

## LETHAL OUTCOME AND TIME TO DEATH IN INJURED HOSPITALIZED PATIENTS

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### SUMMARY

**Objectives:** There is a recent realization that death following injury is time dependent and occurs in a predictable way. The object of this study therefore is to identify trauma death pattern in our environment with emphasis on time of death with the view to proffer efficient trauma care strategies.

**Methods:** The medical records of patients admitted acutely through the Accident and Emergency Department of our institution and who subsequently died between 1998 and 2000 were reviewed. Such information as their age, sex, aetiology of injury, primary diagnosis on admission, interval between injury and presentation, and time to death, and the cause of death as recorded in the duplicate copy of death certificates were collected and analyzed.

**Results:** There were 85 trauma related deaths, fifty-one males and thirty-four females. The male to female ratio is 1.5:1. The age range is 6- 78 years with a mean of 36-/+2.5 years. The most common aetiological factor was road traffic accidents 43(50.59%). This was followed by burns 35 (41.17%). Of the 85 patients, burns were the most common diagnoses on admission 46(54.12%). Fifteen (17.65%) cases sustained injuries to multiple organ systems injuries while open fractures accounted for 12(14.12%) of the deaths. The time to death showed two peaks. The first peak occurred within the first 96 hours due to uncompensated shock, respiratory failure and acute renal shut down while the second peak was observed after the twelfth day due to sepsis and multiple organ failure.

**Conclusion:** Trauma is common cause of death. In our setting patients that arrived the hospital alive run the risk of dying from complications ranging from uncompensated shock in the immediate post injury period to multiple organ failure later. These deaths are largely preventable if a well-funded comprehensive trauma system manned by skilled personnel is put in place.

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*Key words: Lethal outcome, time to death, injured hospitalized patients*

### INTRODUCTION

Public health experts world-wide concede that there is a global epidemic of trauma<sup>1,2</sup>. Trauma is the leading cause of death and disability in those between twenty and forty years of age.. This has led to injury as a subject of study undergoing a renaissance over the last ten years. There is a recent realization that

death following injury is time dependent and occurs in a predictable way. Death following trauma fall broadly into three distinctive groups<sup>3</sup>:

- 1) Immediate death; this usually occur at the accident site and results from severe cranio-spinal injuries, rupture of great vessels or the heart etc. Medical

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intervention has no role in these types of injury. Only preventive measures like use of crash helmet, and seatbelt and strict enforcement of traffic rules will reduce this type of death:

- 2) Early death- this occur within hours (so called golden hours) after injury and is usually due to airway obstruction, distorted breathing mechanism, massive blood loss leading to circulatory collapse, and dysfunction of the central nervous system due to space occupying lesion within the skull.
- 3) Late death- this occurs days (from 2 weeks to 4 weeks) after injury and is due to sepsis and multiple organ failure. Immediate and late deaths are considered preventable and they dominate the main focus of trauma care.

In our environment, Manasseh et al<sup>4</sup>, Rafindadi,<sup>5</sup> and , Seleye- Fubara et al <sup>6</sup> have studied trauma related deaths but mainly from the point of view of cause and effect. The temporal variable of time to death was not considered making it impossible to audit our trauma care.

The objective of this study is to identify trauma death pattern in patients who arrived hospital alive with emphasis on time of death with the view to proffer efficient trauma care strategies.

## PATIENTS AND METHOD

National Orthopaedic Hospital Enugu serves as a regional trauma center for the South East, part of South-South and North Central zones of Nigeria. It is strategically located at the intersect of Enugu-Onitsha, Enugu-Abakaliki and Enugu-Port Harcourt highways. It has the highest concentration of Burns and Plastic Surgeons in the country and therefore acts also as a regional burns center.

Data were collected from all patients admitted acutely through the Accident and Emergency Department of our institution and who subsequently died between 1998 and 2000. Their medical records were reviewed. Such

information as their age; sex, aetiology of injury, primary diagnosis on admission, interval between injury and presentation, and time to death, and the possible cause of death as recorded in the duplicate copy of death certificates were collected. Those who were dead on arrival and those with incomplete records were excluded. Fatality as defined by the United Nations Economic Commission for Europe was adopted<sup>7</sup>

The data was analyzed using SPSS 9.0 for WINDOWS. A descriptive statistics is provided

## RESULTS

Within the period under review, there were 12,618 trauma admissions, 7,152 males and 5,466 females. There were 85 trauma related deaths, fifty-one males and thirty-four females. The male to female ratio was 1.5:1. The age range is 6- 78 years with a mean of 36-/+2.5 years (Table 1). The commonest aetiological factor was road traffic accidents 43(50.59%). This was followed by burns 35 (41.17%), gunshot injuries 4(4.71%) and fall from height 3 (3.53%).

