

# An Autopsy Study of Liver Injuries in a Tertiary Referral Centre of Eastern Nepal

NUWADATTA SUBEDI<sup>1</sup>, B.N. YADAV<sup>2</sup>, SHIVENDRA JHA<sup>3</sup>, SHARMILA GURUNG<sup>4</sup>, AMSHU PRADHAN<sup>5</sup>

## ABSTRACT

**Background:** Liver is the largest gland in the body and it frequently gets wounded. The objective of this study was to determine the patterns, types and severities of liver injuries which were caused by mechanical trauma and to study the organs associated with liver injuries.

**Material and Methods:** This was a hospital based, cross sectional study which was conducted on the autopsies showing the evidence of liver injuries in the mortuary of a tertiary hospital in eastern Nepal. All consecutive autopsy cases which were handled within one year's time (n=46) were included in our study. The cases were studied in detail for liver injuries, which included age, sex, severity, associated injuries, site of the injury, description of the injury, etc.

**Results:** The mean age of the victims was 33.87 years and there

was a male: female ratio of 3.6:1. The injuries had resulted from blunt trauma in 41 (89.1%) cases, the most common of which was road traffic accidents, constituting 37(80.4%) cases. Grade III injuries were seen in 14 (30.4%) cases. Laceration of the liver was the most frequent finding that was evident in 34 (73.9%) cases. Right lobe of the liver was injured in 30 (74%) cases. The sole presence of liver injuries among abdomino-pelvic organs was seen in 14 (30.4%) cases. In 40 (87%) cases, liver injuries were associated with other regional injuries.

**Conclusion:** Laceration is the most common liver injury among autopsy cases. Right lobe is mostly affected and grade III injuries are the most common ones. Liver injuries are frequently associated with other abdomino-pelvic organs and multiple regional injuries.

**Key words:** Liver injury, Autopsy, Abdominal injuries

## BACKGROUND

Injuries and violence related fatalities are subjected to medico-legal examinations in Nepal [1]. Autopsy still remains the "gold standard" by which the physician's clinical diagnosis is confirmed, amended or refuted. It is the most reliable and accurate instrument for investigation of injuries [2]. Early recognition of the injuries and providing an immediate treatment are mandatory for saving the lives of many of these patients [3]. If they are overlooked and neglected, their situations would eventually have medico-legal implications [4].

Liver is the largest gland in the body [5]. In patients with abdominal trauma, the liver is the most frequently injured organ. Owing to its size, fixed position and friable consistency, the liver gets frequently wounded. It may also be lacerated by the fractured ends of the ribs, which perforate the diaphragm. Ruptures usually involve the right lobe, and they occur in the anterior surface and the inferior border. It is more easily lacerated if it is enlarged and fatty. Rupture of the liver causes immediate death due to shock and haemorrhage, especially if the portal vein or the inferior vena cava is injured [6]. A liver injury is the second leading cause of death, which results from blunt trauma and the liver is commonest organ to get injured acquiring penetrating injuries [7].

A blunt impact on the upper abdomen can compress and injure the liver and spleen before a significant whole-body motion occurs. In the liver, compression increases intra-hepatic pressure and it generates tensile or shear strains. If the tissue is sufficiently deformed, laceration of the major hepatic vessels, which occurs, can result in a haemoperitoneum. Abdominal deformation also causes lobes of the liver to move relative to each other, stretching and shearing the vascular attachment at the hilar region [7]. An accurate and a detailed understanding of the frequency and types of injuries leads to more accurately targeted measures of prevention, diagnostic algorithms, education and capital investment management.

## OBJECTIVES OF THE STUDY

- To study the patterns, types and severities of liver injuries which were caused by mechanical trauma.
- To study the associated organs with liver injuries.

## MATERIAL AND METHODS

This was a hospital based, cross sectional study which was conducted on the autopsies showing the evidence of liver injury conducted in the mortuary of a tertiary hospital in eastern Nepal. All the cases which were handled within one year time (14.04.2010 to 13.04.2011) were included in our study. The number of cases was 46. In each case, a routine medico-legal autopsy was performed and all injuries were noted. The cases were studied in detail for liver injuries, which included age, sex, associated injuries, site of the injury, description of the injury, etc.

