

COMPARING SHORTTERM SURVIVAL BY ISS AND NISS IN ROAD TRAFFIC ACCIDENTS

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ABSTRACT

Accident is an event, independent of human will power, caused by an external force that acts rapidly and results in bodily or mental damage. An accident that takes place on the road involving a vehicle is termed as road traffic accident. India, the former USSR and the USA have reported largest number of traffic related fatalities among all nations. Delhi the 3rd most populous city in India has the distinction of having 2nd highest ratio of death by accidents among the metropolitan cities of this country. The importance of survival period of any trauma victim cannot be over emphasised. Different methods have been employed to measure the extent of trauma in numerical terms. Among the anatomical scoring systems the most popular method is injury severity score (ISS). It was modified recently in 1997 to new injury severity score (NISS). Both ISS & NISS were correlated to survival period by multiple regressions among 110 individuals died due to road traffic accidents in East Delhi during 1999-2000. On comparing both scoring systems it was found that although linear regression does not exist between survival period and them, however NISS correlates better to survival period than ISS.

KEY WORDS: Accident, ISS, NISS, Survival period

INTRODUCTION

World Health Organisation defines accident as an event, which is independent of human will power, caused by an external force, acts rapidly, and results in bodily or mental damage. If death occurs at once or within a week after the accident, it is termed as fatal accident (ICD X WHO, 1992).

Vehicular accidents and accidental deaths have taken on an epidemic form worldwide, due to modernisation and a rapid increase in transportation. They have become the major cause of death among people below 50 years of age (Sharma et al, 2001). India, the former USSR and the USA have reported the largest number of traffic related fatalities among all nations (Sahdev et al, 1994). Estimates suggest that there are 60 fatal accidents per 10,000 vehicles per year in India, compared to 2-3 fatal accidents per 10,000 vehicles per year in the developed countries. Road Traffic accident accounts for 33.2% of total accidental deaths in India. National Crime Record Bureau Report (1999) shows that every 1.9 minutes one accidental death is reported in India, with total figure at more than 2.7 lacs per year. Table-1 gives the overall incidence of accidental deaths in India for the period 1995-1999. Delhi, the 3rd most populous city in India has the distinction of having 2nd highest ratio of death by accidents among the metropolitan cities. Table-2 gives the figure of road traffic accident and fatalities in Delhi during last 5 years.

Table 1: Accidental Deaths in India from 1995-1999

Year	No. of deaths			Rate of Accidents to death
	Male	Female	Total	
1995	1,57,219	65,268	2,22,487	24.29
1996	1,56,106	63,988	2,20,094	23.62
1997	1,64,876	69,027	2,33,908	24.62
1998	1,85,520	72,889	2,58,407	26.62
1999	1,93,652	98,266	2,71,918	27.56

Source: Accidental Death & Suicide in India, 1999. NCRB, Ministry of Home Affairs, New Delhi.

Table 2: Road Traffic Accidents in Delhi

Year	No. of Accidents	Impaired	Death
1998	10,957	10,700	2,342
1999	9,907	8,612	2,040
2000	9,863	8,439	1,919
2001	8,987	8,130	1,778

Source: Dainik Jagran 27.12.2001 & Times of India 8.1.2002.

The above figure indicates that around 20% of the injured in accidents dies as a result of the injuries. The short-term survival period in these victims of road traffic accident is an important issue for the following reasons:

- (a) To plan issues related to death such as: will etc.
- (b) To optimally utilise the scarce I.C.U. and other critical care medical facilities.
- (c) To make the relative mentally prepared to ultimate eventuality.
- (d) To assess the quality of care provided by an institution.

