
**“ONE YEAR AUTOPSY STUDY ON
PATTERN OF THORACO ABDOMINAL
INJURIES IN FATAL ROAD TRAFFIC
ACCIDENT CASES AT BELAGAVI”**

**Submitted by
REG. NO - BF0120001**

Dissertation

*Submitted to
KLE Academy of Higher Education and Research,
Belagavi, Karnataka.
In partial fulfilment of the requirements for the degree of*

**M.D. (DOCTOR OF MEDICINE)
In
FORENSIC MEDICINE AND TOXICOLOGY**

**DEPARTMENT OF FORENSIC MEDICINE AND TOXICOLOGY,
JAWAHARLAL NEHRU MEDICAL COLLEGE, KAHER,
BELAGAVI – 590010 KARNATAKA, INDIA.**

JUNE/JULY -2023

**KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH,
BELAGAVI**

**Endorsement by the Head of Department,
Principal of the Institution**

This is to certify that the dissertation entitled “ONE YEAR AUTOPSY STUDY ON PATTERN OF THORACO ABDOMINAL INJURIES IN FATAL ROAD TRAFFIC ACCIDENT CASES AT BELAGAVI.” is a bonafide and genuine research work done by **REG. NO - BF0120001**.



Dr. Ravindra S Honnungar MD

Professor & Head

Dr. Ravindra S. Honnungar
Department of Forensic Medicine & Toxicology,
M.B.B.S., M.D.

Prof & Head
J. N. Medical college, KAHER
Forensic Medicine Toxicology
Belagavi - 590010 College, Belagavi.

Date: 31/12/2022

Place: **Belagavi**



Dr. (Mrs) N.S. Mahanthshetti MD.

PRINCIPAL
Principal, KAHER
J.N. Medical College,
BELAGAVI-590010

Belagavi – 590010

Date: 2/1/2023

Place: **Belagavi**

UNDERTAKING

I, (Reg. No - BF0120001), hereby declare that the information and the data mentioned in my dissertation entitled “**ONE YEAR AUTOPSY STUDY ON PATTERN OF THORACO ABDOMINAL INJURIES IN FATAL ROAD TRAFFIC ACCIDENT CASES AT BELAGAVI.**” belongs to me and is original.

I am aware of the definition of plagiarism as detailed below:

- An act or instance of using or closely imitating the language and thoughts of another author without authorization and the representation of that author’s work as one’s own, as by not crediting the original author.
- A piece of writing or other work reflecting such unauthorized use or imitation.
- The deliberate or reckless representation of another’s words, thoughts or ideas as one’s own without attribution in connection with submission of academic work, whether graded or otherwise.

I hereby declare that the thesis prepared by me is original one and does not involve plagiarism anywhere. In case at a later stage, it is found that I have indulged in plagiarism, then I am solely responsible for the same and the institution is at liberty to take any disciplinary action against me including cancellation of dissertation or any other penalties imposed by the University.

Date : 31/12/2022

Place : Belagavi



(REG. NO - BF0120001)

PLAGIARISM ACCEPTED LETTER



JAWAHARLAL NEHRU MEDICAL COLLEGE

(Recognized by Medical Council of India, New Delhi)



Accredited 'A+' Grade by NAAC (3rd Cycle)

Placed in Category 'A' by MHRD (GoI)

Nehru Nagar, Belagavi- 590 010, Karnataka, INDIA

0831 - 2471350



0831 - 2470759



www.jnmc.edu

principal@jnmc.edu

Ref No: MDC/PG/

Date: 02-12-2022.

ACCEPTANCE LETTER

The softcopy of thesis entitled: "ONE YEAR AUTOPSY STUDY ON PATTERN OF THORACOABDOMINAL INJURIES IN FATAL ROAD TRAFFIC ACCIDENT CASES AT BELAGAVI" has been submitted for Anti-Plagiarism check through Turnitin software. The scan has been carried out and the scanned output reveals a match percentage of 09% which is within the acceptable limits of 10% as per the guidelines given by UGC.

Guide.



Dr. (Mrs.) N.S. Mahantashetti.
Chairperson-Antiplagiarism Committee &
Principal,
J. N. Medical College, Belagavi.

To,
Reg. No. BF0120001.
Postgraduate Student,
2020-21 Batch,
Department of Forensic Medicine,
J. N. Medical College, Belagavi.

ETHICAL CLEARANCE LETTER



K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed - to - be - University)

Accredited 'A' Grade by NAAC (2nd Cycle)

Placed in Category 'A' by MHRD (GoI)

**JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)**

Website: <http://www.jnmc.edu>
E-Mail : dome@jnmc.edu

Phone: (+ 91-(0)831 Office : 2472550
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 52

Date: 25/01/2021

To,

(REG. NO - BF0120001)

PG student in Forensic Medicine and Toxicology,
J. N. Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled "ONE YEAR AUTOPSY STUDY ON PATTERN OF THORACO ABDOMINAL INJURIES IN FATAL ROAD TRAFFIC ACCIDENT CASES AT DR PRABHAKAR KORE HOSPITAL MORTUARY BELAGAVI (A CROSS SECTIONAL STUDY)", is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Smita Sonoli)
Member Secretary

JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Harsha Hegde)
Chairman,

JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.



Institutional Ethics Committee
BELAGAVI INSTITUTE OF MEDICAL SCIENCES, BELAGAVI
Dr. B R Ambedkar Road, Belagavi – 590 001
(An Autonomous Medical Institution)

Date:- 08-10-2021

No. BIMS-IEC/163/2021-22

Chairman

Dr Kishore G Bhat
Professor & Head
Dept of Microbiology
MMDSR Belagavi

Member Secretary

Dr. Dr. R G Viveki
Professor & Head
Dept of Community Medicine
BIMS, Belagavi

Basic Sciences Scientist

Dr (Mrs) Padmaja S Nikam
Associate Professor
Dept of Biochemistry
BIMS, Belagavi

Basic Medical Scientist

Dr Basavraj C Kotinatot
Professor & Head
Dept of Pharmacology
BIMS, Belagavi

Clinicians

Dr Shailesh S Patil
Professor and Head
Dept of Paediatrics
BIMS, Belagavi

Dr (Mrs) Shilpa V Dastikop
Associate Professor
Dept of Dermatology
BIMS, Belagavi

Dr (Mrs) Saraswati N
Assistant Professor
Dept of Psychiatry
BIMS, Belagavi

Dr Suchitra R Latkar
Anaesthesiologist
4th Cross, Bhagyanagar,
Belagavi- 590006

Dr Rajashree R Angol
Paediatrician, Camp, Belagavi

Legal Expert

Adv Maheshchandra S Bagali

Social Worker

Mr. Yunus Ahmed Gokak
Sadashiv Nagar, Belagavi

ay Person

Irs Anita D Bukyalkar
ade Marg, Shahpur,
Belagavi

To,


(REG. NO - BF0120001)

2nd yr Post Graduate
Department of Forensic Medicine and Toxicology
Jawaharlal Nehru Medical College, Belagavi

Sub: Institutional Ethics Committee approval of study protocol.

This is to inform you that the research protocol title
"One year autopsy study on pattern of thoraco abdominal injuries in fatal road traffic
accident cases at Belagavi (A cross sectional study)". was reviewed and approved by
the Institutional Ethics Committee in the meeting held on 01-10-2021
subject to the following conditions ----

1. Any adverse reactions / events during the study and amendments in the study protocol should be informed to the undersigned at the earliest.
2. The study will be conducted only after the informed consent from patient/participant/guardian wherever necessary.
3. The permission for conducting the study to be obtained from the head of the institution or concerned authority.


MEMBER SECRETARY
Institutional Ethics Committee
Member Secretary
Institutional Ethics Committee,
BIMS, BELAGAVI

LIST OF ABBREVIATIONS USED

RTA	–	Road Traffic Accident
SEAR	–	South East Asian Region
ISS	–	Injury Severity Score
NISS	–	New Injury Severity Score
AIS	–	Abreviated Injury Scale
CECT	–	Contrast Enhanced Computed Tomography
SD	–	Standard Deviation

ABSTRACT

Title : ONE YEAR AUTOPSY STUDY ON PATTERN OF THORACO ABDOMINAL INJURIES IN FATAL ROAD TRAFFIC ACCIDENT CASES AT BELAGAVI

Introduction :

In India, 1.77 lakh people died in traffic accidents in 2015. RTA accounts for 10% of all accidental deaths. One-fourth of all accidental deaths worldwide are concentrated in SEAR.

Thoracic cage houses body's most important organs for breathing and circulation. Any damage to it has a significant negative impact on one's chances of living.

Perhaps most basic use of ISS is it's ability to predict survival following trauma. These scoring systems are extremely useful in classification of trauma patients and their appropriate triage. It is also helpful in predicting and study of outcome of patients.

3 most severe injuries on AIS are added together to calculate NISS. According to some pilot studies , NISS is more reliable predictor of trauma death.

NISS is one of the most effective injury scoring systems for post mortem injuries. Hence I have used it in my study. Trauma scores help in determining quality of treatment and thereby reducing mortality.

This study will attempt to examine pattern of thoracic & abdominal injuries in patients involving fatal motor vehicle accidents. In road traffic collision situations, brain injuries have traditionally received a lot of attention, but thoraco abdominal region also needs to be thoroughly examined.

Objectives :

- 1) To examine pattern of abdominal and thoracic injuries in fatal motor vehicle accident cases.
- 2) To correlate the relationship between survival time and injury severity score.

Materials and Methods :

Source of data: Autopsy cases of road traffic accidents sustaining thoraco abdominal injuries which are brought to mortuary of Belagavi Institute of Medical Sciences Civil Hospital and KLE's Dr. Prabhakar Kore Hospital.

Type of study : Cross - sectional study.

Study period: January 1, 2021 - December 31, 2022 (13 months).

Sample size : 105.

The study included all fatal cases of thoraco abdominal injuries that were examined after death. According to standard medico-legal autopsy protocol, a thorough dissection and investigation of the thoraco abdominal area was done, and injuries were noted.

Percentages and frequencies were used to express the collected data. Regression analysis was used to determine coefficient of correlation and establish relationship between NISS and survival time.

Results :

82 % victims were males and 52 % were among age range of 21-40 years. Commonest cause for death was hemorrhagic shock in 51 cases (48.57 %) and most common period of survival was within 2 hours of occurrence of accident in 30 victims (28.57 %). The new injury severity score was 51-75 in 65 (61.9%) cases. Injury severity score had very high negative correlation with period of survival that means

victims who had very high injury severity score had very less survival period. The correlation coefficient was -0.7524 suggesting high degree of negative correlation.

The commonest organ to be involved was lungs in 67 (63.8%) cases and second most common organ and commonest abdominal organ to be involved was spleen in 55 (52.38%) cases, 3rd commonest organ and 2nd commonest abdominal organ to be involved was liver in 50 (47.6%) cases. The commonest injury seen was rib fracture in 60% cases and hemoperitoneum was commonest abdominal injury found in 49 (46.66%) cases followed by liver laceration in 31 cases (29.52%).

Conclusion :

Injury severity score had very high negative correlation with period of survival that means victims who had very high injury severity score had very less survival period. The correlation coefficient was -0.7524 suggesting high degree of negative correlation.

Keywords : Thoracic injuries, abdominal injuries, bony fractures, spinal injuries, New Injury Severity Score

TABLE OF CONTENTS

SL. NO.	CONTENTS	PAGE No
1	INTRODUCTION	1-2
2	BASIC SCIENCES	3-14
3	AIMS AND OBJECTIVES	15
4	REVIEW OF LITERATURE	16-27
5	MATERIAL AND METHODS	28-29
6	RESULTS	30-45
7	DISCUSSION	46-51
8	CONCLUSION	52-54
9	SUMMARY	55-56
10	BIBLIOGRAPHY	57-61
11	ANNEXURES	62-74
	ANNEXURES I – Proforma	62-64
	ANNEXURES II – Key To Master Chart	65-70
	ANNEXURES III – Master Chart	71-74

LIST OF TABLES

TABLE NO	DESCRIPTION	PAGE NO
1	Age and sex wise distribution of cases	30
2	Distribution of cases according to region of body involved	33
3	Distribution of cases according to involvement bony fractures	34
4	Number of victims in relation to different organs involved	35
5	Distribution of cases in relation to period of survival	36
6	Distribution of cases in relation to cause of death	37
7	Thoracic injuries	38
8	Abdominal injuries	39
9	Spinal injuries	41
10	Distribution of cases according to new injury severity score	42
11	Age groups in relation to new injury severity score	42
12	Survival period in relation to new injury severity score	43

LIST OF GRAPHS

GRAPH NO	DESCRIPTION	PAGE NO
1	Age wise distribution of cases	30
2	Sex wise distribution of cases	30
3	Type of victim	31
4	Victims in relation to offending vehicle	32
5	Distribution of cases as per place of occurrence of accident	32
6	Distribution of cases as per time of occurrence of accident	33

INTRODUCTION

Most of the injuries disclose themselves hence treatment becomes easier , but blunt thoraco abdominal injuries are silent ones as a result of which often there a fatal outcome. Victims lives can be saved if these injuries are diagnosed earlier and treated immediately. Famous saying by Ogden Nash “Your hopeless patients will live but healthy patients die” just fits in properly for thoraco abdominal injuries.

Statistics :

One of leading causes of morbidity and mortality among young, productive group of population is thoraco abdominal trauma brought on by traffic accidents. Any event in which a motor vehicle collides with another motor vehicle, a person, an animal, road debris, or any other impediment like an electric pole, tree, gate, etc. is referred to as a RTA . 1.77 lakh road accident fatalities were reported in India in total during 2015. Road traffic accidents account for 10% of all accidental deaths and result in significant financial loss for the person, victim's family, and the nation. ¹

In some regions of India, road accidents are main cause of death other than natural causes. Fourth most prevalent cause of death is an accident. Majority of deaths from non-natural causes amounts to 1.2 million deaths each year caused by automobile accidents. More than a quarter of all accidental deaths worldwide occur in the SEAR. ²

NISS is one of the most effective injury scoring systems for post mortem injuries. Hence I have used it in my study. Trauma scores help in determining quality of treatment and thereby reducing mortality.

