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Surgical Audit of Polytrauma Patients Admitted At Trauma Centre, J.A. Group of Hospitals & G.R. Medical College, Gwalior: A Prospective Study

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Abstract: Polytrauma is defined as significant injury to more than one body region. Road traffic accidents, assaults, falls and other unnatural causality responsible for injuries are increasing rapidly every year. In this prospective-epidemiological study of polytrauma patients admitted at Trauma Centre, J. A. Group of Hospitals Gajra Raja Medical College, Gwalior, M.P., 200 patients of polytrauma patients with signs of life admitted at Trauma Centre were studied. This Centre is a level II trauma care Centre as per recommendations for Pre-hospital trauma care by government of India admits approximately 5000 trauma patients every year, and has no assigned trauma catchment area or geographic jurisdiction. Objective of this study is to determine clinico-epidemiological profile, grading of severity & associated outcome, formulate a standard guideline for management of polytrauma patient and thus helping in providing data required for planning and delivering effective injury prevention programs. Our study showed most of the patients were in the age range of 21-40 years. Road traffic accident was the most common mode of injury (73%) followed by assault and fall. 60% patients were surgically operated and rest were managed conservatively. Duration of hospital stay in survived patients increases with increase in ISS Score with maximum duration of stay in ISS score of >50. Mortality rate was 100% in patients with low Glasgow score (0-5).
Keywords: Polytrauma, prospective-epidemiological study, ISS score, Glasgow coma score.

INTRODUCTION

Injury and trauma, often used interchangeably, represent a major health problem worldwide. Injuries represent 12% of the global burden of disease [1]. Road traffic injuries are a major cause of mortality: 22.8% of overall burden of death is related to injuries [2].

Trauma is a leading cause of morbidity and mortality in the under age 45, and the third highest cause of death in the developed world where there are established trauma care systems [3]. The situation in developing countries is alarming due to lack of resources, organization and integration in trauma care. In India, for example, approximately 3.2 million people are injured in road traffic accidents every year. Of these, about 48,000 die [4]. According to the World Health Organization, by the year 2020, trauma will be the leading cause of years of life lost in both developed and developing countries [5]. Accelerated urbanization and industrialization over the last three to four decades has led to an alarming increase in the rate of accidental injuries, crime, and violence, and ever-increasing terrorist activities over the last two decades have ushered in man-made mass-casualty disasters [6]. Worldwide, about 16,000 people die every day as a result of an injury (5.8 million deaths per year), and the projections for year 2020 show that 8.4 million deaths per year are expected [7, 8].

Injury results from a transfer of energy – most commonly kinetic, but within armed conflict, thermal, chemical, blast, and radiation become important to the patient. The nature/severity of the injuries sustained depends on the type and magnitude of impacting energy and vulnerability of the host. Clearly, risk-taking behavior involving transportation ± alcohol, more prevalent in younger males, conveys a higher likelihood of injury. Indeed, statistics show that males predominate in injury hospitalizations up until the age of 65[9, 10]. Among senior citizens, this type of risk-taking behavior is less common but falls secondary to medical diseases, sensory impairment, and musculoskeletal conditions, which occur increasingly with age. Osteoporosis in older women makes them

more vulnerable to injury from falls at home – usually hip and upper limb fractures – but true polytrauma is relatively rare amongst this group. Polytrauma can be defined as significant injury in at least two out of the following six body regions:

- Head, neck, and cervical spine
- Face
- Chest and thoracic spine
- Abdomen and lumbar spine
- Limbs and bony pelvis
- External (skin)

AIS (abbreviated injury scale) grade the severity of each single injury from 1 (mild) to 6 (maximal) on an ordinal scale: A serious injury to anybody region is usually regarded as AIS >2 [11, 12]. Therefore, polytrauma can be regarded as an AIS >2 in more than one of the following six body regions (ISS >17). The injury severity score makes possible a valid numerical description of the overall severity of injury in persons who have sustained injury to more than one area of body

To ensure prompt referral of victims to definitive care centers to prevent death and disability we need to establish a comprehensive trauma care service. One of the essential components is development of trauma registries to monitor the system and provide statewide cost and epidemiological statistics. The objective of this study to determine clinico-epidemiological profile, grading of severity & associated outcome, formulate a standard guideline of management of polytrauma patients, preparedness & level of training of Trauma Centre staff &setup surgical trauma registry& thus help in providing data required for planning and delivering effective injury prevention programs.

MATERIALS AND METHODS

- Study Design: prospective-epidemiological study
- Study period: January 2016 to December 2016.
- Sample size: 200 patients of polytrauma with signs of life admitted at Trauma Centre, J.A. Group of Hospitals and G.R. Medical College.

Inclusion Criteria

- Patients having multiple sites of injury who required hospitalization.
- Patients who gave written/informed consent for study.

