

Correlation of Injury Severity Score with Survival time in Fatal Road Traffic Accidents in Central Indian Population

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Abstract

The study was carried out in the department of forensic medicine at Government College and hospital, Nagpur over a period of one and half year on 200 dead bodies of victims of road traffic fatalities brought to mortuary for medico-legal post mortem examination. The aim of study was correlation between injury severity score (ISS) and survival time of victim of road traffic accidental deaths. The ISS was calculated from abbreviated injury scale (AIS). The cases were divided into four groups based on their ISS, where the group with less serious injuries (ISS<25) was considered survivable. The second group (ISS 25-49) was considered as severe, third group (ISS 49-74) was critical and fourth group (ISS 75) was fatal. Survival time was more in victims of road traffic accidents who had injury severity score (ISS) less than 25. On the contrary to this, victims who had ISS more than 25 (25-74), survival time was low. Victims who had ISS 75 died on spot or within 1 hours of fatal road traffic accidents. The ISS score is negatively correlated with the survival time with Pearson's correlation coefficient $r = -0.419$ which is highly significant ($p < 0.0001$).

Keywords: Injury Severity Score (ISS), Abbreviated Injury Scale (AIS), Road Traffic Accidents (RTAs), survival time.

Introduction

Road traffic accidents (RTAs) have emerged as an important public health issue. This needs to be tackled by multi-disciplinary approach. The trend in RTA injuries and death is becoming alarming in India. Injuries and death due to road traffic accidents are the major health problem in developing countries where more than 85% of all deaths and 90% of disability-adjusted life years were lost due to road traffic injuries.¹

Trauma has only recently been recognized as a discrete entity by the medical community. The ideal

method used for scoring trauma rely on anatomical or physiological measurements or a combination of the two. The abbreviated Injury Scale (AIS) and its derivative Injury Severity Score (ISS) both are anatomical scales. The Abbreviated Injury Scale, publication of the 1980 revision of the AIS was enthusiastically embraced by the trauma research community as a useful and reliable injury assessment tool. The AIS has been continuously improved since its inception. The current edition, AIS 2005 Update 2008, represents a five-year revision process involving hundreds of contributors in the USA, Canada, Australia, New Zealand and numerous European countries. Today, the AIS is the global system of choice for injury data collection and has become the basis for a number of derivative scales in use (e.g., Injury Severity Score, TRISS, ASCOT).^{2, 3}

The Injury severity score is calculated from AIS virtually the only standard anatomical scoring system in use that correlates linearly with the mortality, morbidity, hospital stay and other measures of severity. So, the purpose of the present study is to establish the correlation

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between injury severity score (ISS) and survival time of victims of road traffic accidental deaths. Introduction of these anatomical scoring method in forensic medicine may provide a standardized database of autopsy findings, clinical value for evaluation of trauma patients which would be a tremendous contribution to the quality of trauma treatment and the assessment of preventable deaths.

Material and Method

The cross sectional prospective study was conducted on total 200 dead bodies of victims of road traffic fatalities brought to mortuary for medico-legal post mortem examination in the department of forensic medicine at Government College and hospital, Nagpur, Maharashtra which serves mostly central Indian population. Duration of study was two years. The study was approved by institutional ethics committee. Decomposed bodies, cases with doubtful history were excluded from the study. The cases were divided into four groups based on their ISS, where the group with less serious injuries (ISS<25) was considered survivable, second group (ISS 25-49) was considered severe, the third group (ISS 49-74) was considered as critical and fourth group (ISS 75) was considered as fatal, thus not survivable.

Injury severity score (ISS) scoring method: Each injury is assigned an abbreviated injury scale (AIS) score and the nine body regions of AIS are grouped into six body regions mentioned below. Only the highest AIS score in each body region is used. The three most severely injured body regions have their score squared and added together to produce the ISS score.^{4,5,6}

$ISS = A^2 + B^2 + C^2$ where A, B, C are the AIS scores of the three most injured ISS body regions. The six body regions of injuries used in the ISS are: 1-Head or neck Face 2-Chest 3-Abdominal or pelvic contents 4-Extremities or pelvic or shoulder girdle 5- Extremities or pelvic or shoulder girdle 6-external. Association for advancement of automotive medicine, 2005 protocols updated in 2008 used for calculation of injury severity score (ISS).