This study will attempt to examine pattern of thoracic and abdominal injuries in patients involving fatal motor vehicle accidents. In road traffic collision situations, brain injuries have historically received a lot of attention. But thoraco abdominal region also needs to be thoroughly examined. Findings of this study will aid in developing strategies and policies to lower mortality and morbidity from thoraco abdominal injuries. It will also help to broadening the understanding of physicians for treating trauma victims and medico-legal professionals to deposit evidence in court of law.

BASIC SCIENCES

Anatomy :

Thoracoabdominal injuries involve both the thoracic and abdominal cavities.

The thorax contains the heart, the great vessels, and the lungs. The lungs are surrounded by two layers of pleurae protected by the ribs and the thoracic musculature. The diaphragm divides the thoracic and peritoneal cavities with a variable position throughout respiration. The abdominal contents may be raised well into the chest and exposed to chest wall trauma.

The peritoneal cavity contains solid organs, such as the liver, spleen, and pancreas, plus hollow viscous organs, including the stomach and the small and large intestines. Also in this area are the lower ribs, the abdominal wall musculature, vascular structures, the bladder, and retroperitoneal organs and spaces.³

Thoraco abdominal injuries provide major contribution to death because thoracic cage contains vital organs of circulation and respiration and trauma to these challenge integrity of whole body. Abdomen is third commonest region of the body injured in trauma, as it is unprotected by bony structure and abdominal cavity contains vital organs like liver, spleen, kidney, pancreas, major blood vessels, stomach, intestine, bladder, etc and thus trauma to this region can challenge viability of individual.⁴

Pathophysiology of thoraco abdominal injuries :-⁵

Thoraco abdominal injuries are generally caused by two mechanisms :

- 1. Compression force**
- 2. Deceleration force**

Compression force acts during direct blow or extrinsic compression against fixed object (E.g.: Seat belt injury). This mostly causes tears or sub capsular hematomas of solid organs. It also cause transient increase in intra luminal pressure in bowel leading to its rupture.

Deceleration forces cause stretching and linear shearing which tends to rupture the supported (fixed) structures at the junction between free and fixed part.⁵

Thoraco abdominal Injuries :⁶

They are of two types :

- 1. Thoracic injuries**
- 2. Abdominal injuries**

Thoracic injuries

1. Lung injuries :

- a. Pneumothorax :** Is the most common intrathoracic injury after blunt thoracic trauma.

- b. **Tension pneumothorax** occurs in 1–2% of patients with a spontaneous pneumothorax. Pneumothorax results from the loss of air from the lung into the pleural space. If no mass effect is caused by this air, the injury is referred to as a simple pneumothorax. However, if the loss of air into the pleural space continues, tension can result with concomitant shift of the mediastinum away from the side of the pneumothorax.
- c. **Lung contusion** : It is a bruise of the lung associated with hemorrhage and edema into the lung parenchyma . It can result from a sudden deceleration in which the lung strikes the chest wall, from a concussive blow to the chest that compresses the lung or from a displaced rib fracture.
- d. **Hemothorax**: It may result from injury to the lung parenchyma or any of the intrathoracic vessels that may be lacerated by a traumatic rib fracture. In the setting of trauma, a pneumothorax may accompany this hemorrhage, causing a hemopneumothorax.

2. Cardiac injuries :

- a. **Comotio cordis** : It is a cause of sudden cardiac arrest resulting from blunt, nonpenetrating trauma to the precordium. It is often of apparently low energy and results in cardiac arrhythmias in the absence of any structural injury to the heart or surrounding tissues .
- b. **Cardiac contusion and other blunt cardiac injuries** : Cardiac contusion (also referred to as contusio cordis) may result from a direct blow to the chest or from a rapid deceleration of the heart, causing it to strike the rib-sternum complex. Most injuries occur to the right ventricle, due to its

proximity to the anterior chest wall. It is more common in high-speed events such as motor vehicle accidents.

3. Chest wall injuries :

- a. **Rib fractures :** Rib fractures are considered the most common serious injury of the chest wall. Rib fractures can be divided into upper zone (first four ribs), midzone (ribs 5–8), and lower zone fractures (ribs 9–12) .

The most commonly fractured ribs from direct impact in any age group are the midzone ribs. Fractures of the upper zone or lower zone ribs, multiple fractures, and flail segments are less likely to be isolated injuries than other patterns of rib fractures and may result in injury to surrounding structures.

Acute traumatic impact fractures of the first and second rib are often associated with neck trauma and vascular injuries, as well as pneumothorax, lung laceration, and hemothorax. Direct impact fractures of the lower ribs may injure the kidneys, liver, or spleen.

Splenic trauma has been reported in up to 20% of left lower rib fractures and acute liver trauma in up to 10% of right lower rib fractures

The diagnosis of acute rib fractures is often indicated by a history of a traumatic event.

- b. **Slipping rib syndrome :** Slipping rib syndrome (also referred to variably in the literature as rib-tip syndrome, clicking rib syndrome, or rib pain syndrome) is characterized by an abnormal movement of the lower ribs resulting in intercostal nerve impingement and pain.

- c. **Costo-sternal syndrome / costochondritis** : costochondritis is a common cause of atraumatic chest pain and is characterized by pain and tenderness of the costochondral junction without swelling.
- d. **Sternal fractures** : Acute traumatic sternal fractures are frequently seen in association with deceleration injuries and/or direct blows to the chest .
- e. **Scapular fractures** : Scapular fractures represent less than 1% of all skeletal injuries and 5% of shoulder fractures. There are eight types of scapular fractures. They are classified by anatomic location: body, glenoid rim, glenoid fossa, anatomic and surgical neck, acromion, spine, and coracoid process. The majority of scapular fractures are body fractures.

Abdominal injuries :

1. **Splenic injury** : Spleen is the most commonly injured intra-abdominal organ. It can result from a direct force to the abdomen, especially the left upper quadrant, and from a sudden deceleration when the hilum is torn or by displacement of lower left rib fractures. Splenic rupture is associated with abdominal pain, left shoulder pain or periscapular pain.
2. **Hepatic injury** : Injury can result from a direct blow, especially to the right upper quadrant, a sudden deceleration, or by displacement of right lower rib fractures. Hepatomegaly results in an increased risk of injury, not only because of the increased size but also because an enlarged liver is softer than normal.

3. **Kidney injury** : Renal injuries may be relatively asymptomatic, even with repeated blows, they may result in renal contusions causing microscopic or gross hematuria.
4. **Pancreatic injury** : The pancreas is injured in 1–2% of abdominal trauma. A forceful blow to the upper abdomen is the most common mechanism of injury.
5. **Bowel injury** : Bowel injury is infrequent and most commonly occurs as a result of a forceful blow to a small area over the small intestine.
6. **Groin injury** : The etiology is most commonly soft tissue injury, contusion or hematoma, and muscle-tendon strain.

*Injury scoring system*⁷

The ability to predict survival after trauma is perhaps the most fundamental use of injury severity scoring. These scoring systems are extremely useful in classification of trauma patients and their appropriate triage. It is also helpful in predicting and study of outcome of patients.

Classification :

1. Physiologic

a. Revised Trauma Score (RTS) –

The Revised Trauma Score (RTS) is one of the more common physiologic scores in use. It combines 3 specific, commonly assessed clinical parameters, as follows: (1) Glasgow Coma Scale (GCS), (2) systolic blood pressure (SBP), and (3) respiratory rate (RR).

b. Acute Physiology and Chronic Health Evaluation (APACHE) –

This system has 2 components, as follows: (1) the chronic health evaluation, which incorporates the influence of comorbid conditions (eg, diabetes mellitus, cirrhosis, chronic renal failure, heart disease malignancy), and (2) the Acute Physiology Score (APS). The APS consists of weighted variables representing the major physiologic systems, including neurologic, cardiovascular, respiratory, renal, gastrointestinal, metabolic, and hematologic variables.

c. Sequential Organ Failure Assessment Score (SOFA)

The score is based on 6 different parameters, as follows: respiratory system ($\text{PaO}_2/\text{FiO}_2$, mm Hg), cardiovascular system (blood pressure/vasopressors), hepatic system (bilirubin, mg/dL), coagulation system (platelets $\times 10^3/\text{mm}^3$), renal system (creatinine, mg/dL), and neurological system (Glasgow Coma Scale).

d. Systemic Inflammatory Response Syndrome Score (SIRS) –

The systemic inflammatory response syndrome (SIRS) score is a generalized response to nonspecific insults, including infections, pancreatitis, trauma, and burns.

e. Emergency Trauma Score –

Comprises 4 parameters: patient age, Glasgow Coma Scale, base excess, and prothrombin time (PT).

2. Anatomic

a. Abbreviated Injury Scale (AIS)

b. Injury Severity Score (ISS)

c. New Injury Severity Score (NISS)

The AIS is a simple numerical method for grading and comparing injuries by severity.

The ISS is defined as the sum of squares of the highest AIS grade in the 3 most severely injured body regions.

Six body regions are defined, as follows:

1. The thorax
2. Abdomen and visceral pelvis,
3. Head and neck
4. Face
5. Bony pelvis and extremities
6. External structures.

Only one injury per body region is allowed. The ISS ranges from 1-75, and an ISS of 75 is assigned to anyone with an AIS of 6.

The ISS has several limitations. The most obvious limitation is its inability to account for multiple injuries to the same body region. Furthermore, it limits the total number of contributing injuries to only 3 and, consequently, as shown in the table below, often omits significant injuries altogether.

A new injury severity score (NISS) which, unlike the ISS, considers the three most severe injuries, regardless of body region. The NISS is computed as the simple sum of squares of the three most severe AIS. Preliminary studies suggest that the NISS is a more accurate predictor of trauma mortality than the ISS.

For example, a patient with multiple gunshot wounds to the abdomen sustains injuries to their small intestine, liver and kidney, with AIS severity codes of 3, 4 and 5, respectively. Since these three injuries are all to one body region (the abdomen), the ISS calculation would only include the kidney injury. However, the NISS calculation will include *all three* abdominal injuries.

To calculate the NISS, square each AIS severity code and then add the three squared numbers. In the GSW patient example above, the calculation would be:

$$\text{NISS} = 3^2 + 4^2 + 5^2$$

$$\text{NISS} = 50$$

Body segments on AIS scale

Body segments	Specifications
The thorax	include injuries to all of the internal chest cavity organs, the diaphragm, thoracic spine and rib cage
Abdomen and pelvic region	include injuries to all of the internal abdominal organs, the pelvis and the lumbar spine
Head and neck	include any injury of the cervical spine, cervical spinal cord, skull, brain and ears
Face	include mouth, eye, nose and facial bone injuries
Extremities	include all sprains, fractures, amputations and dislocations.
External structures	include all contusions, abrasions and lacerations over skin

Classification of thoracic injuries on AIS

AIS	Skeleton injury	Injury to soft tissue
1	Rib fracture	Contusion to bronchus
2	Fracture of 2-3 ribs, fracture of sternum	Partial tear of bronchus
3	4 or more rib fractures on a side/ 2 or 3 rib fractures with haemothorax or pneumothorax	Pulmonary contusion, minor cardiac contusion
4	Fracture of 4 or more ribs on a side with haemothorax or pneumothorax	Bilateral pulmonary laceration, small aortic laceration, large bruise to heart
5	Bilateral fracture of ribs	Severe aortic laceration, pulmonary laceration with tension pneumothorax
6		Aortic laceration with haemorrhage

Classification of abdominal injuries on AIS

AIS	Grade	Injury
1	Minor	Contusion of abdominal organ
2	Moderate	Small laceration over abdominal organ
3	Serious	Laceration of abdominal organ with hemoperitoneum (>1 L)
4	Severe	Rupture of abdominal organ
5	Critical	Laceration of abdominal organ involving vessels
6	Maximum	Avulsion of abdominal organ/ viscera

Classification of head injuries on AIS

AIS	Description
1	Skin and scalp : abrasions, superficial lacerations. Face: fracture of nose
2	Simple fractures or displacement of jaw or jaw fractures
3	Severe fractures, total loss of scalp, contusion to cerebellum
4	Complex fractures to face, exposure or loss of brain tissue, small subdural or epidural hematoma
5	Greater penetration of brain injury, damage to trunk and hematoma, subdural or epidural compression, diffuse axonal injury
6	Mass destruction of both skull and brain

d. Anatomic Profile (AP) –

The AP was developed in response to the limitations of the ISS. Unlike the ISS, the AP includes all serious injuries in a body region. Moreover, the AP appropriately weights head and torso injuries more heavily than other body regions. This index summarizes all serious injuries (AIS greater ≥ 3) into 3 categories. Category A includes the head and spinal cord. Category B encompasses the thorax and anterior neck. Category C includes all remaining serious injuries. A fourth category, category D, summarizes all nonserious injuries.

e. Penetrating Abdominal Trauma Index (PATI) –

This score is used to calculate the risk of complications in patients undergoing celiotomy for penetrating abdominal trauma. Fourteen organs

are examined and assigned a risk factor from 1-5 (eg, pancreas=5, spleen=3, bladder=1). Injuries to any organ are graded by severity from 1 for minimal injury (eg, tangential wound to the pancreas) to 5 for maximal injury (eg, pancreatic proximal duct disruption).

f. **ICD-based Injury Severity Score (ICISS) -**

ICISS is based on ICD-9 Clinical Modification (CM). ICISS is calculated as the simple product of the SRRs for each of the patient's injuries.

AIMS AND OBJECTIVES

1. To examine pattern of thoracic and abdominal injuries in fatal road traffic accident cases.
2. To analyze correlation between survival period & new injury severity score.