Perhaps, the first attempt to classify injuries on the basis of severity was made by De Haven in 1943, when he created a scale to study airplane crash injuries (Ryan et al, 1968). One of the most popular anatomical traumas scoring system was introduced by Baker in 1974 known as Injury Severity Score (ISS). The ISS uses the highest abbreviated injury scale for 3 most severely injured body regions. But, it has been criticised for its failure to account for multiple severe injuries in the same body region (Cooper et al, 1988, Brenneman et al 1998) To overcome this criticism a New ISS (NISS) was proposed by Oster et al in 1977 that takes into account, the 3 most severe injuries (highest AIS score) irrespective of body region (. The study by Brenneman (1998) in Canada evaluated ISS and NISS among patient with blunt trauma and concluded that NISS provides a more accurate prediction of short-term mortality. Thus, a perspective autopsy study was planned to compare whether ISS or NISS in better in co-relation with the survival period in cases of road traffic accidents by autopsy method. Since these scoring methods have been found valid for evaluating trauma care by number of workers (West 1982, Okada et al, 1987, Kumar et al, 1989, Adams et al, 1998).

MATERIALS & METHODS

The study was conducted at Department of Forensic Medicine, University College of Medical Sciences & GTB Hospital. This Institution is the only Tertiary Care Centre, situated in Eastern part of Delhi to caters health and medical needs for this part of city having a population of~3 million people. The study was conducted for one-year period starting from February 1999. In India, all cases of accidental deaths are subjected to complete medicolegal postmortem as per Section 174 code of Criminal Procedures. One hundred and ten victims of road traffic accidents were studied consecutively whose detailed history and case records were available. Unclaimed, decomposed or cases with doubtful history were excluded from the study.

At the time of autopsy, the Abbreviated Injury Scale (AIS) of each injury was determined using Association for Advancement of Automobile Medicine (AAAM), 1990 protocol. Each case was examined in detail and ISS as well as NISS were calculated based on the AIS. Other relevant parameters like age, sex, survival time, date & time of injury and medical invention given were also recorded. The results were analysed to find out the correlation between ISS, NISS and survival period by regression analysis using SPSS 6.0 version using computer.

OBSERVATIONS & RESULTS

(a) Age & Sex Distribution

The age of the victims ranged from 6 years to 80 years with maximum number of cases (37.3%) falling in the age group of 23-30 years of age. Minimum numbers of cases were seen in the age group above 70 years (0.9%) followed by the age group 0-10 years (2.7%). The mean age of victims was 33 years with S.D. \pm 15.87 years. The overall involvement of males was 90% as compared to 10% for female with males, female ratio of 9: 1.

(b) Relationship of Survival Period with ISS & NISS

The cases were divided into 3 categories depending upon survival period as follows:

- (I) Survival period upto 6 hours also includes spot deaths and cases declared brought dead in hospital);
- (II) Survival period more than 6 hours upto 12 hours; and
- (III) Survival period more than 12 hours.

The values of mean, S.D. and 95% C.I. for ISS& NISS in relation to above categories of survival period is given below in Table 3.

Table 3: Distribution of Cases with ISS & NISS Mean, S.D. and 95% C.I. for Mean in Relation to Survival Period

Survival Period (In Hours)	No. of Cases (%)	Mean		S.D.		95% CI for mean	
		ISS	NISS	ISS	NISS	ISS	NISS
Less the 6.00	77 (70.0)	44.9	49.7	22.5	19.6	39.7 - 50.1	45.2-54.1
6.01 - 12.00	10 (9.09)	25.2	34.6	8.06	9.3	19.4 - 30.9	27.9-41.2
12.01& More	23 (20.9)	23.7	35.5	8.97	11.8	19.9 - 27.6	30.3-40.6
Overall	110 (100)	38.7	45.3	21.8	18.6	34.5 - 42.8	41.8- 48.9

Box plot was made using 3 slots of survival period 0-30 minutes, 31-60 minutes and more than 60 minutes in relation to ISS & NISS. In the first slot of 0-30 minutes, there were 94 cases. The medians of ISS & NISS were 34 and 43 respectively. Percentiles at the scores 25 and 50 were higher in NISS in comparison to ISS. Similar trends were witnessed in other two time slots as evident from table 4 & box plots.