The liver injuries were described according to the Organ Injury Scale and Abbreviated Injury Scale (AIS) 2005 update 2008. The AIS is an anatomically based, global severity scoring system that classifies each injury into nine distinct anatomic regions on a six-point ordinal scale (1 is a minor injury and 6 is a maximum injury which is currently untreatable) [8]. The AIS grading can be equilibrated to the Organ Injury scale. The Organ Injury Scales were developed by the Organ Injury Scaling Committee of the American Association for the Surgery of Trauma (AAST). Each organ injury can be graded from 1 to 6. Grade 1 is assigned to the category of a least severe injury, while grade 5 is assigned to the most severe injury in which the patients have chances for survival. Grade 6 injuries are, by definition, not salvageable and they are severe enough to claim the patients' lives [9, 10] [Table/Fig-1].

**Inclusion and exclusion criteria:** All the autopsies which showed liver injuries which were caused by mechanical trauma were included in our study. The bodies that were decomposed and those where cause of trauma was unknown, were excluded from the study.

AAST Grade*	Description	AIS 2005
I	Contusion; Haematoma: Subcapsular, <10% surface area	2
	Laceration: Capsular tear, <1cm parenchymal depth	2
II	Haematoma: Subcapsular, 10-50% surface area	2
	Laceration: Capsular tear, 1-3 cm parenchymal depth, ≤10cm long	2
		2
III	Haematoma: Subcapsular, ≥50% or expanding; ruptured subcapsular or parenchymal Haematoma; intraparenchymal Haematoma >10cm or expanding	3
	Laceration: >3cm parenchymal depth	3
IV	Laceration: Parenchymal disruption involving 25-75% of hepatic lobe or 1-3 Couinaud's segments within a single lobe.	4
V	Laceration: Parenchymal disruption involving >75% of hepatic or >3 Couinaud's segments within a single lobe	5
	Vascular: Juxtahepatic venous injuries: i.e., retrohepatic venacava/ central major hepatic veins.	5
VI	Vascular: Hepatic avulsion.	6

[Table/Fig-1]: Liver Injury Scale

\*Advance one grade for multiple injuries up to grade III

**Data Collection Tools:** Data was collected systematically in a detailed proforma which was developed for the post-mortem evaluation of victims who sustained liver injuries. All collected data was compiled and entered into the Microsoft Excel. Its analysis was done by using SPSS (Statistical Package for Social Sciences), version 17.0. Observations were recorded, analyzed and discussed.

## RESULTS

A total of 479 autopsies were performed in the Department of Forensic Medicine and Toxicology in the study period. Among them, 122 were road traffic accidents (RTA), and 49 other mechanical traumatic causes. Some forms of liver injuries were noted in 46 cases. Among the 46 autopsy cases with liver injuries, 36 (78.3%) were males and 10 (21.7%) females. Their mean age was 33.87 years, with a standard deviation of 15. The commonest age range of the victims was 16-30 years, which constituted 23 (50%) cases, followed by the age group of ≥ 45 years which constituted 12 (26%) cases and 31-45 years which constituted 9 (19.6%) cases, while age group of 0-15 years constituted the least number, i.e., 2 (4.3%) victims.

The injuries had resulted from blunt trauma in 41 (89.1%) of the cases, the most common of which were RTAs, which constituted 37(80.4%) cases overall and 90% of the non-penetrating cases. The other causes of blunt hepatic injuries were fall from a height in 3 (7.31%) cases, and in one case, the injury had resulted from an assault with the use of a blunt weapon. The contribution of penetrating injuries was 5 (10.9%) cases, among which stab injuries and firearm injuries were the causes in two cases each and in one case, a projecting iron rod had caused the injury during a fall from a height.

Liver Injury Scale	AIS 2005	Number of Victims (%)
Grade I	2	6 (13.0)
Grade II	2	8 (17.4)
Grade III	3	14 (30.4)
Grade IV	4	4 (8.7)
Grade V	5	11 (23.9)
Grade VI	6	3 (6.5)
Total		46 (100)

[Table/Fig-2]: Grading of liver injuries

Liver Injuries were graded by using Organ Injury scale and AIS 2005 and the results have been shown in [Table/Fig-2].

Laceration of the liver was the most frequent finding that was evident in 34 (73.9%) cases, followed by haematoma, which was seen in

8 (17.4%) cases. Combined haematoma and laceration was seen in 3 (6.5%) cases, while haematoma, as a sole manifestation, was evident in only one case.