REVIEW OF LITERATURE :

At a medical college in Delhi, 231 cases were examined from May 2019 to April 2021 as part of cross-sectional investigation. Ages 31 - 40 were most often impacted age range (31.2%). Majority of injuries in current study (71.4%) were caused by motor vehicle accidents. 55.8% of victims passed away in a hospital. For 33.9% of cases, hemorrhagic shock was cause of death . Rib fractures accounted for 75.3% of total internal injuries. Mean ISS of those who died on the spot was 72.1 ± 15.4 , followed by 44.6 ± 10.3 for those who died in less than 1 hour and 43.3 ± 11.2 for those who survived 1 to 2 hours. Spearman Correlation analysis was used for analyzing results which showed that when ISS rises, survival period decreases significantly.⁷

From September 2016 - August 2018, Raoof et al. evaluated pattern and ISS in RTA cases . Total of 77 cases were examined. RTA (71.4%) and injuries from firearms (19.4%) were most frequent causes of mortality among those over 30–40 years of age (31%) who were involved. Highways accounted for majority of RTA (85,4%), while cars made up 36.3% of most often involved vehicles. Pedestrians made up majority of victims in traffic accidents (47.2%). Lungs were most frequent organ (30%) to be involved. Rib fractures occurred in 32.5% of cases. In 50.7% of cases, hemorrhagic shock and brain injuries were leading causes of death. Victims had an average survival time of 2.56 ± 5.4 hours. Majority of cases had an ISS of 21–40. ISS range for maximum spot death victims was 51–60. Victims with ISS in the 21–30 range had longer survival times than 24 hours. Low ISS victims endured more survival time than high ISS ones. Average ISS was 38 ± 13 .⁸

Between October 2001 - July 2003, study on patterns and ISS among RTA cases was carried out. There were 125 cases of blunt abdominal trauma examined . Ratio of men to women was 3.8: 1. Victims were mostly between ages of 21 and 30 (20.80%). Most frequent factor contributing to blunt thoracoabdominal injuries was RTA (86.40%), followed by assault (8%). 12.8 percent of victims had no corresponding external injuries. 59 victims (47.2%) passed away instantly. 13 victims (10.04%) died in 2 hours and 15 victims (12.0%) passed away within an hour. Hemorrhagic shock paired with a head injury was leading cause of mortality in 61 (48.80%) cases, followed by hemorrhagic shock alone in 44 (44%) instances. It was discovered that victims with low ISS (ISS score ranges of 21–30 and 31–40) survived more often than those with high ISS (51-60, 61-70 and 71-75 ISS score ranges). Mean ISS score for individuals who died instantly was 61.73, while mean ISS for victims who died within an hour was 48.33. Average ISS for those who lived for more than a week was low, at 27.50.⁹

Kumar et al studied injury pattern and ISS in 215 victims of fatal railway accident. Males composed of 87.44% of cases. Most frequently involved age range was 21 - 30. 68.84% of cases involved pedestrians. Ninety percent of victims passed away instantly. 92.56% of deaths were caused by accident. The head and chest were two body parts that were most frequently affected. Sixty percent of victims belonged to NISS 25-50 group followed by 38.6% to NISS 50-75 group and 1.4% to NISS 0-25 group. Study found that greater the survival period lesser was NISS.¹⁰

Autopsy research was done to examine pattern of injuries in fatal RTA . It took 18 months to complete study, which included 120 autopsied cases. Most frequently affected organ was lung (35.24%). 40% of lung injuries were lacerations,

60% were contusions. Rib fractures were most frequent thoracic injury (36.56%). Liver involvement in abdomen was most prevalent (31.4%). Ages 20 - 49 were most frequently involved in RTA. (n = 65, 54.16 %). 84.17 % victims were males whereas 15.83 % victims were females. In 19.16 % cases there was on spot death.¹¹

Yangala et al investigated pattern of peritoneal and visceral injuries in cases of abdominal trauma. Study took place from 2010 - 2012. 150 cases were examined. In 36% of cases abdominal injury was discovered to be linked to other traumas such head, chest, or limb injuries. Liver was most frequently injured visceral and peritoneal organ, accounting for 72 cases (48%), followed by mesentery (54 cases), spleen (52 cases) & intestine (47 cases) . Most frequent finding was combined liver and spleen injury (23.33%), which was followed by liver injury (15.33%).¹²

From September 2018 - August 2019, Pandey et al. conducted research on injury pattern & prognosis of abdominal trauma. 50 cases in all were examined. Men made up 92% of cases, while women made up 8%. RTA accounted for 78% of all injury cases, and falls from height accounted for 18%. CECT was performed in 30 cases, of which spleen was most often injured solid organ (9 cases, or 29%), followed by liver (7 cases, or 23%), hollow viscous injury (8 cases, or 26%), and retroperitoneal haemorrhage (3 cases, or 10%). Most common post operative complications were paralytic ileus in 31 % cases and pelvic intra abdominal abscess in 31 % cases.¹³

From January 2011 - December 2011, Rao et al. analysed mortality from blunt abdominal injuries. They looked at 63 cases in total. Male victims made up 87% of fatalities while females made up 13% of cases. Age range most frequently included was 21- 30. 67% of all cases of blunt abdominal injury were caused by RTA. Only

43% of instances include abdominal injuries, however there are other cases involving head, chest, and bone injuries as well as other injuries. In 68% of instances, external injuries were evident. 73 % incidents occurred during day time. Most common visceral organ involved was liver (40 %) cases. In 66 % of cases hemorrhage was cause of death. Survival period was less than 1 hour in 31 % of cases. ¹⁴

In study conducted by Shubhendu et al. between December 1, 2014, and November 30, 2015, Cases were analysed for pattern of blunt abdominal trauma. 296 cases in all were examined. In 198 cases, or 66.89%, abdominal injuries were most frequently related to thoracic injuries. Of all instances involving blunt abdominal trauma, 26 (8.78%) involved isolated injury to abdomen. 48.32% of all subjects died there and then. Hemorrhagic shock was shown to be leading cause of mortality, accounting for 139 cases (46.96%), followed by combination of neurogenic shock and hemorrhagic shock, accounting for 129 instances (43.58%). Suicide was cause of death in 12.84% of cases, whereas homicides were extremely rare, accounting for only 2.36% of cases. Remaining 84.8% of cases were unintentional or accidental . ¹⁵

NISS was investigated by Srivastava et al. in fatal thoracic and abdominal trauma cases. Between November 2008 - February 2010. Total of 93 cases were examined. Majority of 93 instances (29% of the total) were among those aged 21 to 30. Men made up 84.9% of cases. Vehicle accidents were most frequent cause of fatal blunt thoracic and abdominal trauma, accounting for 79.57% of all cases. Pelvis alone was involved in 22 % of cases whereas abdomen alone was involved in 20 % of cases. 64.5% of cases were brought dead. 40 % of victims were pedestrians. Offending vehicle was bus in 16 % of cases and it was unknown in 16 % of cases. Rib fracture is seen in majority of cases. Liver and lungs were commonest injured visceral organs.

Pancreas was least injured organ. In 0-20 years age group liver was most commonly injured whereas after 20 years of age lungs were most commonly injured organ. NISS 50-75 group has the greatest percentage of cases (51.6%). Average NISS is 46.59. In each case, cause of death was an accident. Length of survival was inversely correlated with NISS. Most common reason for mortality was hemorrhagic shock (70.97%).¹⁶

Goyal et al did a retrospective analysis from January 2000 - December 2003. 426 instances in all were examined. 31% of cases were female, compared to 69% of cases being male. Most incidences were found in people between ages of 21 - 30. (31.69%). In 24.88% of cases, offending vehicle was motorcycle. 52.6% of victims passed away immediately. More survival time lesser was NISS and ISS. Survival period of 1-6 hours had NISS of 66-75 and ISS ranging between 36-75. NISS and ISS score were same in 28.57 % cases and discrepancy was seen in 71.42 % cases.¹⁷

Pattern and ISS of fatal thoracoabdominal injuries from 2011 - 2014 were studied by Goyal et al. 100 instances in all were examined. Males made up 91% of victims. Age group most frequently involved was between 31 - 40. Most frequent factor (85%) in fatal thoracoabdominal injuries was motor vehicle accident. Trucks were most commonly at-fault vehicles (31% of occurrences). Majority of victims (34%) only experienced chest and abdominal injuries. Most common cause of death was hemorrhagic shock (69%).¹⁸

ISS and Survival Time in Fatal RTA were correlated by Hussain et al. Sample size was 200. Study lasted for two years. 18.37% of victims passed away immediately, while 22% died so between one and six hours after incident. 17% (34 instances) of RTA victims had ISS of less than 25, whereas 69.50% (139 cases) had

ISS in range of 25 - 49. 7.5% (15 instances) of road traffic collision victims had ISS of 50- 74, while 16% (12 cases) had an ISS of 75. Victims of RTA who had ISS less than 25 had longer survival times. ISS over 25 victims (25-74) had a less chance of survival. ISS 75 victims perished at the scene of deadly road traffic incidents or within an hour of them. Survival time has a negative correlation with ISS.¹⁹

Between January 2002 - December 2003, 400 RTA victims had their autopsy conducted. Rautji et al. looked at AIS and its Correlation with Preventable RTA deaths. Age range most frequently engaged was 20 - 40. 90% of victims were men. 44% of casualties were pedestrians, while bus was most often involved vehicle with 25.5% of the incidents. 25.5% of accident victims died at scene, while another 25.5% died while being treated at hospital or within an hour of event. In 45% of instances, chest was implicated, whereas in 34.5 percent of cases, abdomen was. Sixty-six percent of patients had multiple traumas, meaning that at least two body areas had serious or life-threatening injuries. In 43.5% of cases, head injuries were main causes of death. Hemorrhage either intra-thoracic or intra-abdominally caused 20% of fatalities. Bulk of accidents (n=120, 30%) took place from 18 a.m. to 24 a.m. In 52 (17.8%) instances, alcohol use was found. 58 instances (14.5%) had ISS value of 25, 61% had a value between 25 and 49, 9.5% had a value between 50 - 75, and 15% had a value of 75. 86 instances (35.25%) out of 244 individuals with ISS between 25 - 49 lived for more than 1 day. and 26 instances (44.83%) out of 58 cases with an ISS of 25 lived for more than a day.²⁰

Ravi et al examined distribution of thoraco-abdominal injuries in fatal RTA. Study examines 232 autopsies of people who died in traffic incidents with thoraco-abdominal injuries between August 2012- July 2013. Victims were mostly male

(84.50%) and ranged in age from 31 - 45 years old (40.51%), with male to female ratio of 5.4:1. Rib fractures (60%) were most frequent bone injury. Pedestrians made up 35.8% of casualties. Liver (30.17%) and spleen (17.24%) were two abdominal solid organs that were wounded most frequently. 65.5% of victims passed away immediately. Heavy trucks made up 51.72% of offending vehicles.²¹

During September 2016 - September 2018, Shinde et al. examined patterns of thoracic & abdominal injuries brought on by traffic accidents. Sample size was 200. Ratio of men to women was 2.28:1. 31-40 year olds (32%) were age group most frequently involved. Thoraco-abdominal anatomy was most frequently impacted in 113 cases (56.5%), followed by 60 cases (30%) of thoracic alone. Pleura and lungs accounted for 162 (81%) of internal organs most often damaged in thoracic traumas, followed by pericardium and heart (100%) and airways (46%). Liver was internal organ most frequently injured in abdominal traumas (143, or 71.5%), followed by kidney (71, or 35.5%).²²

100 autopsy cases were used in a research by Gaur et al. at Dr. Sampurnanand Medical College in Jodhpur in 2016 to examine blunt thoracic & abdominal injuries in fatal RTA cases. Most often involved age range was 20 - 39. Hemorrhagic shock was to blame for 87% of deaths. In 45% of instances, liver was organ most often damaged, next was spleen in 30% of cases. Internal injuries of abdomen were observed in 72 % cases. 45 % victims died within 1-6 hours whereas 15 % died within 1 hour. ISS was more than 50 in 10 % cases whereas survival period was least in these 10 % cases.²³

Study was done on 98 cases of thoraco abdominal injuries. 58 % were male victims. 40 % victims were in age range of 31-40 years. In this study, liver laceration was found in 34% cases causing hemoperitoneum, kidney laceration in 20% cases. 62 % cases the cause of death was hemorrhagic shock. 57.14 % victims had on spot death. It was found that victims whose ISS was low ranging between 21-30 and 31-40 , survival duration was more. Since majority of victims died on the spot ISS was high. ISS was 75 in 24 % victims and it was 61-70 in 21 % victims. ²⁴

Autopsy study was done in Banglore between 2008-2010 on 100 postmortems on pattern of thoraco abdominal injuries. Majority of patients in this research (50%) were between ages of 20 - 40. Majority of patients (92% were male), 71% had bone cage injuries, and 26% had thoracic injuries. Heart (7.6%) and lungs (92% each) were most affected. Internal abdominal injuries were seen in 49 cases. ²⁵

Gushinge et al studied abdominal injuries in RTA among 114 cases. Between October 1, 2012 - September 30, 2014, study was conducted. 85% of victims were men. Age range most frequently involved was 51- 60 (31%). 42 % victims died on the spot. In 65.89 % cases both internal and external injuries were present over abdomen. Most commonly injured organ was liver (58,77 % cases) followed by spleen in 36.8 % cases. Laceration was most common type of injury (77 % cases) ²⁶

International studies :

In Tanzania 1 year prospective research on patterns and prognoses in victims of abdominal trauma was conducted between August 2016 - August 2017. A total of 136 patients were examined, and 115 (84.6%) of those cases were male. 53.7% of injuries were caused by traffic accidents, which were the most prevalent cause of

injury. Spleen (33 patients; 91.7%) and small bowel (12 patients; 46.1%) were most frequently affected organs. Least damaged organs were kidney, pancreas and retroperitoneal wall. High score on NISS and greater time interval between time of incidence and time of admission was directly proportional to mortality rate.²⁷