Results

Table 1: Distribution of Cases according to Survival Period

Survival Time	Cases	Percentage
Spot death/< 1 hrs	37	18.50
1 to 6 hrs	44	22.00
6 to 12 hrs	9	4.50
12 to 24 hrs	23	11.50
24 to 48 hrs	22	11.00
48 to 96 hrs	29	14.50
4 to 7 days	11	5.50
>7 days	25	12.50
Total	200	100.00

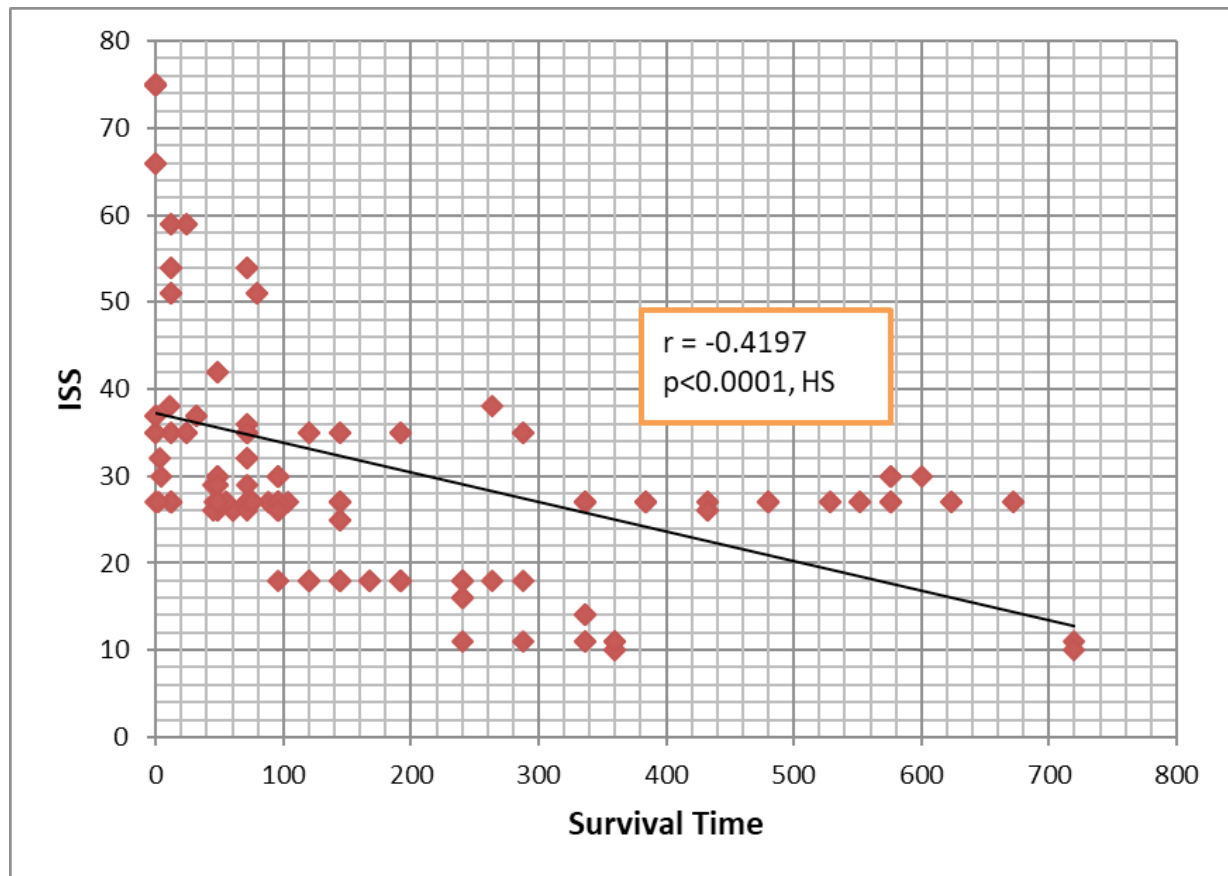
Table 2: Distribution of Cases according to Injury severity score (ISS)

Injury Severity Score	Cases	Percentage
< 25	34	17.00
25 to 49	139	69.50
50 to 74	15	7.50
75	12	6.00
Total	200	100.00

Table 3: Correlation between ISS and Survival time

Survival Time	ISS < 25	ISS 25 to 49	ISS 50 to 74	ISS 75
Spot death/< 1 hrs	0	14	11	12
1 to 6 hrs	0	40	4	0
6 to 12 hrs	0	9	0	0
12 to 24 hrs	0	23	0	0
24 to 48 hrs	0	16	0	0
48 to 96 hrs	1	25	0	0
4 to 7 days	8	12	0	0
>7 days	25	0	0	0
Total	34	139	15	12
Percentage	17.00	69.50	7.50	6.00

The ISS score is negatively correlated with the survival time with pearson's correlation coefficient $r=-.0.419$ which is highly significant ($p<0.0001$) as shown in graph 1.



