion set for only patients brought by ambulance has further ensured full utilisation of the programme to deserving victims. This will equally assist in validating the number of patients enrolled and avoiding wastage of resources. The health intervention program dealing with the emergency service and ambulance system from the federal Ministry of Health, Nigeria, is also being implemented in some African countries and other

resource-constrained regions [23]. Many of these free or highly subsidised programs were meant to change the health-related behaviours of the target population [24]. This is largely due to many reasons, including affordability and accessibility to healthcare services. A specific location-based mobile government-free emergency service has also been run in some developed countries [25]. Due to the low capital base and high burden of borrowing by developing countries on various essential developmental projects, including health sectors, World Bank counter-funding on these key services is necessary to initiate and maintain continuous financial support for the success of these programs [25, 26].

Previous studies on waiting time at the TC revealed that the long waiting period was largely due to overcrowding and insufficient workforce [27]. Procurement of the needed treatment materials also plays an important role because many patients are in financial difficulties, coupled with misplaced priorities and narrower health insurance coverage. Further to these, urgent surgical interventions required in some patients with major fractures, head, chest and urologic injuries would not tolerate any undue delay if favourable outcomes were anticipated. Without free medical intervention, delays in surgery due to lack of payment by patients have been identified as an established barrier to emergency care service and have greatly contributed to morbidity and mortality associated with those life-threatening injuries [28].
The sustainability of the programme is dependent on the dedicated budget and seamless financial support from the government and non-governmental bodies. In the future, it is hoped that the partner health institutions will be able to sustain such or similar services of reducing waiting time through proper resource mobilisation, careful use of health insurance and improvement of service at emergency departments.

Conclusion

Improving the waiting time to initiate treatment, including triage at an emergency department, is critical because it contributes to a reduction in overall morbidity and mortality, especially in the presence of a mass casualty with all the congestion and limited resources. Prolongation in waiting time at the emergency department is multifactorial and requires a multipronged approach to holistically get the desired results, aside from the current efforts being made to cut the financial implications on the patients and the health institution. These include effective insurance coverage for the entire population, road networking, paid ambulance services and rejig of healthcare delivery.

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