Between April 14, 2010- April 13, 2011, Subedi et al. conducted research on abdominal & pelvic trauma at Nepal. There were 80 instances in all that were examined. In that study, all autopsies with pelvic and/or abdominal injuries from known mechanical trauma were taken into account. 80% of fatalities were men, and average age of victims was 30.76 years. In 82.5% of cases, traffic accidents were source of trauma. In 87.5% of instances, cause of death was accidental, whereas 11.25% of deaths were homicidal. Most often affected organ was liver (57.5%), followed by spleen (37.5%). Injuries to several organs were observed in 67.5% of patients, whereas no external injuries were present in 31.25%.²⁸

Motorcycle riders and their pillions were compared in terms of injury patterns and severity in a study by Chiang et al. 62 victims participated in study. Study took place between 1 August 2011 - 20 March 2012. In this research, collisions with cars were most frequent form of accident (14 pairs, or 45%), followed by self-skid accidents (29%) and collisions with buses, lorries, or vans (16%). Nine pairs (29%) self-skidded, nine pairs (29%) experienced damage from crashes on each side of motorbike, and eight pairs (26%) were engaged in head-on incidents. In this research, there were no fatal instances. All of the victims in our research had low ISS (less than 15). Between riders and pillions, there was no statistically significant difference in ISS, POS, RTS. Between riders and pillions, there was no discernible difference in

likelihood of survival, Revised Trauma Score, distribution of injuries, overall length of hospitalisation, or ICU stay.²⁹

Pattern of thoracoabdominal injuries related to head traumas from RTA were explored by Maksoud et al. It was study carried out during January 2010- January 2020 in Saudi Arabia. Total 1235 victims were studied. 86.9 % victims were men whereas 13.1 % victims were women. Lung contusion and pneumothorax were most frequent thoracic injuries seen, with 19.0% and 13.1% of patients having related chest injuries. For 38.1% of patients, abdominal injuries were seen. Majority (14.3%) of abdominal injuries were splenic (out of all studied patients). Only 3.6% of patients suffered from both abdominal as well as thoracic injuries.³⁰

In Belgrade study was carried out in 1998. Sample size included 272 victims among which 193 were males and 79 were females. Average age was 51.08 years. Pedestrians were among most frequently involved victims.. Three peaks were visible in sample distribution for ISS values: 75, 41-50, and 26-35. The ISS value for 87 people who did not survive was 75. There were 73 people without an outliving period whose ISS values were below 75; on average, these people had ISS values of 31.87 (SD = 11.30) in this group. Their mean ISS value was 18.05 (SD = 15.33), which was statistically significantly lower than ISS value in preceding group ($t = 7.015$; $p 0.001$), and their mean survival duration was 4.79 days (SD = 3.77) in 112 instances.³¹

Between January - June 30, 1993, Friedman et al. conducted study. There were 279 casualties, and 86% of them were men. First forty years of life were most often affected age group. ISS of 75 was ascribed to 110 autopsy (39.4%). 150 autopsy (53.7%) from ISS group 16–66 were used in this investigation. There are just 19

casualties in ISS < 14 group. ISS is negatively related to survival period. Lesser the survival period greater is the ISS.³²

In Nigeria between January 1, 2000- December 31, 2009, Olaofe et al. conducted research to examine autopsy results of patients having abdominal trauma following traffic accidents. 76 (12%) of the 685 RTA victims analysed suffered stomach injuries. 4.1:1 male to female ratio. Victims were a median age of 34.2 years. The age range of 30 to 40 years was most often afflicted, with 26 instances (34.2%). 53.9% of victims died immediately. Spleen suffered injuries the most frequently. In 51 instances (67.1%), it was lacerated. This was followed by injuries to liver and intestines which occurred in 17 (22.4%) and 12 (15.8%) cases, respectively. Kidney was damaged in only four cases (5.3%). 76 % cases had hemoperitoneum.³³

Khichi et al conducted study involving 110 cases who died exclusively due to thoracoabdominal injuries were evaluated. Incidence was more common in males as compared to females. Of all the RTA cases 47.4 % fatalities were exclusively due to thoraco abdominal injuries. 50.9 % victims died on the spot whereas 1.8 % victims survived for more than 12 hours. While 7.3% of victims sustained chest, abdomen, and pelvic fractures, 29% of victims had injuries to chest & abdomen. Most commonly involved organ in thoracic cavity was lung in 52.7 % cases and in abdomen it was liver in 56.3 % of cases. Pedestrians (54.5%) were most commonly involved victims; whereas trucks (42.1%) and buses (34.2%) formed the majority of offending vehicles.³⁴

Tristan et al. used data from 1996 - 2013 to study abdominopelvic injuries resulting from automobile accidents from French Rhone register. 10,165 of the 162,695 victims in RTA (6.7%) sustained abdominal and pelvic injuries. Most

casualties (62.4%) were males (6,347 men and 3,815 women, ratio 1.7). Victims' average age was 32.2 years. Car drivers made up 46% of casualties. In 27.3% of patients, spleen was abdominal organ most often affected, then liver in 25.2% of cases. Average ISS was 8.7, and out of all fatalities, 55.3% of victims passed away immediately and 20.8% did so within first 24 hours. Chest was most frequently injured body part among patients with AIS of 4+ (41%) followed by head (27%) & abdomen (21%).³⁵

Study on pattern of profile, outcomes, and mortality factors in instances of abdominal trauma was undertaken by Haddad et al. in Riyadh. Study took place from March 1999 - June 2013. 722, or 89.5%, of the victims were men. Victims' average age was 30.7. RTA were most frequent cause of abdominal and pelvic injuries in 70.4% of cases. Liver was the organ most frequently affected (25.8%), followed by spleen (23.3%). Retroperitoneal hematoma was the most frequent cause of mortality. Mean ISS was 30.6. Abdominopelvic injuries were associated with thoracic injuries in 55.6 % cases and head injuries in 41.9 % cases. Pelvic fractures were seen in 46.2 % cases.³⁶

MATERIAL AND METHODS :

Source of data: Autopsy cases of road traffic accidents sustaining thoraco abdominal injuries which are brought to mortuary of Belagavi Institute of Medical Sciences Civil Hospital and KLE's Dr. Prabhakar Kore Hospital.

Study type : Cross - sectional study.

Study period: 1st January 2021 - 31st January 2022 (13 months).

Inclusion Criteria:Thoracic and abdominal injuries due to RTA between January 2021- January 2022.

Exclusion criteria:

1. Thoraco abdominal injuries sustained by other cause like railway accident, domestic assault, industrial mishap, fall from height, firearm injury, explosion or blast injuries, and landslides.
2. Head injuries.
3. Cases with injury sustained over other body parts except thorax and abdomen.

Sampling Procedure :

All cases will be enrolled.

Universal sampling method is used.

Sample size is computed with 95% confidence limits , 20 % allowable error and 10 % attrition

$$n = \frac{Z_{1-\alpha/2}^2 SD^2}{(20\% SD)^2} * 1.1$$

Where $z_{1-\alpha/2} = 1.96$ n = sample size SD= standard deviation

$$n = 105$$

Method of collecting data-

All fatal cases of thoraco abdominal injuries subjected for postmortem examination. were taken up for the study. A detailed dissection and examination of thoraco abdominal region was carried out as per standard medico-legal autopsy technique and injuries were noted and entered as per proforma in Annexure 1.

Pre-designed proforma was used to enter the various data for:

- a. Parameters being studied.
- b. New Injury Severity Score(NISS)

Statistical analysis:

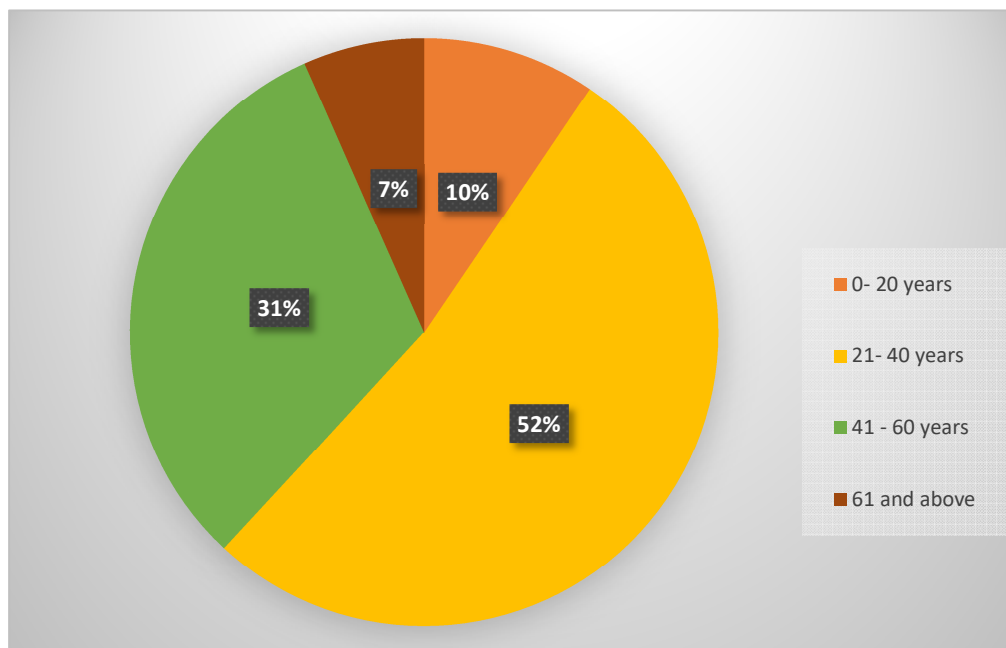
1. Microsoft Excel was used to code and input the data that had been gathered.
2. Frequencies and percentages were used to represent collected data.
3. Charts and tables are created.
4. Regression analysis was used to determine coefficient of correlation and establish relationship between NISS and survival time.

Ethical Clearance :

J.N. Medical College's and Belagavi Institute of Medical Sciences' Institutional Ethical Committee granted approval for study. Ethical Committee Clearance letter has been attached.

RESULTS:

GRAPH 1 - Age wise distribution of cases



GRAPH 2 - Sex wise distribution of cases

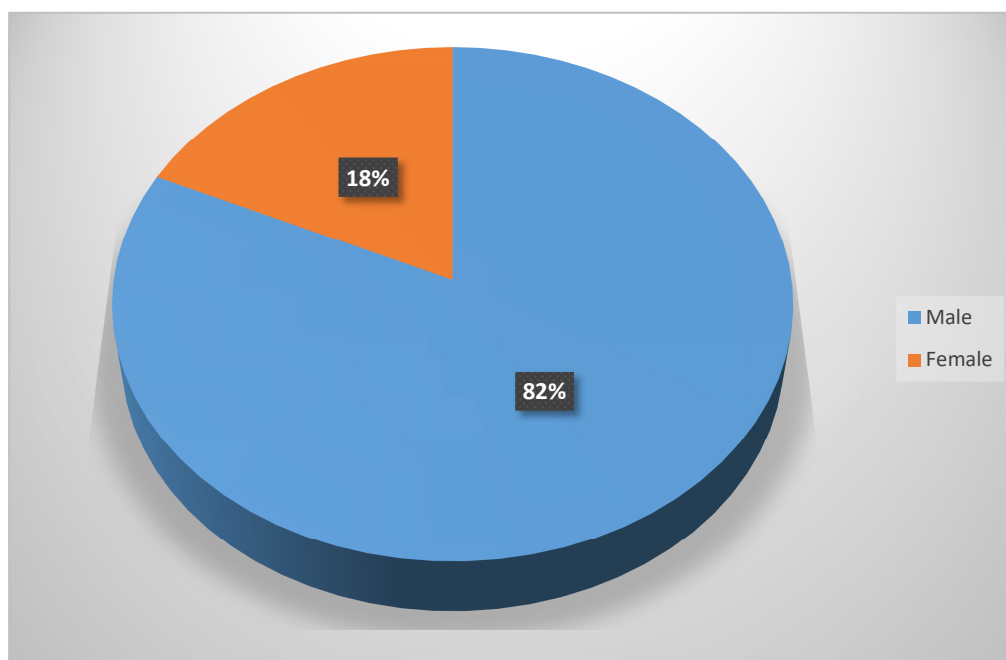
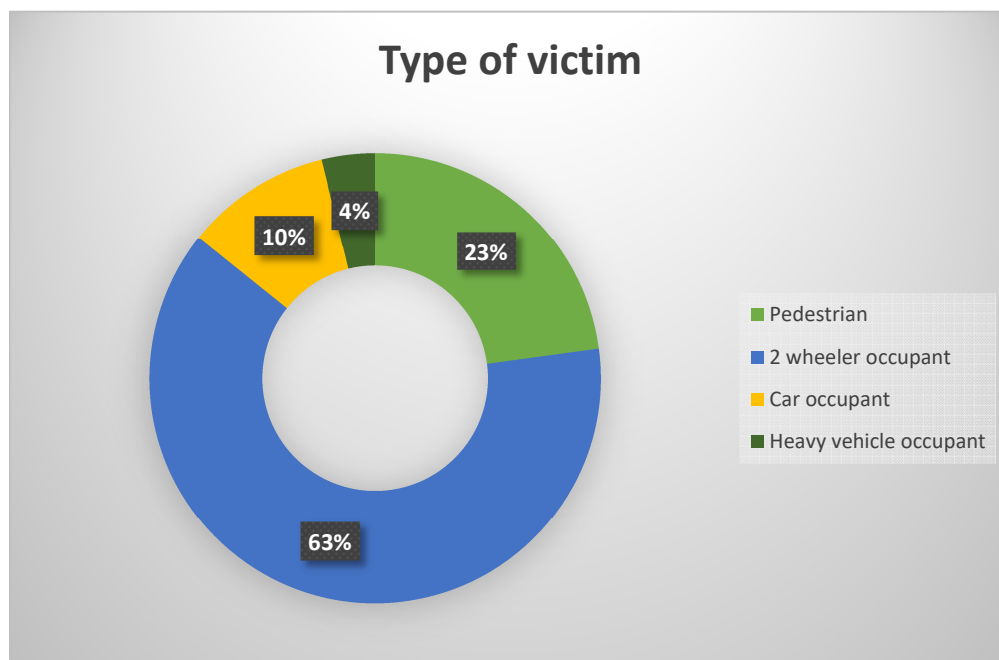