Right lobe of the liver was mostly injured. The involvement of right lobe was seen in 34 (73.9%) cases, that of left lobe was seen in 5 (10.9%) cases and a bilobar involvement was seen in 7 (15.2%) cases. The convex surface was the most common site which was affected by all the types of injuries. Its involvement was seen in 27 (58.7%) cases. Injuries on the inferior surface were detected in 12 (26%) cases and on those on the diaphragmatic surface were detected in 7 (15.2%) cases.

Injuries	Number (%)
Isolated Liver Injury	14 (30.4)
Mesentery	13 (28.0)
Spleen	10 (21.7)
Kidneys	10 (21.7)
Diaphragm	10 (21.7)
Large intestine	6 (13.0)
Pelvic bones fracture	5 (10.8)

[Table/Fig-3]: Associated abdominal and pelvic injuries

[Table/Fig-3] shows the association of liver injuries with other abdominal and pelvic injuries. The association of other regional injuries has been depicted in [Table/Fig-4].

Injuries	Number (%)
≥2 Body regions	22 (47.8)
Thorax only	11 (23.9)
Extremities only	5 (10.9)
Head only	2 (4.3)

[Table/Fig-4]: Associated Injuries on the body regions

## DISCUSSION

The most vulnerable age group in our study was 16-30 years. This age group leads a more active life and is at the peak of its activity, having the tendencies of taking risks, alcoholic intoxication, etc. thereby subjecting itself to the dangers of accidents and injuries. Males were predominantly involved in our study and the male: female ratio was 3.6:1. The fact that males are usually the earning members of the families makes them more mobile and thus, vulnerable to accidents and construction and industrial mishaps, as compared to females who mostly indulge in household chores. A similar pattern was shown by other studies also [3, 11-16].

Blunt trauma was the predominating trauma mechanism in the study population. The overwhelming bulk of liver injuries were caused by road traffic accidents. Non-penetrating injuries, as the common cause of liver trauma, has also been mentioned in other similar studies [3, 11, 14-16].

The predominant injury site was the right hepatic lobe in our study. This result was similar to that of many studies which had been conducted earlier [3, 12, 15-17]. The greater pre-ponderance of right sided liver injuries could be explained on the basis of the bulkier size of the right sided liver, which could have led to a greater vulnerability of it bearing more impact. The right lobe of liver is not well supported anatomically, which can be another explanation. In the fatalities with liver injuries, laceration was the most common nature of injury which was present in our study. It can be attributed to the friable consistency of the liver. As was highlighted in our study, upon the commonest sites and type of hepatic injuries, it can be helpful in timely intervention and early treatment of the patients. Convex surface was the commonly affected site. This finding was supported by those of other similar studies [15, 16].

Shakeel A et al., [11-12] didn't find any Grade V and VI injuries. This

was in contrast to our study findings, as our study included only the fatal group. Our results were similar to those of P Tavling et al., [12] They had studied autopsies with liver injuries. Assessment of the degrees of hepatic injuries may be helpful in determining the outcome and treatment quality at different centres. The medico-legal expert who conducts the autopsy, when he/she is called upon to present his/her autopsy findings in court and to express an opinion regarding the amount of force that may have been applied in order to produce the traumatic lesions which were noted, has to rely on a subjective interpretation of the findings and this may vary from pathologist to pathologist. The scientific grading of injuries provides uniformity among the pathologists.

Liver injuries occur in combination with other abdomino-pelvic injuries, commonly with mesenteric, diaphragmatic and splenic injuries. They can also be associated with multiple regional injuries. P Tavling et al., [12] also reported similar findings. As liver injuries increase in severity, other organ systems may become involved and so, total mortality may result from the cumulation of all damaged organs. This also emphasizes the need of a proper monitoring of the victims of trauma.

## CONCLUSION

Laceration is the most common liver injury among autopsy cases. Right lobe is mostly affected, convex surface is the most vulnerable site and grade III injuries are the most common ones. Liver injuries are frequently associated with other abdomino-pelvic organs and multiple regional injuries. Proper identification of hepatic injuries, with a timely response to victims of such trauma and improvement of emergency services in the hospital, may help in saving human lives in a better manner.

## ACKNOWLEDGEMENT

I acknowledge BP Koirala Institute of Health Sciences for providing the the permission for conducting this study. The staff and residents of Department of Forensic Medicine and Toxicology, BPKIHS are also thanked for helping in accomplishing this study.

