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30-DAYS MORTALITY IN TRAUMA IN A TERTIARY CARE CENTRE- AN ANALYSIS

General Surgery

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ABSTRACT

Background: One sixth of the total world population of the world lives in India. We have about five lakh road traffic accident victims in the year. However, the total deaths in India account for 21% of the world that's more one fifth of the world mortality. **Methods:** Data was collected from October 2022 to November 2022, in a tertiary care centre in Maharashtra. The patients who had come to the emergency with road or rail related injuries, falls, assaults and burns were evaluated. Their on-admission presentation with vital parameters and methods of care were evaluated on early (within 24 hours), delayed (24 hours to 7 days), and late (8 days to one month) mortality. **Results:** Of 500 patients in the study, 450 were subjected to analysis. The 30-day mortality was 12.4% among all trauma victims early (within 24 hours) mortality was 2%, delayed (24 hours to 7 days) mortality was 7%, and late (8 days to one month) mortality was 3%. Abnormal parameters such as blood pressure on admission, GCS, respiratory rate, heart rate, were observed among all patients. 30-day survival was markedly possible, by early initiation of trauma assessment and monitoring as soon as possible upon arrival at the hospital. **Conclusion:** One in ten admitted trauma patients (12.4%) died in a tertiary care centre in Maharashtra. Most of the trauma deaths were not on admission, but were at the late stage i.e. from 2nd to 7th day. Moreover, the vital parameters measured on admission were a very strong predictor of mortality

KEYWORDS

30 days Mortality, Trauma, Maharashtra

INTRODUCTION:

Globally, injuries claim more lives than HIV/AIDS, TB, and malaria together.[1] India has one-sixth (16%) of the world's population but over one-fifth (21%) of the world's injury mortality. There are more than a million people who die following injury each year in India.[2] Globally, age-standardized death rates for transport injury have decreased since the 1990s. However, India's injury-related death rates have been on the rise.[3] In 2011, the WHO declared a Decade of Action for Road Safety,[4] to implement pre-hospital and in-hospital trauma survival strategies. The Global Road Safety Report recommended the 30-day fatality criteria (dying within 30 days of injury) as a standard to compare post-crash outcomes across trauma centres, within and among nations.[5] India has one percent of total vehicle population in the world and a staggering 10 % of road accident-related deaths.[6]

In previous studies, in-hospital trauma mortality in Indian hospitals was double that of high-income countries (HIC).[6] Half of the trauma deaths in India occur at the scene of the injury or on the way to hospital (second delay), while the remaining half of trauma deaths occur following arrival at the hospital (second or third delay).[7] It has been estimated that by providing the appropriate and timely trauma care in hospitals which exists in many HICs in low to- middle-income countries (LMICs) settings, two million deaths might be averted annually.[8] Systematic recording and analysis of causes of human death remains one of the most resilient successes for public health, beginning with routine and continuous reporting of deaths by physicians starting in the 15th century.[2]

However, despite the large burden of injuries in India, the literature on severity-adjusted 30-day mortality remains sparse.

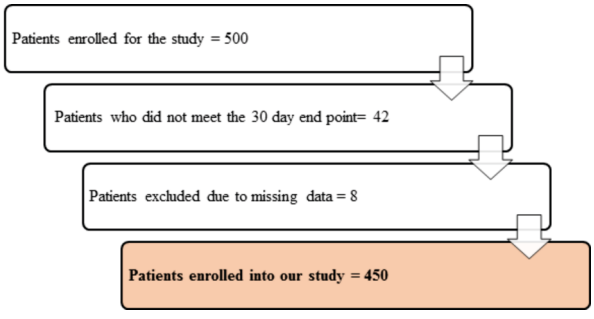
OBJECTIVES:

1. To describe the 30 days mortality in Trauma cases.
2. To study the associations between demographic, physiological, and process-of-care factors with early (0–24 h), delayed (1–7 days), and late (8–30 days) in-hospital trauma mortality while adjusting for injury severity.

MATERIALS & METHODS:

Study Background & Study setting:

This study is a prospective analysis of all the patients who were admitted in Trauma department of our Tertiary care centre, from October 2022 to November 2022 at Dr. Ulhas Patil Medical College and Hospital**.** Ethics Approval was obtained before the start of the study from Institutional Ethics Committee, DUPMC. All patients presenting to the emergency department with a history of injury and with a mechanism of road traffic, railway, fall or assault and admitted to the hospital were included. Patients who were dead on arrival were not included. Patients should met the primary end-points of (1) Death, (2) Discharge, or (3) 30-day in-hospital stay , to be included in the data analysis. Those who could not be observed for a full 30-day period before the study ended were excluded from the analysis. Patients with the missing records of admission or hospital disposition dates were excluded. The recruitment algorithm of patients is as follows.