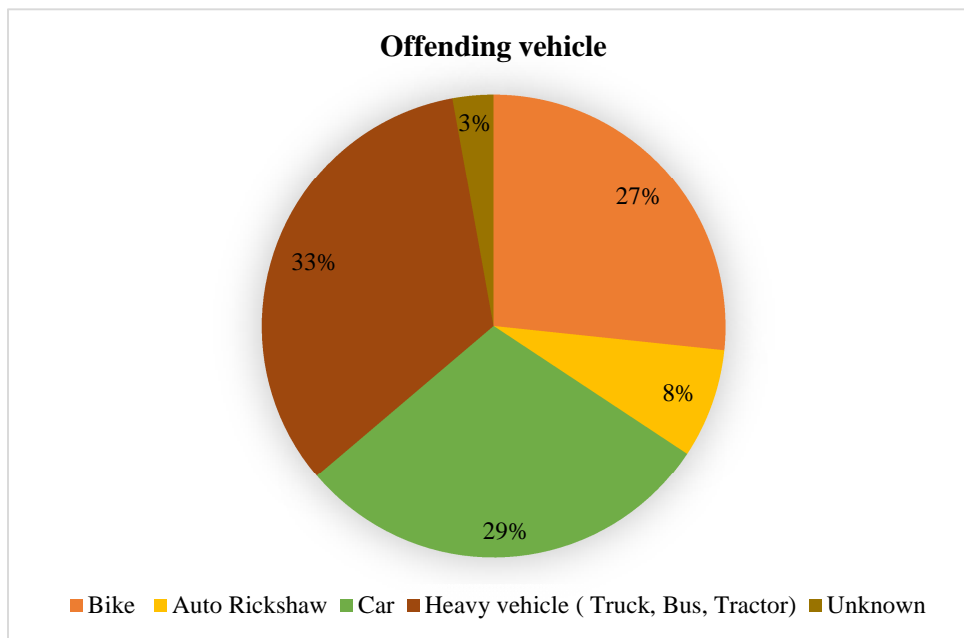
TABLE 1 - Age and sex wise distribution of cases :

Age group in years	Males	Percentage	Females	Percentage
0-20	7	6.66	3	2.85
21- 40	47	44.76	8	7.61
41- 60	27	25.71	6	5.71
61 and above	5	4.76	2	1.9
Total	86	82	19	18

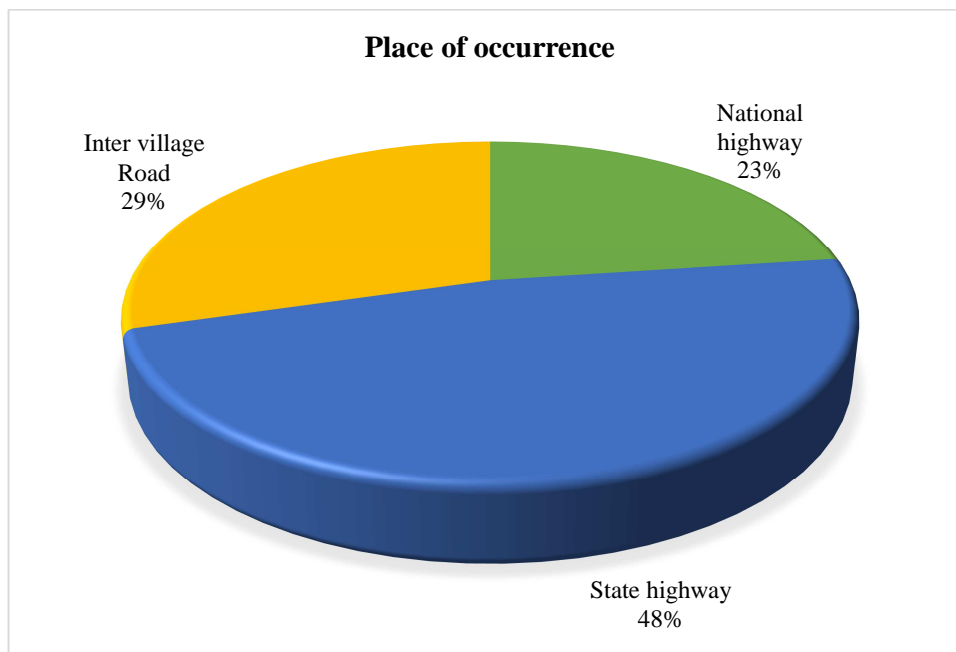
GRAPH 3 - Thoracoabdominal trauma victims

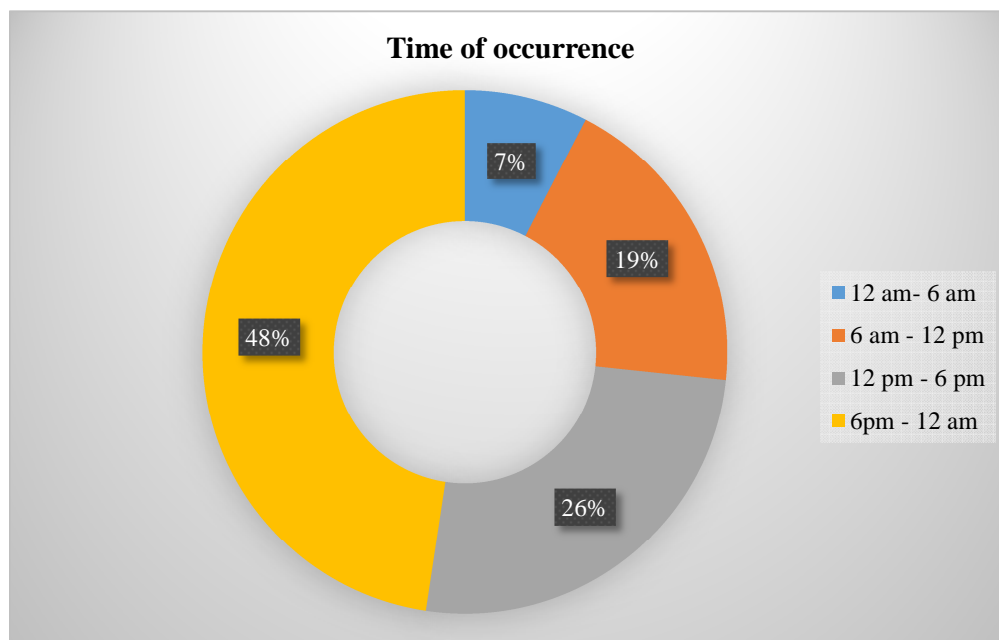


GRAPH 4 - Victims in relation to offending vehicle :



GRAPH 5 - Distribution of cases as per place of occurrence of accident



GRAPH 6 - Distribution of cases as per time of occurrence of accident**TABLE 2 - Distribution of cases according to region of body involved**

Region of the body involved	No. of cases	Percentage
Chest alone	10	9.5
Abdomen alone	5	4.76
Spine alone	1	0.95
Chest and abdomen	65	61.9
Chest and Spine	7	6.66
Abdomen and Spine	1	0.95
Abdomen, Chest and Spine	16	15.23
Total	105	100

TABLE 3 - Distribution of cases according to involvement bony fractures

Bony fractures	No. of cases	Percentage
Ribs	63	60 %
Clavicle	8	7.6%
Sternum	14	13.33%
Vertebrae	24	23%
Pelvis	18	17.14%

TABLE 4 - Number of victims in relation to different organs involved

Sr no.	Organs	No. of cases	Percentage
1	Lungs	67	63.8
2	Heart	14	13.33
3	Oesophagus	8	7.61
4	Aorta and great vessels	2	1.9
5	Diaphragm	2	1.9
6	Chest wall	39	37.14
7	Liver	50	47.6
8	Spleen	55	52.38
9	Kidney	36	34.28
10	Adrenals	2	1.9
11	Bowel	10	9.5
12	Stomach	4	3.8
13	Urinary Bladder	4	3.8
14	Genitals	10	9.5
15	Peritoneum	40	38
16	Perineum	4	3.8
17	Abdominal wall	14	13.33
18	Spinal cord	25	23.8

TABLE 5 - Distribution of cases in relation to period of survival

Period of survival	No. of cases	Percentage
< 2 hours	30	28.57
2-6 hours	22	20.95
6-12 hours	13	12.38
12-24 hours	12	11.42
1 – 7 days	11	10.47
1 – 4 weeks	15	14.28
>4 weeks	2	1.9
Total	105	100

TABLE 6 - Distribution of cases in relation to cause of death

Cause of death	No. of cases	Percentage
Hemorrhagic shock	51	48.57
Septicemia	8	7.61
Polytrauma	17	16.19
Hemopneumothorax	3	2.85
Hypovolemic shock	7	6.66
Others (Respiratory failure, Neurogenic shock, Severe chest injury with lung consolidation, Thrombosis , Crush injury, Traumatic cervical spine injury)	19	18.09
Total	105	100

TABLE 7 - Thoracic injuries

Sr. No.	Thoracic injuries	No. of cases	Percentage
1	Rib fracture	63	60
2	Clavicle fracture	8	7.6
3	Sternal fracture	14	13.33
4	Pneumothorax	18	17.14
5	Hemothorax	38	36.19
6	Lung contusion	34	32.38
7	Lung collapse	8	7.6
8	Lung laceration	26	24.76
9	Lung rupture	5	4.76
10	Heart contusion	7	6.66
11	Heart rupture	4	3.8
12	Heart laceration	3	2.8
13	Esophagus crush injury	2	1.9
14	Esophagus laceration	2	1.9
15	Chest wall emphysema	7	6.66
16	Chest wall crush injury	8	7.6
17	Chest abrasion	45	42.85
18	Chest contusion	5	4.76
19	Diaphragm laceration	1	0.95

TABLE 8 - Abdominal injuries

Sr no.	Abdominal injuries	No. of cases	Percentage
1	Hemoperitoneum	49	46.66
2	Pneumoperitoneum	2	1.9
3	Liver laceration	31	29.52
4	Liver rupture	12	11.42
5	Crush injury of liver	7	6.66
6	Kidney laceration	10	9.52
7	kidney rupture	11	10.47
8	Crush injury of kidney	12	11.42
9	Kidney hematoma	2	1.9
10	Spleen laceration	16	15.23
11	Spleen rupture	13	12.38
12	Crush injury of spleen	7	6.66
13	Crush injury stomach	4	3.8
14	Crush injury bladder	5	4.76
15	Crush injury genitals	10	9.52
16	Crush injury bowel	8	7.61
17	Bowel rupture	2	1.9
18	Crush injury abdominal wall	12	11.42

19	Crush injury pelvis	9	8.57
20	Fracture pelvis	18	17.14
21	Pelvic laceration	3	2.85
22	Pelvic hematoma	2	1.9
23	Adrenal hematoma	1	0.95
24	Great vessel rupture	2	1.9
25	Perineal laceration	2	1.9
26	Abrasion over abdomen	10	9.52
27	Contusion over abdomen	6	5.7
28	Laceration over abdomen	4	3.8

TABLE 9 - Spinal injuries

Sr. No.	Spinal injuries	No. of cases	Percentage
1	Vertebral fracture	24	23
2	Retropulsion	2	1.9
3	Anterolisthesis	4	3.8
4	Vertebral muscle edema	4	3.8
5	Disc bulge	5	4.9
6	Paraspinal spasm	3	2.8
7	Cervical spondylosis	1	0.95
8	Disc contusion	2	1.9
9	Cord compression	1	0.95
10	Spine straightening	1	0.95
11	Disc rupture	1	0.95

Injury Severity Score

TABLE 10 - Distribution of cases according to New Injury Severity Score

NISS Score	Number of cases	Percentage
0-25	19	18.09
26-50	21	20
51-75	65	61.9
Total	105	100

TABLE 11 - Age groups in relation to New Injury Severity Score

Age group (years)	NISS 0- 25	NISS 26- 50	NISS 51-75	Total
0 – 20	0	1	9	10
21 – 40	8	13	34	55
41 – 60	9	5	19	33
61 and above	2	2	3	7
Total	19	21	65	105

TABLE 12 - Survival period in relation to New Injury Severity Score

Period of survival	NEW INJURY SEVERITY SCORE			
	0 - 25	26 – 50	51- 75	TOTAL
< 2 hours	0	2	28	30
2 – 6 hours	0	2	20	22
6 – 12 hours	0	4	9	13
12 – 24 hours	1	4	7	12
1 – 7 days	2	8	1	11
1 – 4 weeks	14	1	0	15
> 4 weeks	2	0	0	2
TOTAL	19	21	65	105

Associations and Correlations**Association between New Injury Severity Score and period of survival :**

To find out the association between period of survival and New Injury Severity Score CHI- Square test is applied.

The value is less than 0.0001 (highly significant)

The smaller values of Period of survival and higher values of New Injury Severity Score have high frequencies and vice versa

Correlation between New Injury Severity Score and period of survival

Correlation or co-relation can refer to any departure of two or more random variables from independence, but most commonly refers to a more specialized type of relationship between mean values. There are several correlation coefficients, often denoted ρ or r , measuring the degree of correlation.

Since the parameters are discrete in nature , to find the correlation coefficient , Spearman Rank Correlation Coefficient is computed .

Ranks are given to the values in increasing order for each parameter. D is the difference in the ranks

The formula for the Spearman rank correlation coefficient is:

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

ρ = Spearman rank correlation coefficient

d = difference between the two ranks of each observation

n = number of observations

Spearman Returns a value from -1 to 1 where

$+1$ = perfect positive correlation between the ranks

-1 = perfect negative correlation between the ranks

0 = no correlation between the ranks

Rank correlation coefficient of our study is – 0.7524 .

The value is less than 0.0001 (highly significant)

There is high degree of negative correlation between period of survival and New Injury Severity Score.

This means that as New Injury Severity Score increases period of survival decreases.