Exclusion Criteria

- The patient who suffered from severe poly-trauma due to burn and drowning were excluded from the study.
- Patients not giving consent for undergoing in the study will be excluded from study

A comprehensive history was taken from the patient or the attendant and questionnaire was framed for each patient. A fixed protocol was made for the management of polytrauma patient and evaluation was done accordingly. Simple, rapidly performed maneuvers, such as the administration of Intravenous fluids, Endo-tracheal intubation, and compressive dressings on sites of active bleeding on arrival of patients to Trauma Centre were done.

After resuscitation required investigations were performed:

- CBC count, coagulation studies, blood type, and blood cross-match (if indicated).
- Urinalysis, urine toxicological screen, and serum or urine pregnancy tests in females of appropriate age.
- Serum electrolyte values, Creatinine level, and glucose values are often obtained for reference.
- Lipase or amylase level.
- Imaging studies (USG, X-RAY, CT scan, MRI etc.)

Data was collected and compiled regarding:

- Age of the patient
- Sex
- Injury time
- Mechanism of injury
- Time from injury to arrival in trauma centre
- Diagnosed injuries
- Injury severity score, Glasgow Coma Scale
- Operative procedure performed
- Total length of hospital stay
- Mortality prior to discharge
- Cause of death.

The Glasgow Coma Scale (GCS) score was calculated using the following table.

The Abbreviated Injury Scale (AIS) was created to describe the individual injuries of a crash, but soon after it became describable to have a severity score characterizing the patient as a whole. The desire to give a numerical rating to poly-traumatized patients led to the development of the Injury Severity Score.

For the purpose of scoring, the body is divided into seven regions.

- Head (including the face)
- Neck
- Thorax
- Abdomen/pelvic contents
- Spine
- Extremities

Eye opening	Score
Spontaneous	4
To speech	3
To pain only	2
No eye opening	1
Best motor response	
Obeys commands appropriately	6
Localizes to stimulation	5
Withdrawal from stimulation	4
Abnormal flexion response	3
Abnormal extension	2
No motor response	1
Best Verbal Response	
Oriented and appropriate	5
Confused conversation	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1

Total score = Sum of (eye opening + best motor response + best verbal response).
Total Score ranges from 3-15.

The AIS classifies individual injuries by body region as follows:

- AIS 1- Minor
- AIS 2- Moderate
- AIS 3-Serious
- AIS 4- Severe
- AIS 5- Critical
- AIS6 – Maximal (currently untreatable)

The Injury Severity Score is therefore defined as the "sum of the squares of the highest AIS grade in each of the three most severity injured areas".

American Medical Association Committee defined nine categories of severity for several anatomic areas of which 5 were applicable to ISS. 1 to 5 value as presented in AIS. An AIS 6 represents a fatal injury for that anatomic area and automatically scores the ISS as 75 (the highest possible score) regardless of any other injury. AIS scores of 7-9 each define fatal injury at the scene or within 24 hours irrespective of injury severity, so they were not clinically useful in the development of the ISS.

OBSERVATION AND RESULTS

Table-1: Age distribution in poly-trauma and blunt trauma abdomen patients

Age group (yrs)	No. of patients	Percentage
0-20	34	14
21-40	114	57
41-60	42	21
> 60	10	5

According to table the younger age group had more incidences of poly-trauma and blunt trauma abdomen. The age group most affected was 21-40yrs (57%) and 41-60 yrs (21%) followed by 0-20yrs followed by >60 yrs.

Table-2: Gender Distribution in polytrauma patients

Gender	No. of patients	Percentage
Male	163	81.5
Female	37	18.5

As per above table males were predominantly affected than the females (81.5% vs. 18.5%).

Table-3: Distribution of polytrauma patients according to mode of injury

Mode of Injury	No. of patients	Percentage
Road Traffic Accident	146	73
Fall From Height	16	8
Assault	38	19

In our present study road traffic accidents (146) were the most common mode of injury among the poly-trauma patients followed by assault (38) and followed by fall (16).

Table-4: Distribution of Polytrauma patients according to system involved

Injuries	No. of patients	Percentage
Head injury	88	42
Chest	110	55.5
Abdomen	116	58
Spine	12	6
Pelvis	22	11
Upper limb	46	23
Lower limb	35	17.5
External injury	39	19.5

As showed maximum cases of involvement was seen in abdomen (56.5%) followed by chest (54.9%) followed by head injury (42%) upper limb (23%), external injuries (19.5%), lower limb (17.5%), pelvis (11%) and spine (6%).

As per the above mentioned table most of the patient in our trauma center required surgical intervention (60%) (Table-5).