## REFERENCES

- [1] Sharma Gyanendra, Shrestha Pramod K, Wasti Harihar, Kadel Tulsi, Ghimire Pratima, et al. A review of violent and traumatic deaths in Kathmandu, Nepal. *Int J Inj Contr Saf Promot.* 2006; 13(3):197-9.
- [2] Jansen JO, Yule SR, Loudon MA. Investigation of blunt abdominal trauma. *BMJ.* 2008 Apr; 336(7650):938-42.
- [3] Jhanjee, Akash. A Post mortem study of abdominal and pelvic trauma in Central Delhi. Anil Aggrawal's internet journal of forensic medicine and toxicology [Online] 2000 July-Dec [cited 2010 Feb 4]; 1(2)1. Available from URL: <http://www.gerads.com/anil/ij/indexpapers.html>.
- [4] Abdul Halim Mansar, Muhammad Aadeel, Khairul Osman, Sharin Iskandar A.W. An Epidemiological Study of Abdominal and Pelvic Injury Trauma in post-mortem cases at Hospital Kuala Lumpur between the year of 2002-2003. *Jurnal Sains Kesihatan Malaysia.* 2008;6(2): 65-73.
- [5] Decker GAG. Lee McGregor's Synopsis of Surgical Anatomy. Bristol: John Wright and Sons LTD; 1986.
- [6] K Mathihran, Amrit K Patnik. (editors). *Modi's Medical Jurisprudence and Toxicology*, 23rd ed. New Delhi: Lexis Nexis; 2006; 830-41.
- [7] Viano DC, King AI. Biomechanics of Chest and Abdomen Impact. *The Biomedical Engineering Handbook*: 2nd ed. Ed. Joseph D. Bronzino Boca Raton: CRC Press LLC; 2000.
- [8] Association for Advancement of Automatic Medicine. *Abbreviated Injury Scale* 2005, Update 2008. Barrington, USA; 2008.
- [9] Moore EE, Shackford SR, Pachter HL, et al. Organ injury scaling - spleen, liver and kidney. *J Trauma.* 1989; 29(12):1664-66.
- [10] Moore EE, Cogbill TH, Jurkovich MD, et al. Organ injury scaling: spleen and liver (1994 revision) *J Trauma.* 1995; 38(3):323-24.
- [11] P Tavling, M Beckman, T Häggmark1, L Iselius 1. Epidemiology of Liver Injuries, *Scand J Surg.* 2003; 92:192-4.
- [12] Shakeel A Mir, Ghulam Q Peer, Fazl Q Parray. Profile of Liver Trauma. *JK-Practitioner.* 2006; 13( 4):194-9.
- [13] Gakwaya AM. Blunt Liver Trauma in Mulago Hospital. *East and Central African Journal of Surgery.* 2004 Dec; 9(2):85-8.
- [14] Moosa Zargar, Marjan Laal. *International Journal of Collaborative Research on Internal Medicine & Public Health.* 2010; 2(4):96-107.
- [15] Devi Th, Meera, H Nabachandra, Sudhirchandra Singh Th. "Blunt hepatic trauma: A Study." *Medico-Legal update – An International journal.* 2006; 6(3):73-6.
- [16] Prabir Chakraborty, Somnath Das, Surendra Kumar Pandey. Comparative Study of Hepatic Injury and its Different aspects in Medicolegal Autopsies. *J Indian Acad Forensic Med.* 2011; 33(3):203-6.
- [17] Zoran Marjanovic, Ruzica Milicevic, Marijana Krstic, Stevan Jovcic, Ana Kostic. Treatment of blunt liver injuries in children. *Acta Medica Medianae.* 2003; 42:23-26.

### PARTICULARS OF CONTRIBUTORS:

1. Lecturer, Department of Forensic Medicine, College of Medical Sciences, Bharatpur, Chitwan, Nepal.
2. Professor, Department of Forensic Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal
3. Associate Professor, Department of Forensic Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal.
4. Assistant Professor, Department of Forensic Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal.
5. Lecturer, Department of Forensic Medicine. KIST Medical College and Hospital, Lalitpur, Nepal.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Nuwadatta Subedi,  
Lecturer, Department of Forensic Medicine, College of Medical Sciences, Bharatpur, Chitwan, Nepal.  
Phone: +977 9842039565, E-mail: subedind@yahoo.com

Date of Submission: **Feb 19, 2013**  
Date of Peer Review: **Jun 13, 2013**  
Date of Acceptance: **Jun 18, 2013**  
Date of Publishing: **Aug 01, 2013**

FINANCIAL OR OTHER COMPETING INTERESTS: None.