DISCUSSION

Age and sex distribution of victims

In present study most of victims (82 %) were males and most common affected age group was 21- 40 years (52 %). This can be attributed to fact that males are mostly working member of family and 21-40 years people are commonly engaged in outdoor activities. Similar findings were seen in Singh J, Raof et al, Meera et al, kumar et al, Rautaji et al .^{2,8,9,10,20}

Contrast results were seen in Gushinge et al study where commonest age group involved was 51-60 years.²⁶

Type of victim and offending vehicle

A total of 63 % victims were two wheeler occupants and the most common offending vehicle was a heavy vehicle (truck, bus, tractor) in 33 % of cases. Next common offending vehicle was bike (27 % cases)

The number of two wheelers riding on road with high speed is more in Belagavi region as compared to cars or other vehicles. Road safety rules are not followed properly. Bikers coming from wrong side is very common.

There are large number of heavy vehicles operating in Belagavi region. Even because national highway is near , interstate trucks operate in large numbers . Similar results were seen in Sharma et al and Raof et al where most common offending vehicle was a heavy vehicle like bus or truck.

Contrast results were seen in Raouf et al , Meera et al, Sharma et al , Ravi et al, Deepayan et al where majority victims were pedestrians. This can be due to encroachments of pavements which forces pedestrians to walk on roads.

Place and Time of occurrence

In this study road traffic accidents involving thoracoabdominal injuries most commonly occurred on state highway (48%) followed by intervillage road (29%) . This can be attributed to fact of poor maintenance of state highways and congested roads in Belagavi region .

Similar findings were seen in kumar et al where maximum accidents (52 %) occurred on highways followed by city road (28.2%)

Contrast findings were seen in Raouf et al where most common place of occurrence was national highway (54.5%) followed by state highway in 30.9 % cases.

Road traffic accidents involving thoracoabdominal injuries mostly occurred in evening time between 6 pm and 12 am (48 %). This can be attributed to fact that there is heavy flow of traffic during this time.

Cause of death

In this study , the most common cause of death was hemorrhagic shock in 51 cases (48.57 %). In Gyan et al, Raouf et al , Deepayan et al, Bhowate et al , Rao et al, Meera et al studies too, hemorrhagic shock was commonest cause of death.

This is due to fact that most of the vital organs of the body are located in thorax and abdomen. Any injury to these regions causes deterioration of hemodynamic functions causing internal hemorrhage.

Period of survival.

In our study about 30 victims (28.57 %) died within 2 hours of accident, followed by 22 victims (20.95 %) whose survival period was between 2- 6 hrs.

Contrast findings were seen in Dipayan et al study where 57% victims died on the spot , in Bhowate et al study 82 % victims died within 2 hrs of accident, Gushinge et al study where 53 % victims had survival period of less than 1 hour.

Abdominal cavity doesn't have any bony covering like head. This leads to injury to vital organs and vascular system of abdomen thereby causing hemorrhage and death. There is need for early transport of patients to hospital, on the spot emergency medical care .

Injury Severity Score

In present study new injury severity score was 51-75 in 65 (61.9%) cases. Injury severity score had very high negative correlation with period of survival that means victims who had very high injury severity score had very less survival period. The correlation coefficient was – 0.7524 suggesting high degree of negative correlation.

Weak negative correlation was seen in Raof et al study where correlation coefficient was -0.418 and in Srivatsava et al study where correlation coefficient was -

0.472. Also the Nikolic et al study showed weak negative correlation with correlation coefficient as -0.458.

Negative correlation was also appreciated in Meera et al, Gaur et al, Dipayan et al, Rautaji et al, friedman et al studies.

Similar findings were also seen in Dipayan et al study where 50 % cases had ISS between 51-75. In Gaur et al study only 10 % of total cases had injury severity score between 51-75 but negative correlation between ISS and survival period was present in Gaur et al study too. In Friedman et al study about 39.4 % victims had injury severity score of 75.

We have taken New injury severity score into consideration because unlike Injury severity score it is not limited to one injury in one anatomic region. In injury severity score there is high chance of elimination of summative effect of multiple severe injuries of same region.

Region of body involved and involvement of different organs

In present study , involvement of both chest as well as abdomen was seen in 65 cases (61.9%) whereas only chest was involved in 10 (9.5 %) cases and only abdomen was involved in 5(4.76 %) cases.

In our study, the most common organ to be involved was lungs in 67 (63.8%) cases and second most common organ and commonest abdominal organ to be involved was spleen in 55 (52.38%) cases, 3rd commonest organ and 2nd commonest abdominal organ to be involved was liver in 50 (47.6%) cases.

Findings are in agreement with Shinde et al study where where both thorax and abdomen were involved in 56.5 % cases, lungs were most commonly involved in 162 (81%) cases. In khan et al study where lung was most common organ to be involved in 80 cases (35 %) and 2nd most common to be involved was liver in 67 cases (31.45 %) .

Similar findings were seen in Bhowate et al study where lungs were most common organ involved in 82 cases (45.81%) followed by liver in 77 cases (43.01%)

Contrast findings were seen in Gushinge et al study which considered only abdominal injuries, the liver was most common organ involved in 67 (58.77 %) cases.

Just like present study even in international studies spleen was seen as most commonly involved abdominal organ in Ntundu et al where its involvement was seen in 91.7 % cases , Tristan et al study spleen was most commonly injured organ in 27.3 % cases and also in Olaofe et al study spleen involvement was seen in 67.1 % cases.

But in Subedi et al study liver was most commonly injured organ in 57.% cases and spleen involvement was seen in 37.5 % cases .

Injuries sustained by victims (Thoracic injuries, abdominal injuries, spinal injuries, bony fractures)

In our study, rib fracture was commonest injury seen in 63 (60%) cases. Next common fracture was that of vertebrae in 24 (23%) cases. In thoracic injuries following rib fracture second common injury was chest abrasion in 45 (42.5%) cases and hemothorax in 38 (36.19%) cases.

In present study, hemoperitoneum was commonest abdominal injury found in 49 (46.66%) cases followed by liver laceration in 31 (29.52%) and spleen laceration in 16 (15.23 %) cases.

In our study, vertebral fracture was the most common spinal injury seen in 24 (23%) cases followed by disc buldge in 5 % cases.

Our findings corresponded with findings of Ravi et al study where the most common injury observed were rib fractures in 60 % cases , also in Bhowate et al study rib fracture was the commonest injury and it was seen in 68.15 % cases followed by lung laceration in 38.54 % cases and the commonest abdominal injury was liver laceration in 32.4 % cases.

Contrast findings were seen in Maksoud et al study where lung contusion (19%) and pneumothorax (13.1%) constituted the most common thoracic injuries and in Olaefe et al study the commonest injury was spleen laceration in 51 (67.1%) cases.

CONCLUSION AND RECOMMENDATIONS

In present study the victims were mainly males (82%) and most of the victims were youngsters between the age group of 21-40 years (52%).

In this study 63 % victims were two wheeler occupants and the most common offending vehicle was a heavy vehicle (truck, bus, tractor) in 33 % of cases.

Place of occurrence in present was state highway in 48% of cases and accidents occurred in evening time between 6 pm to 12 am in 48 % of cases.

In present study death was mainly as a result of hemorrhagic shock in 51 cases (48.57 %) and most common period of survival was within 2 hours of occurrence of accident in 30 victims (28.57 %).

In present study new injury severity score was 51-75 in 65 (61.9%) cases. Injury severity score had very high negative correlation with period of survival that means victims who had very high injury severity score had very less survival period.

The correlation coefficient was -0.7524 suggesting high degree of negative correlation.

In this study, there was involvement of both chest and abdomen was seen in 65 cases (61.9%) whereas only chest was involved in 10 (9.5 %) cases and only abdomen was involved in 5(4.76 %) cases.

In present study the commonest organ to be involved was lungs in 67 (63.8%) cases and second most common organ and commonest abdominal organ to be

involved was spleen in 55 (52.38%) cases, 3rd commonest organ and 2nd commonest abdominal organ to be involved was liver in 50 (47.6%) cases.

In this study, the commonest injury seen was rib fracture in 60% cases and hemoperitoneum was commonest abdominal injury found in 49 (46.66%) cases followed by liver laceration in 31 (29.52%).

The following preventive measures should be followed to avoid fatalities in road traffic accident cases :

1. There is need of more trauma centers in Belagavi region.
2. Along with main road separate tracks should be made for pedestrians to walk.
3. Compulsory use of seat belts not just by drivers but also by fellow passengers in vehicle will result in lesser injuries.
4. There is need for maintaining speed limit to reduce fatal injuries.
5. Road design and environment alongside the road should be safer so as to avoid lager and fatal injuries.
6. Areas or regions which are more prone to accidents should be noted and area wise traffic management should be done.
7. Children should be taught road safety education.
8. Pedestrians need to be encouraged for using zebra crossings rather than direct crossing of the roads in any manner.

9. Non Government Organizations, police and also individuals who witness any accident should provide prehospital care to injured patients which will reduce fatality to a large extent.
10. Ambulances should not be just transport vehicles but they should be well equipped with pre hospital treatment facilities.
11. In cases of mass casualties in road traffic accidents the patients with higher injury score should be given preference in treatment.
12. Injury severity scoring should done immediately in emergency department or casualties so as lessen fatalities.

SUMMARY :

One year cross sectional study titled “One year autopsy study on pattern of Thoraco abdominal injuries in fatal road traffic accident cases at Belagavi” was conducted.

All fatal cases of thoraco abdominal injuries subjected for postmortem examination were taken up for the study. A detailed dissection was carried out and examination of thoraco abdominal region was done as per standard medico-legal autopsy procedure and later the injuries were noted and entered as per prescribed proforma in Annexure 1. A total of 105 cases were studied from 1st January 2021 to 31st January 2022.

My study results are summarized as follows :

1. 82 % victims were males and 52 % victims were among the age group of 21-40 years.
2. 63 % victims were two wheeler occupants and the most common offending vehicle was a heavy vehicle (truck, bus, tractor) in 33 % cases.
3. Death was mainly due to hemorrhagic shock in 51 cases (48.57 %) and most common period of survival was within 2 hours of occurrence of accident in 30 victims (28.57 %).
4. The new injury severity score was 51-75 in 65 (61.9%) cases. Injury severity score had very high negative correlation with period of survival that means victims who had very high injury severity score had very less survival period.

The correlation coefficient was -0.7524 suggesting high degree of negative correlation.

5. There was involvement of both chest and abdomen was seen in 65 cases (61.9%) whereas only chest was involved in 10 (9.5 %) cases and only abdomen was involved in 5(4.76 %) cases.
6. The commonest organ to be involved was lungs in 67 (63.8%) cases and second most common organ and commonest abdominal organ to be involved was spleen in 55 (52.38%) cases, 3rd commonest organ and 2nd commonest abdominal organ to be involved was liver in 50 (47.6%) cases.
7. The commonest injury seen was rib fracture in 60% cases and hemoperitoneum was commonest abdominal injury found in 49 (46.66%) cases followed by liver laceration in 31 (29.52%).

BIBLIOGRAPHY

- 1) Park Textbook of Preventive and Social Medicine 25th edition chapter 6 accidents and injuries pg 436
- 2) Singh J. A Cross-Sectional Study on Pattern and Injury Severity Score in Thoracoabdominal Trauma Among Medicolegal Autopsy Cases in North India. *Asian Journal of Medical Research*, 11(1), 25-30
- 3) Autopsy Cases in North India. *Asian J. Med. Res.* 2022;11(1):25-30.
- 4) Hamish Kerr, Brady Bowen, and Deborah Light. Thoracoabdominal injuries- A Practical Approach. In the book- *The Adolescent Athlete*, 2nd edition, pg 113-135.
- 5) Sandip Bhowate, BH Tirpude, SS Asawa study on pattern of thoraco abdominal injuries in fatal trauma cases at MGIMS Sewagram, Wardha and PCMS and RC Bhopal , *IJFMT* Jan-June 2016 vol. 10,issue 1pg 95-100.
- 6) Kerr H, Bowen B, Light D. Thoracoabdominal Injuries. *The Adolescent Athlete*. 2018 Jan 29:113–33. doi: 10.1007/978-3-319-56188-2_7. PMID: PMC7123492.
- 7) Timothy H Pohlman (2022, July 22) Trauma Scoring Systems. Retrieved from Medscape. Website - <https://emedicine.medscape.com/article/434076-overview#showall>
- 8) Raoof Abdul MP, Devi Th. M, Neha S, Chhetri D. Pattern and injury severity score in thoraco-abdominal trauma: A cross-sectional study in medicolegal autopsy cases. *Indian J Forensic Community Med* 2019;6(1):18-23.

- 9) Th, Meera & Nabachandra, H.. (2005). A Study of Pattern and Injury Severity Score in Blunt Thoraco-abdominal Trauma cases in Manipal. *Medico-Legal Update*. 5. 47-52.
- 10) M, Kumar & Kohli, Anil & AK, Tyagi. (2015). Injury pattern and injury severity scores in railway accidents in Delhi.. *International Journal of Medical Toxicology and Legal Medicine*. 18. 42.
- 11) Rashid Nehal Khan, Ravi Rautji and K V Radhakrishna. (2018); PATTERN OF THORACO ABDOMINAL INJURIES IN FATAL ROAD TRAFFIC ACCIDENTS IN PUNE (MAHARASHTRA) INDIA - AN AUTOPSY STUDY. *Int. J. of Adv. Res.* 6 (Dec). 1430-1435] (ISSN 2320-5407
- 12) Ramu Yangala¹, Suraj Sundaragiri², Vijaya Durga Koppada³. (2019). Pattern of Visceral and Peritoneal Injuries in Fatal Blunt Abdominal Trauma at a Tertiary Care Teaching Hospital in South India. *Medico Legal Update*, 19(2), 253–256. <https://doi.org/10.37506/mlu.v19i2.782>
- 13) Pandey VK, Shahi HP, Singh R, Pratap P. A prospective study of injury pattern and outcome of blunt trauma abdomen patients in a tertiary care hospital in eastern part of India. *Int Surg J* 2020;7:2557-62.
- 14) Ananda Rao BVS, Rajesh B, Uppu R, et al. Study of deaths due to blunt injury abdomen in and around Visakhapatnam. *J. Evid. Based Med. Healthc.* 2018; 5(51), 3466-3469. DOI: 10.18410/jebmh/2018/706
- 15) Shubhendu, Kumar & Bhengra, Ajay & Mahto, Tulsi & Chaudhary, A.. (2016). Analysis of Blunt Abdominal Trauma with Respect to Associated Injuries, Period of Survival And Mechanism of Death Among Autopsies Conducted in Dept. of FMT, RIMS, Ranchi.. *IOSR Journal of Dental and Medical Sciences*. 15. 74-78. 10.9790/0853-1510047478.