Table-5: Distribution of polytrauma patients as per the intervention done

	No. of patients	Percentage
Operated	120	60
Conservative	80	40

Table-6: Various Intervention performed on polytrauma patients

Intervention done	No. of patients
Laparotomy	30
ICTD	31
Orthopedic intervention	50
Craniotomy	40
Other	34

The above table shows various type of intervention done with orthopedic intervention being the most common intervention (50) followed by craniotomy (40) followed by other interventions (34) (Like suturing of external wounds) followed by ICTD followed by laparotomy (30).

This table 7 that maximum cases (111) lie in the range of ISS Score 21-40 followed by score of >40 (49) followed by score of 21-40 (40)

Table-7: Distribution of polytrauma patients according to ISS Score

ISS score	No. of patients	Percentage
0-20	40	20
21-40	111	55.5
> 40	49	24.5

Table-8: Comparison of ISS Score and Mortality in polytrauma patients

ISS Score	Patients	Expired	Percentage
0-20	38	0	0
21-30	89	3	3.3%
31-40	39	11	28.2%
41-50	29	25	86.2%
>50	5	5	100%

As the ISS score increases mortality rate increases with increase in ISS score. Maximum mortality is with ISS Score >50 (100%) followed by 41-50(86.2%), 31-40(28.2%), 21-30(3.3%) and lastly 0-20 (0%).

Table-9: Mortality rate according to system involved

System involved	Number of patients	Expired	Percentage
Head and neck	87	39	44.8
Chest	110	11	10
Abdomen	116	15	12.9

As evident from the above table, maximum mortality (44.8%) occurred in the patients with injury to head and neck followed by abdomen (15%) followed by chest (10%).

Table-10: Duration of hospital stay in patients survived versus the ISS score

ISS SCORE	Total no of patients Survived	Average duration of hospital stay in days
0-20	38	7
21-30	86	8
31-40	28	12
41-50	4	17

Above table shows the average duration of hospital stay in survived patients was higher in patients with ISS score 41-50 followed by ISS score of 31-40 followed by ISS score of 21-30 followed by ISS score of 0-20.

Table-11: Relation of Glasgow coma scale score versus mortality in patients of polytrauma

Glassgow Coma Scale score	Total	Expired	Percentage
0-5	2	2	100
6 – 8	17	16	94.1
9 – 12	79	22	27.8
>12	102	4	3.9

Above mentioned table shows that mortality rates were 100% in patients with low Glasgow score 0-5 followed by 94.1% in score of 6-8 followed by 27.8% in score of 9-12 and lowest of 3.9% in score of >12

Table-12: Distribution of polytrauma patients according to mode of discharge

Mode of discharge	No. of patients	Percentage
Discharge	138	69
Expired	44	22
LAMA	7	3.5
Referred	4	2
Abscond	7	3.5

Of the total patient 136 patients were discharged followed by Expired (44) followed by LAMA (7), followed by Abscond (7) and referred (7).

DISCUSSION

In our study, the maximum number of patients sustaining poly-trauma belonged to the productive age group, i.e. 20-40 yrs (55.5%). The experience of other workers in the field of poly-trauma is almost same. The mean age of patients was 40 years in study conducted by Jat A. *et al*. [13]. A wide age range was included in study done by Punjabi S. K. *et al*. [14] but the mean age was found to be in 3rd decade. Reason may be due to the fact that people in young age were relatively more energetic and involved in outdoor activities, involvement in violence and careless in following rules of traffic Exposing them to risk of trauma. It was observed that, in both males and females the most commonly affected age group is 10-39 yrs.

In terms of gender majority of polytrauma patients were males (81.5%) in comparison of females (18.5%). Payal p. *et al*. [15] found in their study that males were affected more often than females (19:1) out of 210 patients of polytrauma in emergency department. In study of Punjabi S. K. *et al*. [14] males were found to be the main victims of maxillofacial trauma. In a study of Markopoulou A. et al[16] the sample consisted of 53 polytrauma patients; out of these 81.1% (n=43) were men.

Among the various cause of injury included, road traffic accident involving 133 patients (66.5%) out of total, followed by assault (25.5%) and fall from height

(8%). Jat A. A. *et al*. [14] also shows the cause of injury was road traffic accident in nine patients (52.9%), falls in three (17.6%), and gunshot wound in five (29.4%). In the study done by Punjabi S. K. *et al*. [14] the most common cause of facial injury was found to be road traffic accident (RTA) followed by assaults while sports was associated least with facial fractures. Study done by Markopoulou A. et al[16] stated regarding the cause of injury, 17% (n=9) of the sample had a fall from height, 18.9% (n=10) was entrainment by a moving vehicle, 34% (n=18) had motorcycle accident and 15.1% (n=8) had a car accident. The reason behind emergence of RTA as leading cause of trauma is that, the number of vehicle on road are increasing exponentially every day without paying attention towards road safety measures.