Variables:

Mortality within 30 days of admission was our primary outcome measure. Time to the primary outcome was further categorized as early (0–24 h), delayed (1–7 days), and late ([7 days).[9,10] Study parameters included were age, gender, mode of transport, injury mechanism, and Injury Severity Score (ISS). Physiological parameters observed on-admission were systolic blood pressure (SBP), Glasgow Coma Scale (GCS), respiratory rate (RR), oxygen saturation level (SpO2), and heart rate (HR). This was consistent with the recommended process-of-care measurement for administering the local health service delivery as per the WHO recommendation.[11] Survival was measured in relation to second delay i.e. the time of injury to first vital sign recording, combined with the third delay in 'receiving care' (hospital arrival to admission).

Data Management & Statistical Analyses:

Collected data were checked, edited at the end of the day during the period of data collection. Data were analysed using SPSS 24 (SPSS Inc., IBM Corporation, Chicago). An independent sample t-test was used to examine the differences between continuous variables. Kaplan–Meier survival analyses were performed across age groups,

SBP, GCS, and mechanism of injury. Normally distributed numerical variables were reported as mean and standard deviation. ANOVA test was used to compare the mean and standard deviation of three groups. A p value below 0.05 was considered statistically significant.

RESULTS:

There were 450 patients who were eligible for the study after applying the inclusion and exclusion criteria. The 30-day mortality was 12.4% among all trauma victims. Early (24-h) mortality was 2.2%, delayed (1–7 days) mortality was 7.1%, and late (8–30 days) mortality was 3.1%. There was no statistically significant difference in mortality between males and females (p = 0.52). However, male trauma patients were 72.4% of the total trauma victims.

Table 1 display the univariate unadjusted analysis results, comparing those who died in the hospital within 30 days versus those who survived. The Mean age (SD) of those survivors and non-survivors was 32.9 (18.5) and 33.9 (17.1) years, respectively. The age distribution of survivors and non-survivors was approximately normal p value was not found to be significant.

Table 1. Univariate Analysis Of Patients Admitted

Parameters	Overall N = 450	Survivors N = 394	Non-Survivors N =56
Age	33 ± 18.33	32.88 ± 18.51	33.85 ± 17.10
Male	326 (72.4%)	283(71.8%)	43(76.8%)
Female	124 (27.6%)	111(28.2%)	13(23.2%)
Mechanism Of Injury			
RTA	232(51.6%)	200(50.8%)	32(57.4%)
Fall	129(28.7%)	115(29.1%)	14(25%)
Assault	53 (11.7%)	47 (11.9%)	6(10.7%)
Burns	17(3.8%)	16(4%)	1(1.7%)
Railway	9(2%)	8(2.1%)	1(1.7%)
Others (Acid Burns, Machine Injuries)	10(2.2%)	8(2.1%)	2 (3.5%)
Mode Of Transport			
Ambulance	204(45.3%)	176(44.7%)	28(50%)
Private	146(32.4%)	127(32.2%)	19(34%)
Rickshaw	59(13.2%)	55(13.9%)	4(7.1%)
Police	28(6.2%)	24(6%)	4(7.1%)
Others (Walking & Unspecified)	13(2.9%)	12(3.1%)	1(1.8%)
	Median (IQR)	Median (IQR)	Median (IQR)
Injury Severity Score	12(8-18)	12(8-17)	14(9-23.5)

Parameters	Overall N=450	Survivors N= 394	Non-Survivors N=56	P Value
Age Category	N(Column %)	N(Row%)	N(Row%)	0.01823, Significant
<15 Years	47(10.4%)	40(85.1%)	7(14.9%)	
15-55 Years	317(70.4%)	286(90.2%)	31(9.8%)	
>55 Years	86(19.2%)	68(79%)	18(21%)	
GCS				<0.0001, Highly Significant
13-15	321(71.3%)	314(97.8%)	7(2.2%)	
9-12	61(13.5%)	40(65.6%)	21(34.4%)	
3-8	68(15.2%)	40(58.8%)	28(41.2%)	
SBP				0.001, Significant
≥ 90 MMHG	415(92.2%)	370(89.1%)	45(10.9%)	
<90 MMHG	35(7.8%)	24(68.5%)	11(31.5%)	
Injury Severity Score				0.002, Significant
<9	140(31.1%)	130(92.8%)	10(7.2%)	
9-15	168(37.3%)	152(90.4%)	16(9.6%)	
16-25	84(18.7%)	66(78.5%)	18(21.5%)	
>25	58(12.9%)	46(79.3%)	8(20.7%)	