TABLE 1: AGE DISTRIBUTION OF THE PATIENTS

<10 years	7
11-20 years	9
21-30 years	22
31-40 years	23
41-50 years	11
51-60 years	3
61-70 years	5
>70 years	5

The commonest primary diagnosis on admission was burns 46(54.12%). Of these 46 burns patients, 32(37%) had total body surface area greater than 75%, which is considered lethal from the outset. Fifteen (17.65%) other patients sustained injuries to multiple organ systems while open fractures accounted for 12(14.12%) of the deaths (Table 2).

**TABLE 2: PRIMARY DIAGNOSIS ON ADMISSION**

Burns	46 (54.12%)
Multiple injuries	15 (17.65%)
Open fractures	12 (14.12%)
Spinal injury	5 (5.88%)
Head injury	3 (3.53%)
Closed fracture	3 (3.53%)
Pelvic injury	1 (1.18%)

A close look at the burns injuries showed that domestic accidents such as kerosene explosion 18(39.13%) and gas explosion 10(21.74%) were dominant aetiological factors. In most cases these occurred when the victim was lighting the gas cooker or adding kerosene in a lit stove or lantern. Entrapment in a car that caught fire after accident accounted for 11 (23.91%) of the burn cases. The total body surface area (TBSA) burnt ranged from 10-100 % with an average of 71% (Table 3).

**TABLE 3: CAUSES OF BURNS**

Kerosene explosion	18 (39.13%)
Burns from RTA (trapped in car which caught fire)	11 (23.91%)
Gas explosion	10 (21.74%)
Petrol stored in the house	4 (8.7%)
Chemical burns (assault)	2 (4.35%)
Electrocution	1 (2.17%)
Scald	1 (2.17%)

(TBSA 10%- 100%, average 71%)

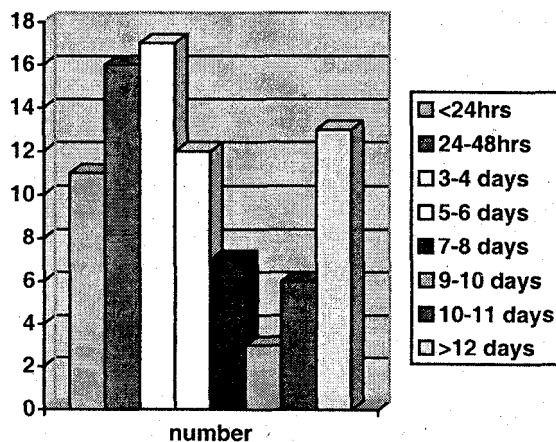
The time interval between injury and presentation to our hospital varied. Thirty two (37%) patients presented within six hours of injury. However, a significant proportion presented after 72 hours and some after one week (Table 4). All the patients who arrived our hospital after 24 hours received initial treatment either in private hospitals 17(20%) or by traditional bone-setters 10(12%). In all these cases, the resuscitation was adjudged inadequate.

**TABLE 4: INTERVAL BETWEEN INJURY AND PRESENTATION AT OUR CENTRE**

Interval	Frequency (n)	Per cent
0-6 hours	32	37
7-12 hours	8	10
13-24 hours	18	21
25-48 hours	8	10
49-72 hours	7	8
>3days but <1week	6	7
>1 week	6	7
Total	85	100

The time to death showed two peaks. The first peak occurred within the first 96 hours and was mainly due to uncompensated shock 26(30.59%), acute respiratory failure 20 (23.53%), and acute renal shut down 7(8.25%). The second peak was observed after the twelfth day. This was due to sepsis 20(23.53%), multiple organ failure 10 (11.76%), see Table 5 and Fig 1.

**Fig 1 Time to Death**



The greatest impediment to adequate and timely resuscitation was the need for patients to provide either the intravenous fluid or blood as demanded by the revolving fund scheme.