Table 4: Medians & Interquartile Range of ISS & NISS in Relation to Survival Periods

Survival Period (Minutes)	Frequency	ISS			NISS				
		Median	Percentiles		Median	Percentiles			
			25	50	75		25	50	75
0-30	94	34	22	34	75	43	34	43	75
31-60	3	22	16	22	27	27	27	27	41
61 +	13	22	18.5	22	33.5	29	24	29	42

The multiple regression values of ISS &NISS in relation to survival period are given below in Table 5.

Table 5: Values of Multiple Regressions of ISS & NISS in Relation to Survival Period

Score	Multiple regression Value	Value of F	Value of Sign F	Whether Significant
ISS	0.77403	3.37291	0.0690	No
NISS	0.18846	3.97726	0.0486	Yes

The multiple regressions suggest that the significant correlation exists between survival period and NISS and not with ISS for short- term survivability.

DISCUSSION

Road traffic accidents (RTA) exceed any other lethal causes and take first place for work years of potential life lost (Wang et al, 1998). Autopsy still remains the "Gold Standard" by which the physician's clinical diagnosis is either confirmed amended or refuted. It is the most reliable and accurate instrument for investigation of injuries. The age and sex distribution of the cases was found in tune with other similar studies (Rutledge et al 1993,Friedman et all.1996, Salgado et al 1998, Sharma et al 2001).

Seventy-seven (70%) victims died either on the spot or with in 6 hours of arrival in hospitals and 48 (43.6%) victims died either on the spot or were declared brought dead in the hospital. These figure are lower to study by Steenberg (1994) and were significantly higher in comparison to study by McAnena et al (1992) and Sharma et al (2001). The higher figure of early mortality may be due to inadequate infrastructure for early transport and management of trauma patients and involvement of heavy vehicle on the highway in the vicinity of the hospital where large number of accidents took place.

Other workers have also felt the importance of relationship between injury scores and survival period (Kumar 1989, Bergvist 1983). This information can help in giving priority in treatment especially in countries where resources are limited. Again this information can serve as a yardstick to measure the quality of care being provided by an institution for these types of cases. However, a better quality audit can be done using a physiological scoring system such as TRISS method (Boyd et al, 1987).

The mean ISS was almost double for the spot deaths and those died within 6 hours of arrival in the hospital in comparison to those who survived more than 6 hours. The difference was highly significant ($p = 0.000$) for both ISS and NISS. When the mean ISS & NISS of cases, who did not died on the spot or were not declared dead on arrival in hospital, were compared they were 30.8 ± 15.0 for ISS and 38.8 ± 13.8 for NISS. This difference was again statistically significant ($p = 0.0000$). This indicates that

NISS correlates better with the mortality than ISS. The mean of ISS & NISS for this group of patients were almost similar to the results obtained by Brennaman (1998), who also advocated that NISS is a better scoring system as compared to ISS. In the present study 24(21.8%) victims were having the AIS of 75. Identical ISS & NISS were found in 63(57.2%) victims and discrepant in 47(42.7%). The figures for higher identical scores were due the large number of cases with score of 75. The identical scores were seen in almost half (32%) in the study by Brennaman (1998). The box plots in all the 3 time slots shows higher values of median and percentile in NISS than ISS. The total range was however narrower in NISS in comparison to ISS. The multiple regressions establish that NISS correlate significantly with survival period (Sing F=0.0486), whereas ISS do not. Survival periods and injury scores shows that linear relationship does not exist between these two variables in a hospital setting. The possible explanation for such relationship can be: a) large number of cases with higher scores either died on the spot or survived for a very short period; b) both ISS and NISS are anatomical scoring method with no consideration for physiological factors responsible in deciding the survival period; and c) variable quality of care rendered depending upon the type of injuries in the hospital.

In conclusion, despite the limitations, anatomic injury scoring systems are useful tool for doctors and trauma research. Among the pure anatomic scoring systems NISS is a better system as compared to ISS in order to measure survival period as well as mortality. Another practical forensic utility of the study lies in the fact that it provides an objective criterion as to at what median/mean of NISS/ISS the injuries may be sufficient to have a fatal outcome. In order to accomplish the above reference values of mean/median of NISS/ISS should be available for each type of traumatic death in a particular set up.

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