Graph 1: Scatter plot showing correlation of ISS and Survival time

Discussion

Survival Time: 22%(44 cases) of victims of road traffic accidents died in between 1to 6 hours of interval while 18% (36 cases) of victims died on spot or within one hour of road traffic accident i.e. 40% of victims died within 6 hours after the road traffic accidents. Only 12.50% (25 cases) of victims survived for more than 7 days (table 1). Mean survival time \pm SD=145.7 $3\pm$ 293.31 Median survival time = 20 hours and Range is 0-1800 hours.

Present study findings are partly comparable with Sharma B.R et al⁷, Rautji R et al⁸, Kamdar BA et al⁹ and Kumar A et al¹⁰.

The reason for major mortality within the 6 hours of road traffic accidents were most of the injuries were too severe in nature to seek treatment, most of them died on spot or during transportation of victims to the hospitals.

Injury severity score grouping: 17% (34 cases) had an ISS less than 25, while 69.50% (139 cases) of road traffic accidents victims had an ISS in between 25-49. 7.5% (15 cases) had an ISS in between 50-74 and 16% (12 cases) of road traffic accident victims had ISS 75 (as shown in table 2)

Our study is partly in accordance with the studies conducted by Rautji R et al⁸, Friedman Z et al¹¹ and Henrikson EM et al¹². The reason for maximum number of cases had ISS value in between 25-49 is because of the more serious nature of accidents resulting into more severe injuries. The percentage of cases falling between ISS 25-49 is consequently much more as compared to the developed countries, where the higher percentage of cases are seen with ISS 75 (non-survivable). The reason behind it may due to urgent, prompt treatment and facility of trauma centre in developed countries, majority of death having ISS in between 25-49 could have been prevented.

Correlation between injury severity score and survival time: Victims who had ISS less 25, among them, 1 case survived for 48 to 96 hours, 8 cases survived for 4 to 7 days and 25 cases survived for more than 7 days.

On the other hand victims who had an ISS in between 24-49, 14 cases died on spot or within one hour of accidents, 40 cases survived for 1 to 6 hours, 9 cases survived for 6 to 12hours, 23 cases survived for 12 to 24 hours, 16 cases survived for 24 to 48 hours, 25 cases 48 to 96 hours and 12 cases 4 to 7 days. None of them survived for more than 7days. ISS in between 50-74 which was considered as critical had total 15 cases (7.50%) of victims of road traffic accidents, out of which 11 died on spot or within one hour of road traffic accidents while 4 cases survived for 1 to 6 hours. None of them survived for more than 6 hours in this group. ISS 75 which was considered as fatal had total 12 victims, all of them died on spot or within one hour of road traffic accidents (as shown in table 3). The ISS score is negatively correlated with the survival time with Pearson's correlation coefficient $r=-.0.419$ which is highly significant ($p<0.0001$) as shown in graph 1.

Our study partly correlates with the study conducted by Baker SP et al⁶, Rautji R et al⁸ and Nikolic' et al¹³, Vivek S et al¹⁴.

From our observation and above studied it is clear that survival time was more in cases having ISS less 25 (serious group) and cases having ISS in between 25 to 49 (severe group). Death may be prevented in these groups if effective emergency medical system, urgent and prompt surgical intervention, medical care and treatment were done in time. The higher figure of mortality in both these ISS group in our country is due to virtual absence of basic resuscitative measures being given to the casualties at the accident sites, as most of the casualties in the present study were brought to the emergency department by the general public and police personal, who unfortunately have no practical knowledge of basic first aid.

On the contrary, third group ISS 50-74 which was considered as critical and fourth group ISS 75 considered as fatal and thus un-survivable had very low survival time. Death cannot be prevented in this group regardless of adequate medical care and emergency measure. The injuries were fatal in nature.

Conclusion

Survival time was comparatively more in serious and severe groups as compared to critical and fatal groups in our study. The Injury Severity score is negatively correlated with the survival time with Pearson's correlation coefficient $r=-.0.419$ which is highly significant ($p<0.0001$). The patients in these groups require immediate care and prompt treatment by specialists. With the quality of care and treatment, prognosis of these patients could be better. The use of survival scoring systems permits rapid identification of unexpected outcomes, allowing investigators to perform detailed reviews of particular cases and to determine the reasons for particular outcomes. Very few studies have been done in central Indian scenario on this topic. Further studies and researches with more sample sizes are needed to enhance its role in post mortem cases.

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