TABLE 5: TIME TO DEATH AND CAUSES OF DEATH

	Shock	Respiratory failure	Acute renal failure	Sepsis	Multiple organ failure(MOF)	Pulmonary embolism	Total
Time to death							
<24hrs	5	4	1	-	1	-	11(12.94%)
24-48hrs	7	4	2	1	2	-	16(18.82%)
3-4 days	8	4	1	3	1	-	17(20.00%)
5-6 days	3	2	2	3	2	-	12(14.12%)
7-8 days	1	2	-	3	1	-	7(8.24%)
9-10 days	-	1	-	2	-	-	3(3.53%)
10-11 days	1	1	1	2	1	-	6(7.06%)
>12 days	1	2	-	6	2	2	13(15.29%)
Total	26 (30.59%)	20 (23.53%)	7 (8.25%)	20 (23.53%)	10 (11.76%)	2 (2.35%)	85 (100%)

## DISCUSSION

Trauma kills more Nigerians in their prime than HIV/AIDS<sup>8,9</sup>. However, trauma care remains critically under-funded compared with the treatment of diseases with higher advocacy profiles. In this study the deaths were clustered around the ages of 20-50years. This is the most active age group that drives the economy of any nation. Although trauma is a leading cause of death in this age group, it remains a neglected disease. Apart from its high mortality, it is responsible for temporary and permanent loss of function in an immense group of patients<sup>10</sup>. This important issue must be made clear when discussing the cost of trauma care especially in times of limited financial resources. Good trauma care pays for itself<sup>11</sup>. The male to female ratio of 1.5:1 in this study is higher than the more commonly observed ratio of 4-5:1<sup>12</sup>. This is due to the fact that burns were common injury in this setting and great majority of the victims were females.

Road traffic accidents remain the commonest cause of lethal injuries in a civil setting<sup>2,4,5</sup>. This study supports that observation. A triad of driver, vehicle, and road has been recognized in epidemiological studies as the

major factor in causing traffic accidents with human error playing a dominant role<sup>13</sup>.

In this study, burns injury was the commonest primary diagnosis. This is different from what Solagberu et al<sup>11</sup> reported from Ilorin. Our findings appear to reflect the increasing incidence and severity of fire disasters in Nigeria. Scarcity of petroleum products in the country has created three synergistic problems: petroleum pipeline vandalization leading to incendiary, storage of prime motor spirit (petrol) in surface tanks and importation of toxic kerosene resulting in wide spread domestic explosions. Pipeline vandalization and the resulting fire is often characterized by huge loss in lives and property; pronounced environmental degradation; and overwhelming socio-economic disturbances occasioned by displacement. This study observed that great majority of the burns were sustained either from kerosene explosion or following road traffic accident in which the driver was carrying petrol in a jerry can in which the vehicle caught fire on impact. With major burns patients with multiple system trauma do poorly.

The death pattern in this study showed bimodal peaks. The first peak occurred within

the first 96 hours and was mainly due to uncompensated shock, acute respiratory failure, and acute renal shut down. The second peak was observed after the twelfth day due to sepsis and multiple organ failure. In our environment trauma care faces special logistical problems, that include the need to transport injured patients over long distances, the economic hardships of practicing medicine in a depressed economy, the lack of sophisticated emergency-care delivery systems, influence of traditional bone setters<sup>14</sup>, and faith healers. In most accident and emergency units such as ours, the major militating factors in resuscitation of severely injured who arrived hospital alive are the lack of appropriate fluids, non functioning blood bank, the revolving fund system in most government hospitals (cash and carry) and poor appreciation of the need of the injured by many health care workers and the general public. It is not unusual for patients with severe trauma to waste precious time in the hands of charlatans thereby stretching the "golden hours" to "golden day" and in some cases "golden weeks".

Quite a number of our patients presented hours and even days after injury with profound haemodynamic instability have been receiving "first aid" from a local hospital. It has been clearly documented in trauma outcome studies that the quality of the initial care has a great influence on the final outcome<sup>15</sup>. It is important that our undergraduate curriculum should be reviewed. A few weeks of posting in orthopaedic and trauma is definitely not enough considering the evolving trauma epidemic. Health policy makers should see the need for implementation of comprehensive trauma system which is an organized and coordinated effort in a defined geographic area (states or regions), which delivers the full spectrum of care to an injured patient, from the time of injury to transport to acute care to rehabilitation with significant element of injury prevention. This is known to decrease trauma mortality<sup>11</sup>.

## CONCLUSION

Trauma is a common cause of death in people between the ages of 20- 40 years. In our setting, patients who arrived hospital alive run the risk of dying from complications ranging from uncompensated shock in the immediate post injury period to multiple organ failure later. These deaths are largely preventable if a well-funded comprehensive trauma system manned by skilled personnel is put in place.

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