Table 2: On-admission Physiological & Process Of Care Parameters In Survivors & Non-survivors:

On admission physiological parameters	Survivors n, Mean ± SD	Non- Survivors n, Mean ± SD	P value
SBP	109.6 ± 13.7	97.5 ± 10.5	<0.0001, HS
Heart Rate	86.1 ± 11.3	103.9 ± 9.9	<0.0001, HS
Respiratory Rate	17.6 ± 1.8	20.7 ± 1.8	<0.0001, HS
SpO2 – Median (IQR)	99(98-99)	98(97-98)	<0.0001, HS
GCS- Median (IQR)	14(13-15)	8.5(7-10.5)	<0.0001, HS
Process parameters	(Median- IQR)	(Median- IQR)	P value
Injury to hospital arrival (Minutes)	68.5(54-97))	64(50-92.5)	0.117, NS
Hospital arrival to first vitals	13(10-16)	8(6-10)	<0.0001, HS
Hospital arrival to Admission	16(15-18)	17(15-17)	0.9591, NS
Injury to admission	85(71-116)	82(66.5-111)	0.112, NS

Regarding the physiological parameters of SBP, HR, RR, SpO2, and GCS, there was a statistically significant difference in the mean of each between survivors and non-survivors (p < 0.0001, HS). Compromised physiological parameters on arrival were seen more among non-survivors, as compared to that of survivors. The mean SBP of survivors (109.6 (13.7 mmHg)) was 12 mmHg higher than in non-survivors (97.5 (10.5 mmHg)). Similarly, non-survivors (103.9 (9.9)) had a mean first-recorded HR, which was 17 beats per minute higher than in survivors (86.1(11)). Further, similar differences in RR and oxygen saturation levels were recorded in those who survived and non-survivors (p < 0.0001), as shown in Table 2.

Regarding the process of care measurements, the median time from: injury to arrival at hospital (p = 0.11), arrival to admission (p = 0.95), and injury to admission (p = 0.11) were not found to be statistically different between survivors and non-survivors. However, the 5-min difference in median time from arrival at the hospital to the first vital sign measurement, between survivors and non survivors, was statistically significant (p <0.0001) (Table 2).

Table 3: Demographic, Physiological And Process Parameters In Early, Delayed And Late In-hospital Trauma Mortality

Parameters	Early Mortality 2.2%N = 10	Delayed Mortality 7.1%N = 32	Late Mortality 3.1%N = 14	P Value
Age	38.3 ± 20.9	33 ± 15.8	32.6 ± 17.6	0.55
Gender				
Male	8(80%)	27(84.4%)	8(57.1%)	0.12, Ns
Female	2(20%)	5(15.6%)	6(42.9%)	
Heart Rate	119 ± 9	103 ± 6	96 ± 4	0.02, Significant
Sbp	86 ± 11	100 ± 10	100 ± 6.2	<0.0001, Hs
Rr	22 ± 1	20 ± 1	20 ± 2	0.0004
Spo2	96 ± 2	98 ± 1	98 ± 1	0.0004
Gcs	7 ± 2	8± 2	12 ± 2	0.0023
Process Of Care Parameters	Median (Iqr)	Median (Iqr)	Median (Iqr)	
Injury To Hospital Arrival	72(61-96)	63 (49.5- 89)	63(47-98)	0.001
Hospital Arrival To First Vitals	6.5(6-8)	8(6-9)	7.5(6-10)	0.63
Hospital Arrival To Admission	16.5 (16-18)	18(16-19)	17.5 (16-20)	0.63
Injury To Admission	87.5 (76-113)	80.5(66.5-107.5)	80 (62-113)	0.0009