In present study of cases of polytrauma patients, the maximum patients were managed successfully and were discharged (138) with death of 44 patients. Trauma death studies were very important as these serve as a medical audit and a measure for quality of care provided to Trauma patients in the pre-hospital and In-hospital setting. These studies were also a useful tool to revise, renew, and improve assessment and therapeutic methods in early trauma care. In study done by Jat A. A. *et al*. [13] there were 18 trauma deaths out of 279 patients. The median age of the patients who died was 58.8 years and 125 (61%) patients were men in study of Mestoui Z. E. *et al*. [17]. Contributing factors included the non-availability of portable ventilators in the emergency room, non-availability of beds in the ICU, delayed availability, and in some cases non-availability of radiological investigation, absence of pre-arrival notification, indecision on the part of admitting teams, and at times delayed availability of a senior admitting physician, and non-existence of a Trauma team and the absence of a senior anesthetist resident in the Trauma team. These deficiencies in the trauma care system reflect the overall inadequate infrastructure development in developing countries.

The median ISS of dead patients was 25 (range, 9–75), compared to a median ISS of 9 (range, 1–41) for patients who were discharged alive from the hospital in study of Jat A. A. *et al*. [13]. In another study conducted by Eid *et al*. [18] on patients with brain injuries, it was found that ISS and hypotension reduced their chance of survival. Similarly, Costa *et al*.[19] proved that as ISS increased in patients with ISS>15, mortality increased equally with statistically significant difference in relation with factors such as age, forces acted in injured region and total length of stay in hospital. It can be concluded from above mentioned studies that the Injury Severity Score represents an important step in solving the problem of summarizing injury severity, especially in patients with multiple trauma. The score was easily derived and use of it facilitates comparison of the mortality experience of varied groups of trauma patients, thereby improving ability to evaluate care of the injured.

The predominant cause of death in study done by Mestoui Z. E. *et al*. [17] was CNS injury (63.4%), followed by exsanguination (17.6%). The predominant cause of death because of complications was respiratory failure (6.3%), followed by MOF (1.5%). Sauaia *et al*. [20] shows Central nervous system injuries were the most frequent cause of death (42%), followed by exsanguination (39%) and organ failure (7%). While acute and early deaths were mostly due to the first two causes, organ failure was the most common cause of late death (61%) out of 289 trauma deaths.

A patient's Glasgow Coma Scale reflects the severity of Traumatic brain injury and may be representative of the probability of death after polytrauma. Because of its extreme significance, GCS should be used as a warning sign to guide the performance of a rigorous investigation for and facilitate the resolution and prevention of secondary injuries. In a study done by Costa Da V. *et al*. [19], 200 hundred patients were included and Independent early predictors of mortality were as follows: arterial hemoglobin oxygen saturation (p<0.001), diastolic blood pressure (p<0.001), lactate level (p<0.001), Glasgow Coma Scale score (p<0.001), infused crystalloid volume (p<0.015) and presence of traumatic brain injury (p<0.001).The association between mortality and GCS score in the study suggested that each increased GCS point corresponded to a 2% decrease in mortality. Glasgow Coma Scale allows the conscious level of patients to be assessed and recorded using a numerical score. Its advantage was that it is relatively 'universal', in that it enables different health-care professionals to assess the patient at different times in order to make serial comparisons of the patient's conscious level. It is a simple, straightforward and very brief bedside assessment.

There may be many potential influencing factors that affect the duration of intensive care treatment for patients who have survived multiple injuries. Successful prevention of complicated courses of illness, such as sepsis and renal and respiratory failure, could significantly abbreviate the ICU stay in trauma patients. Therefore, the staff's attention should be focused on preventive strategies. The limitations in our study include its study population of 200 patients, which is statistically insufficient for broader generalizations.

CONCLUSION

The polytrauma patient is a challenge for the surgeon and the ICU team. Most of these patients are young and otherwise normal. Tertiary care centers like our hospital should have an integrated trauma care system with specialized trauma care unit. Accidents are the most common cause of injury in our part of the

country which necessitates use of proper implementation of traffic legislation. There is lack of awareness about road safety in the public. Programs must be initiated leading to increased awareness regarding this. There should be a poly trauma management team consisting of general surgeon, anesthetist, orthopedic surgeon, neurosurgeon, cardiothoracic surgeon, ENT surgeon, nurses and other paramedical staff. Delay in definitive treatment is a very significant contributor to poor outcome and is probably peculiar to a developing nation. We need to reorganize trauma care in such a fashion that the patient receives definitive care in the emergency room. This will ensure a good outcome and improve quality of care even if the patient is shifted to another facility. an effective inter hospital communication system between referring hospitals is needed. This can result in early notification and trauma team activation, better resource utilization, and, in case of non-availability of required resources, early referral to another facility and better outcome of patient

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