- 16) Srivastava, Vivek & Kohli, Anil & Banerjee, K.. (2015). New Injury Severity Score in Fatal Blunt Thoracoabdominal Trauma in North East Delhi. *Journal of Indian Academy of Forensic Medicine*. 37. 65-67. 10.5958/0974-0848.2015.00015.9.
- 17) Sharma, B & Manisha, Gupta & Sumedha, Bangar. (2005). NISS a Valuable Tool for Trauma Scoring on Autopsy. *Pakistan Journal of Biological Sciences*. 10.3923/pjbs.2005.995.1000.
- 18) Goyal, A. & Oberoi, S.S. & Aggarwa, K.K. & Aggarwa, A.D.. (2014). Pattern of injuries cases in the mortuary in the year 2011-2014 in rajindra hospital patiala. *Journal of Punjab Academy of Forensic Medicine and Toxicology*. 14. 105-107.
- 19) Biyabani Naushad Husain¹, Makarand S. Vyawahare², Rajeshwar Pate³. (2020). Correlation of Injury Severity Score with Survival time in Fatal Road Traffic Accidents in Central Indian Population. *Medico Legal Update*, 20(2), 37–41. <https://doi.org/10.37506/mlu.v20i2.1057>
- 20) RAUTJI R, BHARDWAJ DN, DOGRA TD. The Abbreviated Injury Scale and its Correlation with Preventable Traumatic Accidental Deaths: A study from South Delhi. *Medicine, Science and the Law*. 2006;46(2):157-165.
- 21) Ravi, Binod. (2017). Study on Pattern of Thoraco-Abdominal Injuries in Fatal Road Traffic Accidents at Ranchi, Jharkhand. *Journal of Medical Science And clinical Research*. 05. 22301-22305. 10.18535/jmscr/v5i5.166.
- 22) Amol Shinde, Sahil Khurana An observational study on pattern of thoraco abdominal injuries at BJ medical college Pune, *Indian journal of basic and applied medical research* September 2019 vol. 8 issue 4 pg 85-89

- 23) Gyan Prakash Gaur, Anupama Garg, P C Vyas study on pattern of blunt thoraco abdominal injuries in fatal MLC cases in Jodhpur, IRMPS vol. 2 no 2 April-June 2016 pg 29-35.
- 24) Dipayan Deb Barman , R Karnaboopathy, study on pattern and severity score of fatal blunt abdominal injuries sustained in RTA, J Indian Academy for Med 2019 jul-sept 41(3) pg 158-162
- 25) Bayyapa Reddy, Hanumantha epidemiological study on pattern of thoraco abdominal injuries sustained in fatal RTA cases of Banglore, J of emergency trauma and shock April 2014-June issue 2 pg 116-120
- 26) Gushinge M, Kadu S. Autopsy Study of Abdominal Injuries in Road Traffic Accidents. Int J Educ Res Health Sci 2017;3(2):90-92.
- 27) Ntundu, S.H., Herman, A.M., Kische, A. et al. Patterns and outcomes of patients with abdominal trauma on operative management from northern Tanzania: a prospective single centre observational study. BMC Surg **19**, 69 (2019). <https://doi.org/10.1186/s12893-019-0530-8>
- 28) Subedi, Nuwadatta; Yadav, B.N.; Jha, Shivendra; Paudel, Ishwari Sharma; Regmi, Rajendra (2013). A profile of abdominal and pelvic injuries in medico-legal autopsy. Journal of Forensic and Legal Medicine, 20(6), 792–796. doi:10.1016/j.jflm.2013.06.002
- 29) Chiang, Valerie X.Y.; Cheng, Jolene Y.X.; Zhang, Z.C.; Teo, Li-Tserng (2014). Comparison of severity and pattern of injuries between motorcycle riders and their pillions: A matched study. Injury, 45(1), 333–337. doi:10.1016/j.injury.2013.01.040

- 30) Abd El Maksoud WM, Algahtany MA. Pattern and In-Hospital Mortality of Thoracoabdominal Injuries Associated with Motor Vehicle Accident-Related Head Injury: a Single-Center Retrospective Study. *Applied Bionics and Biomechanics*. 2022 ;2022:3602838. DOI: 10.1155/2022/3602838.
- 31) Nikolic S, Micic J, Mihailovic Z. Correlation between survival time and severity of injuries in fatal injuries in traffic accidents. *Srp Arh Celok lek*. 2001;139:291-5.
- 32) Friedman, Zvulun M.D.; Kugel, Chen M.D.; Hiss, Jehuda M.D.; Marganit, Baruch M.D.; Stein, Michael M.D.; Shapira, Shmuel C. M.D. The Abbreviated Injury Scale, *The American Journal of Forensic Medicine and Pathology*: September 1996 - Volume 17 - Issue 3 - p 233-238
- 33) Olaofe OO, Odesanmi WO, Adelusola KA, Komolafe AO, Sabageh D. An autopsy review of abdominal injuries resulting from road traffic accidents: The Ile-Ife experience. *Sahel Med J* 2017;20:187-91
- 34) Khichi Z, Afridi HK, Mateen A, Kahiri GQ. Audit of thoracoabdominal injuries in road traffic accidents in Larkana, autopsy study. *Pak J Med Health Sci* 2013;7(4):1109-1112.
- 35) Tristan Monchal, Amina Ndiaye, Blandine Gadegbeku, Etienne Javouhey, Olivier Monneuse. Abdominopelvic injuries due to road traffic accidents: Characteristics in a registry of 162,695 victims. *Traffic Injury Prevention*, Taylor & Francis, 2018, 19 (5), pp. 529-534.
- 36) Haddad SH, Yousef ZM, Al-Azzam SS, et al. Profile, outcome and predictors of mortality of abdomino-pelvic trauma patients in a tertiary intensive care unit in Saudi Arabia. *Injury*. 2015;46:94–99

ANNEXURES

ANNEXURE -1 PROFORMA FOR STUDY

One year autopsy study on pattern of thoraco abdominal injuries in fatal road traffic accident cases at Belagavi (a cross sectional study)

1. Post mortem number -
2. Name -
3. Age -
4. Sex –
 - Male
 - Female
5. OP/IP no -
6. Date and time of incidence –
7. Place of occurrence -
 - National highway
 - State highway
 - Intervillage road
8. Date and time of hospital admission –

9. Offending vehicle -

- Bike
- Autorickshaw
- Car
- Heavy vehicle (truck, tractor, bus)
- Unknown

10. Type of victim -

- Pedestrian
- 2 wheeler occupant
- Car occupant
- Heavy vehicle occupant

11. Region of body involved –

- Chest
- Abdomen
- Spine

12. Bony fractures –

- Ribs
- Sternum
- Clavicle
- Vertebrae
- Pelvis

13. Organs involved –

14. Thoracic injuries –

15. Abdominal injuries –

16. Spinal injuries -

17. Cause of death -

18. Period of survival -

19. NISS score -

ANNEXURE -II KEY TO MASTER CHART

- TOV – Type of victim
- OV – Offending vehicle
- POO – Place of occurrence
- TOO – Time of occurrence
- ROBI – Region of body involved
- BF – Bony fractures
- OI – Organs involved
- TI – Thoracic injury
- AI – Abdominal injury
- SI – Spinal injury
- POS – Period of survival
- COD – Cause of death
- NISS – New injury severity score

Age –

- 0-20 years - 1
- 21-40 years - 2
- 41-60 years – 3
- 61 years and above – 4

Sex –

- Male- m
- Female -f

Time of occurrence (TOO) –

- 12 am- 6 am - 1
- 6am – 12 pm – 2
- 12 pm- 6 pm – 3
- 6 pm – 12 am – 4

Type of victim (TOV) –

- Pedestrian – 1
- 2 wheeler occupant – 2
- Car occupant – 3
- Heavy vehicle occupant – 4

Offending vehicle (OV) -

- Bike - 1
- Autorickshaw -2
- Car -3
- Heavy vehicle (truck, tractor, bus) - 4
- Unknown – 5

Place of occurrence (POO) –

- National highway -1
- State highway -2
- Inter village road – 3

Period of survival (POS)-

- < 2 hrs - 1
- 2-6 hrs - 2
- 6-12 hrs - 3
- 12-24 hrs -4
- 1-7 days - 5
- 1 -4 weeks - 6
- >4 weeks – 7

New Injury Severity Score (NISS) -

- 0-25 – 1
- 26-50 – 2
- 51-75 – 3

Cause of death (COD) –

Haemorrhagic shock - HS

Septicaemia - ST

Polytrauma - PT

Hemopneumothorax - HP

Hypovolemic shock - HVS

Others (Respiratory failure, Neurogenic shock, Severe chest injury with lung consolidation, Thrombosis , Crush injury, Traumatic cervical spine injury) - O

Region of body involved (ROBI) -

Chest alone - C

Abdomen alone -A

Spine alone - S

Chest and abdomen - CA

Chest and Spine - CS

Abdomen and Spine – AS

Chest , abdomen, Spine – CAS

Bony Fractures (BF) –

Ribs – RF

Sternum – SF

Clavicle – CF

Vertebrae - VF

Pelvis – PF

Injuries :

Abrasion – AB

Contusion – CO

Laceration – LA

Crush – CR

Complete transection – CT

Retropulsion – RP

Disc buldge - DB

Pneumothorax – PT

Hemothorax – HT

Pneumoperitoneum - PP

Hemoperitoneum - HP

Collapse – CP

Edema – E

Emphysema - EM

Organs involved (OI) –

Lungs - L

Heart – H

Oesophagus - E

Aorta and great vessels – V

Diaphragm – D

Chest wall – CW

Liver – LI

Spleen – S

Kidney – K

Adrenals - AD

Bowel – B

Stomach - ST

Urinary Bladder – U

Abdominal wall – AW

Spinal cord – SC

Peritoneum – P

Perineum – PE

Genitals – G

Thoracic injuries : (TI)

Rib fracture - RF

Clavicle fracture – CF

Sternal fracture – SF

Pneumothorax - PT

Haemothorax - HT

Lung collapse – LCP

Lung oedema – LE

Lung contusion – LCO

Lung laceration - LLA

Lung collapse – LCP

Lung rupture – LR

Heart contusion – HCO

Heart rupture – HR

Heart laceration – HLA

Oesophagus crush injury – ECR

Oesophagus laceration - ELA

Chest wall emphysema – CWEM

Chest wall crush injury - CWCR

Chest abrasion – CAB

Chest contusion – CCO

Diaphragm laceration – DLA

Abdominal injuries : (AI)

Hemoperitoneum – HP

Pneumoperitoneum – PP

Liver laceration – LILA

Liver rupture – LIR

Crush injury of liver – LICR

Kidney laceration – KLA

Kidney rupture – KR

Crush injury of kidney – KCR

Kidney hematoma – KH

Spleen laceration – SLA

Spleen rupture – SR

Crush injury of spleen – SCR
Crush injury stomach – STCR
Crush injury bladder – UCR
Crush injury genitals – GCR
Crush injury bowel – BCR
Bowel rupture - BR
Crush injury abdominal wall – AWCR
Crush injury pelvis - PCR
Fracture pelvis – PF
Pelvic laceration – PLA
Pelvic hematoma – PH
Adrenal hematoma – AH
Great vessel rupture – VR
Perineal laceration – PELA
Abrasion over abdomen – AAB
Contusion over abdomen -ACO
Laceration over abdomen -ALA
Spinal injuries : (SI)
Fracture – VF
Retropulsion – RP
Anterolisthesis – AT
Vertebral muscle edema – VE
Disc bulge – DB
Paraspinal spasm – PSS
Cervical spondylosis - CS
Disc contusion – DC
Cord compression – CC
Spine straightening – SS
Disc rupture - DR