On-admission vital signs were best to predict 24-Hour mortality. Non-survivors were compared for on-admission parameters and process of care parameters based on early, delayed and late mortality. All three groups were comparable based on their age and gender since their p value was found to be non-significant. Parameters like HR, SBP, RR, SpO2 and GCS were found to be significant implying that non-survivors of early mortality group had high HR, low SBP, high RR, low SpO2 and low GCS on admission when compared with delayed and late mortality group. However, as the length of in-hospital stay increased, the differences in on-admission vital signs between patients with delayed and late mortality were decreased (Table 3) and, consequently, the ability of on-admission physiological vital signs and GCS to predict delayed and late mortality. The critical process of care indicator of the third delay (in receiving care), is the time interval between the arrival of the trauma victim to the first vital measurement being taken (signalling the initiation of triage). There were significant difference of injury to hospital arrival time between three groups implying this time could also contribute to the mortality, but this time was non-significant when compared with survivors. Hospital arrival to first vitals & Hospital arrival to admission were not significant among the non-survivors. Because of the injury to hospital arrival time parameter, Injury to admission time was found to be significant among the non-survivors.

DISCUSSION:

This study examined the 30-day mortality rate in a tertiary care centre and the estimate was found to be 12.4% of all trauma admissions. This Indian rate was higher than the in-hospital mortality rates reported by HIC trauma centres for similarly injured patients. [8] However, the current 12.4% mortality rate was similar to the study done by Prashant Bhandarkar et al[1]. There have been improvements in communications, development of infrastructure, and equipment. But there has been no significant trauma systems implementation or intervention (neither pre-hospital nor in-hospital) that can be credited for this observed improvement in mortality. This study might not be representative of the broader situation across India.[12] More than 50 % deaths were in the first week, but after the first 24 hours. Intervention should be specifically planned for this group of patients to bring down the overall mortality. Inadequate pre-hospital resuscitation during the transfer from the injury site to the hospital, with no prehospital fluid or blood resuscitation during a hospital transfer may attribute to the delayed deaths.

The low incidence of patients in hypovolemic shock (and barely recordable BP) on hospital arrival is 12.4%. It might suggest that many of the severely compromised patients who would have died within 24-h of in-hospital stay may have died in the pre-hospital phase. For physiological parameters like SBP, HR, RR and SpO2, there existed a statistically significant association. A low GCS (<9) on arrival was seen to be associated with 53% mortality in our study. In many trauma studies, a low on-arrival GCS was considered as a strong predictor of trauma mortality.[13,14]

Our data also suggested the same finding that the overall mortality progressively decreased with an increasing on-arrival GCS. It reduced from 34.4% in the moderate GCS category to 2.2% in the mild GCS category. Our finding of the GCS and mortality association reflects the same results as studies with large dataset which validates the appropriate use of GCS for triage on-admission in Indian trauma patients. Increasing age is associated with a higher probability of 30-day mortality and this is consistent with findings worldwide.[15]

The process of care delays tend to be relatively pronounced across Lower Middle Income Countries, including India.[6] The 'second delay' or pre-hospital transit time was the median time between injury and arrival (the delay in reaching care, also called the second delay) was slightly longer for survivors than non-survivors. This may mean that although there is no formal system of pre-hospital triage, injury victims with severe conditions likely to die need to be sent directly to the trauma centre by the first responder, who could be a bystander or the police.[1] When second delay was compared between early, delayed and late non-survivors, it was found to be significant implying that it could contribute to the mortality. The 'third' delay or the delay in initiating management is an important delay peculiar to the LMICs. Unfortunately, it has not been adequately studied. In our study, this was the median time from arrival at hospital to first measurement of vital signs, and this served as a proxy measure for the third delay. The third delay was not significant between survivors and non-survivors. Relative proportions of survival in each of the groups were compared based upon time to first vital sign recording.

When compared with the earlier times, improvements have been made in the trauma care centres, as the patient had arrived and vitals checked within 17 minutes, resulting in early triage. This third delay was be improved by immediate triaging on arrival and pre-hospital notification and trauma team call-out protocols, when compared with the earlier studies.

CONCLUSION:

In urban trauma centres of India, One-tenth of all admitted trauma patients (12.4%) died. More than half of the trauma deaths were delayed, beyond 24 h but within a week. We need further research to warrant the causes of death in this delayed group of non-survivors. Physiological vital signs remain a valid predictor of early 24-h trauma mortality but were less predictive of late (8-30 days) and delayed (1-7 days) mortality. Early initiation of trauma assessment and monitoring immediately on arrival was important, not only to predict 30-day survival**,** but also to reduce the mortality. Second delay and third delay might play an important role in mortality. But Early arrival at the hospital and early triage could be a life saver for the patient.

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Conflict Of Interest: Nil

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