ANNEXURE -III MASTER CHART

SI No	Name	Age	Sex	TOV	OV	POO	TOO	ROBI	BF	OI	TI	AI	SI	POS	COD	NISS
1	YAS	2	m	2	3	2	4	CA	RF	L, K	RF, LCO	KCR		1	HS	2
2	DEV	2	m	3	4	2	1	CAS	CF, VF, RF	L, S, CW, SC, P	CF, RF, PT, LCP, LE, EM	HP, SLA	VF, RP, AT, VE, DB	6	O	1
3	GAJ	3	m	2	4	3	2	CA		L, P, B	LCP	HP, PP, BCR		5	ST	2
4	BASA	4	m	1	1	2	4	CAS	VF	CW, PE, SC	HT, PT, RF, EM, CAB	PELA	VF	7	ST	1
5	BASA	3	m	3	4	1	3	CA	PF, RF	CW, L, P, LI	CAB, RF, LLA	PF, PP, HP, LILA		1	PT	3
6	RAT	3	f	2	3	2	1	CS	VF	L, SC	LCO, LCP		PSS, CS, VF	5	HS	1
7	BASAL	4	m	1	4	3	4	CA	RF	CW, L, LI, P	CAB, LCO, RF,	HP, LIR		4	HS	2
8	UN	2	m	2	5	2	2	CA	RF, SF	CW, L, H, E, AW, ST, K, LI, S, U, G	CWCR, RF, SF, LLA, HLA, ELA	AWCR, STCR, KCR, LICR, SCR, UCR, GCR		2	HS	3
9	NAR	2	m	1	2	3	4	CAS	RF, VF	CW, L, S, K, LI, SC	HT, PT, RF, EM, LLA	SLA, KCR, LILA	VF	2	HS	3
10	ANI	2	m	1	4	2	2	CA		L, AW, P, LI, S, K	LCO	AWCR, HP, LICR, SCR, KCR		1	HS	3
11	YAL	1	m	2	4	2	3	CA	RF, SF	CW, L, H, E, AW, P, ST, B, LI, S, K, U, G	CWCR, LCR, HCR, ECR	AWCR, PCR, STCR, BCR, LICR, SCR, KCR, UCR, GCR		1	PT	3
12	HAL	2	m	3	4	2	3	CA	RF	CW, P, LI, S, K	CAB, RF	HP, LILA, SLA, KCR		1	PT	3
13	NAG	4	m	1	5	3	4	CS	PF, VF, RF	CW, L, SC	HT, PT, EM, RF, LCP		VF, DB	2	HP	2
14	SAN	4	f	2	3	1	4	CAS	RF	CW, L, K, SC	RF, PT, HT, CWCR, LCO	KH	VF	4	HS	3
15	SUR	2	m	3	5	1	4	CA		L, H, LI, S	LCO, HCO	LILA, SR		6	PT	1
16	AKSH	2	m	2	3	2	4	CAS	VF, SF	CW, S, SC	CAB, SF	SLA	VF, DC	4	O	1
17	GOP	2	m	2	3	3	2	CA	RF	P, LI, K	RF, HT	HP, LIR, KR		4	HS	3
18	SHA	2	m	2	4	3	4	CA	RF, SF	L, P, LI, K, S	RF, SF, HT, LR	HP, LIR, KR, SR		3	HS	3
19	RAJ	3	m	2	3	3	3	CA		P, LI, K	PT	HP, LILA, KLA		3	HP	3
20	BHA	2	m	2	4	2	4	CA	RF	L, P, LI, S	RF, LLA, HT	HP, LIR, SR		1	HS	3
21	KAL	3	m	2	3	1	2	AS	PF, VF	SC		PCR, PF,	VF	2	HS	3
22	SAG	2	m	1	3	2	4	CA		P, LI, K, V	CAB	HP, LIR, KR, VR		3	HS	3
23	IRA	2	m	2	2	2	3	CA		H, L, S	CAB, HT, LCO, LLA, HCO	SLA		2	PT	3
24	SAT	4	m	1	3	1	3	CA		L, H, LI, S, K	LCO, HCO	LILA, SLA, KLA		3	O	3
25	UNK	2	m	2	1	1	4	C	RF	L	CAB, HT, LLA, RF			2	HP	3
26	YAM	3	m	2	4	2	4	CA	RF	L, H, P, S, K	RF, LCO, HCO	HP, SLA, KR		6	O	1
27	GAN	2	m	2	4	2	2	CA	PF	CW, AW, U, G	CWCR,	AWCR, PCR, PF, UCR, GCR		1	HS	3
28	NIRM	3	f	2	1	3	2	CAS	RF, PF, VF	CW, SC	CAB, RF	PF, PH	VF	6	ST	1
29	NIR	2	f	2	3	2	1	CA	RF	CW, L, P, LI, B	CAB, RF, HT, LLA	HP, LILA, BCR		1	HS	3
30	MAL	2	m	3	1	2	4	CAS	VF	CW, P, LI, S, K, SC	CCO	HP, LIR, SR, KR	VF, CC	6	HS	2

31	SOM	3	m	2	4	3	2	CA	RF, SF	CW, D, P, LI, K	CAB, RF, SF, DLA	HP, LILA, KR		2	HS	3
32	PIA	1	f	2	4	3	3	CAS	VF, PF	CW, SC	CAB	PF	VF	2	O	3
33	BHA	2	m	2	3	1	4	CAS	RF, SF, VF, PF	CW, L, SC	CAB, RF, SF, HT, PT, LCO, LLA, LCP	PF	VF	7	HS	1
34	UN	2	f	2	1	2	2	CS	VF	CW, SC	CAB		VF	1	O	3
35	LAX	3	m	2	1	2	4	C	SF, RF	H, L, CW	CLA, SF, RF, HT, LLA, LCO, HCO			2	HS	3
36	ATI	2	m	2	4	1	1	C	RF	CW, H, L	CAB, RF, HT, LCO, HR			1	HS	3
37	NAN	3	m	2	3	3	4	CS	RF	CW, L, SC	CAB, PT, LCO, RF		PSS, SS	1	PT	3
38	PRA	1	m	1	1	3	3	CAS	VF, PF	CW, P, G, SC	CAB	PF, HP, GCR	VF	2	PT	3
39	SID	2	m	1	3	3	4	CA		AW, LI, S, P	CAB	ACO, HP, LILA, SLA		1	PT	3
40	SHY	3	m	2	2	2	4	C	RF	CW, H, L	CAB, RF, HT, LCO, HR			1	HS	3
41	SRI	2	m	2	1	1	3	CS	RF, VF	CW, L, SC	CAB, RF, LLA		VF	1	O	3
42	GUR	3	m	2	1	1	4	CA	RF	L, K	CAB, RF, LLA, HT	AAB, KLA		1	PT	3
43	DIG	2	m	2	3	2	4	CA	RF	S	CAB, RF, HT	AAB, SR		1	PT	3
44	ANK	1	m	2	4	3	3	C		L	CAB, PT, LCO	AAB		1	PT	3
45	VIS	2	m	3	1	3	4	C	CF, RF	L	CAB, CF, RF, LCO, PT			5	O	1
46	VIT	3	m	2	4	3	1	C	RF	L	PT, HT, LCO, LE, RF			6	O	1
47	MAL	2	m	1	3	2	4	CA		L, P, AD	CAB, LCO	HP, AH		5	HS	2
48	ARU	1	m	2	1	2	4	A		P, K, V		ACO, HP, KR, VR		4	HS	3
49	MAR	3	m	3	4	1	4	S	VF	SC			AT, VF, DB, VE, PSS	6	O	1
50	VIS	2	m	4	2	2	4	CAS	SF, RF, CF, PF, VF	L, SC	CAB, SF, RF, CF, LLA	ACO, PF, PH	VF	3	HS	2
51	UNK	2	m	2	1	3	2	C	SF, RF	L, H	SF, RF, HT, LLA, HCO			3	HS	2
52	JOE	2	m	2	3	2	4	CA	RF	K	CCO, RF, HT	KLA		5	HS	2
53	SRI	2	m	2	4	2	2	CA	RF, PF	LI, K	RF, HT	ACO, HP, LILA, KR, PF		2	PT	3
54	BHA	2	f	2	3	1	3	CA		LI, S	CAB, PT	HP, LILA, SLA		3	HS	3
55	SHA	3	f	2	3	1	3	CA	RF	L, LI	RF, LCO	HP, LIR		2	HS	3
56	AKA	2	m	2	4	2	4	CS	VF	CW, SC	CAB		AT, VF, DR, VE	6	O	1
57	RAM	2	m	3	3	1	4	CA	RF	L, LI	CAB, RF, HT, LCO	HP, LILA		3	O	2
58	TOP	4	m	1	3	3	2	CA	SF, CF, RF	L, LI	SF, CF, RF, LLA, HT	HP, LILA		6	PT	1
59	VIM	4	f	1	4	3	2	CA		AW, S, LI, K	CAB, HT	AWCR, HP, SR, LIR, KLA		2	HVS	3
60	SHA	3	f	2	4	2	4	CA	RF	AW, L	RF, HT, LLA	AWCR		4	HS	3
61	KI	2	m	2	1	2	4	CA	RF, PF	L	CAB, RF, HT, LCO	PF, AAB, HP		6	ST	1
62	VIL	3	m	2	1	3	4	CA		L, K	CAB, LCO, HT	AAB, KLA		6	O	1
63	VAN	2	m	2	4	3	2	A		AW, PE		AWCR, PELA		2	HS	3
64	NAG	3	m	2	2	2	3	CA		B, P	HT	HP, BR		6	ST	1
65	GUR	2	m	2	3	1	4	CA	RF	CW, LI	CCO, RF, HT	HP, LILA		2	HS	3
66	OM	1	m	2	1	2	4	CA	RF	CW, L, LI	CAB, RF, LCO	HP, LILA		1	HS	3

67	HOB	3	f	2	2	1	3	CA		L, S, K	CAB, LCO	HP, SR, KR		5	HS	2
68	UNK	3	m	2	1	3	4	C		L	CAB, LCP			6	PT	1
69	TAR	3	m	2	1	2	4	C	RF	CW, L	CCO, RF, HT			5	PT	2
70	RAV	3	m	2	3	3	3	CA	RF	LI	RF	HP, LILA		1	PT	3
71	PAR	2	m	2	1	3	3	CA	RF	L, LI, S	CAB, RF, HT, LCO	HP, LILA, SR		2	HS	3
72	UM	2	m	1	2	2	4	CA	RF	L, H, LI, S, B, K, G	CWCR, RF, LLA, LCR, HLA	AWCR, LICR, SCR, BCR, KLA, GLA		2	O	3
73	KI	3	m	2	2	2	3	CA	RF	L, LI, S, CW, AW	CCO, RF, LCO	ACO, LIR, SR		2	O	3
74	NI	2	m	1	3	2	4	CA	RF	L, LI	CAB, RF, LLA	HP, LILA, AAB		2	HS	3
75	AD	2	m	1	1	2	4	CAS	VF, PF	P, B, SC	HT, PT	AWCR, HP, BCR, PF, PCR	VF	4	HS	3
76	GAN	3	m	1	3	2	2	CA	RF	L, LI	RF, HT, LLA	LILA		3	HS	3
77	AKR	3	m	1	4	2	3	CA	RF, SF	CW, L, H, E, AW, ST, K, LI, S, BL, G	CWCR, RF, SF, LLA, HLA, ELA	AWCR, STCR, KCR, LICR, SCR, UCR, GCR		1	HS	3
78	AKA	2	m	1	3	3	3	CAS	RF, VF	CW, L, S, K, LI, SC	HT, PT, RF, EM, LLA	SLA, KCR, LILA	VF	3	HS	3
79	RAG	2	f	2	3	2	4	CA		L, AW, P, LI, S, K	LCO	AWCR, HP, LICR, SCR, KCR		1	HS	3
80	NIR	2	m	2	1	3	4	CA	RF, SF	CW, L, H, E, AW, P, ST, B, LI, S, K, U, G	CWCR, LCR, HCR, ECR	AWCR, PCR, STCR, BCR, LICR, SCR, KCR, UCR, GCR		2	O	3
81	LAX	3	m	1	1	2	2	CA	RF	CW, P, LI, S, K	CAB, RF	HP, LILA, SLA, KCR		3	HS	3
82	GOK	2	m	2	1	1	3	CS	PF, VF, RF	CW, L, SC	HT, PT, EM, RF, LCP		VF, DB	1	PT	3
83	KAJ	2	f	1	1	2	4	CAS	RF	CW, L, K, SC	RF, PT, HT, CWCR, LCO	KH	VF	6	ST	1
84	VIT	3	m	2	3	2	4	CA		L, H, LI, S	LCO, HCO	LILA, SR		2	O	2
85	BHA	2	f	1	3	3	1	CAS	VF, SF	CW, S, SC	CAB, SF	SLA	VF, DC	3	HS	2
86	ANU	2	m	2	1	2	4	CA	RF	P, LI, K	RF, HT	HP, LIR, KR		4	O	2
87	SAY	2	f	2	1	2	3	CA	RF, SF	L, P, LI, K, S	RF, SF, HT, LR	HP, LIR, KR, SR		1	HVS	3
88	MIT	1	f	2	4	2	3	CA		P, LI, K	PT	HP, LILA, KLA		1	HS	3
89	NIK	3	f	2	4	2	3	CAS	CF, VF, RF	L, S, CW, SC, P	CF, RF, PT, LCP, LE, EM	HP, SLA	VF, RP, AT, VE, DB	6	O	1
90	SAT	1	f	1	4	1	4	CA	RF	L, P, LI, S	RF, LLA, HT	HP, LIR, SR		1	HS	3
91	GAN	1	m	2	4	2	2	CA	PF	L, B, LI, K, S	LCO	PCR, BCR, AAB, PF, LICO, KCO, SCO		3	HS	3
92	RAV	3	m	2	1	3	4	CA	RF	P, LI, L	RF, LLA	HP, LILA		1	HS	2
93	SAG	2	m	2	1	2	4	CA		L, S	LCO	HP, SR		4	HS	3
94	RAJ	3	m	1	4	3	4	CA	PF	L, G	LCO	AAB, PCR, GCR, PF		4	HS	3
95	NAG	3	m	3	4	2	1	CA	RF, CF	L, S, P	RF, CF, LLA	HP, SLA		5	HS	3
96	MUK	2	m	3	3	1	4	CA	RF, CF	L, LI, K	CAB, RF, CF, LLA	LILA, KLA		4	HVS	2
97	SHA	2	m	4	4	3	2	A	PF	AW, G, PE		ACO, GCR, PCR, PF		2	HS	3
98	SHI	2	m	2	3	2	3	A	PF	AW, G, PE		AAB, PLA, GCR, PF, LILA		1	HS	3

99	SAN	2	m	4	4	1	1	A		P, LI, S, K		HP, LILA, SLA, KCR		5	ST	2
100	VAI	2	f	2	4	1	3	CA	RF, PF	L,	CAB, RF, LLA	PF, PLA, PCR,		1	HS	3
101	VIR	3	m	1	4	1	2	CA	RF	L, LI, P	CAB, RF, LCO	HP, LILA		1	HVS	3
102	PRI	1	m	2	4	3	3	CA	RF	L, LI, P	RF, LLA	AAB, PLA, HP, LILA		5	HVS	2
103	ANI	3	m	3	3	1	2	CA		L, S, K	CAB, LCO	SLA, KLA		1	HVS	3
104	SAN	2	m	4	4	1	3	CA	CF, RF	CW, P, LI	CAB, CF, RF	HP, LILA		4	HVS	2
105	BAKU	2	m	2	1	2	4	CA		B, LI	CAB	HP, BCR, LILA		5	ST	2