Original Article

OPEN ACCESS

Outcomes of Patients with Grade I and II Blunt Liver Trauma Managed Non-operatively

Fayeza Javaid, Muhammad Shah*, Shahid Munir, Gohar Ali, Muhammad Bilal, Shimee Shahzadi

[1] Surgical Unit, Hayatabad Medical Complex, Peshawar- Pakistan

Article Info

Corresponding Author
Muhammad Shah
Surgical Unit,
Hayatabad Medical Complex,
Peshawar, Pakistan.
Email: drmuhammadshah@yahoo.com

Date Received:
09th Mar, 2026
Date Revised:
18th May, 2026
Date Accepted:
18th May, 2026

Abstract

Objective: To determine the length of hospital stay in patients with grade I and II blunt liver trauma managed non-operatively.

Methodology: This cross-sectional observational study was conducted at the Department of General Surgery, Hayatabad Medical Complex, Peshawar from May 7, 2021, to November 7, 2025. A total of 150 patients presented with blunt liver trauma of grade I and II, who were managed non-operatively, were observed to determine the mean hospital stay. Non-probability consecutive sampling technique was employed.

Results: A total of 150 patients were encompassed in the study with blunt liver trauma. The mean age of the patients was 41.56 ± 5.357 years. Of these, 94 (62.7%) were male and 56 (37.3%) were female. The most common mechanism of injury was a fall from height, observed in 52 (34.7%) patients, followed by physical assault in 23 (15.3%) and sports injuries in 18 (12.0%). Conservative management was successful in 136 (90.7%) patients, whereas 14 (9.3%) required further intervention. Mortality was recorded in 6 patients (4.0%), whereas 144 patients (96.0%) were alive. The mean hospital stay was 4.39 ± 2.10 days. Grade II had 5.3±1.8 days (p = < 0.05) longer hospital stay compare to grade I 3.3±1.2 days.

Conclusion: In conclusion, the mean hospital stays for patients with Grade I and II blunt liver trauma managed non-operatively was 4.39 ± 2.10 days. Grade II had longer hospital stay compare to grade I. However, the overall success rate and the effectiveness of this approach may be adversely affected by limited hospital resources and the lack of consensus regarding conservative treatment protocols.

Keywords: Abdominal Injuries, Conservative Treatment, Length of Stay, Liver Injuries, Wounds, Nonpenetrating

This article may be cited as:
Javaid F, Shah M, Munir S, Ali G, Bilal M, Shahzadi S. Outcomes of patients with grade i and ii blunt liver trauma managed non-operatively. J Postgrad Med Inst. 2026;40(2):99-104. http://doi.org/10.54079/jpmi.40.2.3934

Introduction

Trauma is the leading cause of deaths in children and young adults globally. According to World Health Organization (WHO), trauma claimed an estimated 5 million lives in the year 2016 with a majority 20 to 25%, resulting from road traffic accidents (RTA).[1,2] Approximately 6% of all deaths in Pakistan are caused by trauma.[3] Liver is one of the most commonly injured solid organs in blunt abdominal trauma accounting for up to 38% of cases, which is 15% to 20% in Pakistan in a local study.[4] Liver trauma, most often resulting from road traffic accidents, falls from height, or assault, is predominantly blunt in nature accounting for 75–90% of all cases—and carries a mortality rate that may reach 12.2%.[5]

Modern radiological modalities, particularly computed tomography (CT), have significantly advanced the evaluation and understanding of liver trauma over the past three decades, transforming trauma surgery practice.4,6 According to the World Society of Emergency Surgery (WSES) 2020 guidelines, conservative management is the preferred approach for blunt hepatic injuries in hemodynamically stable patients, while surgical intervention is reserved for those who are unstable.[6]

Non-operative management (NOM) of blunt liver trauma offers significant advantages, comparative to major surgical procedures that carry patients risks, peri-operative complications and increased healthcare costs.[7] Surgery is associated with prolonged hospital stays, delayed recovery, and slower return to work.[6,8] NOM should therefore be adopted carefully ensuring close clinical monitoring, frequent examinations of abdomen and radiological investigations, with a multidisciplinary approach.[6,8] Conservative management of blunt hepatic trauma has shown high success rates, with shorter hospital stays and low mortality, particularly in patients with the American Association for the Surgery of Trauma (AAST) Grades I–III.[9]

The aims of this study are to bridge the existing literature gap by evaluating the outcomes, particularly the mean hospital stays, of NOM of blunt liver trauma in younger population. Additionally, to improve strategies in resource-limited settings in trauma care.

Methodology

This cross-sectional observational study was conducted in the Department of General Surgery, Hayatabad Medical Complex, Peshawar, from 7th May 2021 to 7th November 2025.

A total of 150 patients were included. Non-probability consecutive sampling technique was used with the sample size was calculated using the following WHO formula for estimating sample size:

$n = (Z^2 \times \sigma^2) / d^2$

Where: n = required sample size, Z = Z-value at 95% confidence level (1.96), σ = standard deviation (4.81 days), d = absolute precision the anticipated mean hospital stay was 7.72 ± 4.81 days. Relative precision was kept at 10%, so the calculated sample size was 149.1 rounded to 150.[6]

The study included the patients of both genders aged 10 and 60 years diagnosed with blunt liver trauma of grade I or grade II. The enrolled patients had ASA class I or II, body mass index (BMI) between 19 and 30 kg/m^2, hemodynamically stable at presentation. Exclusion criteria comprised of patients who had penetrating abdominal trauma on primary survey or polytrauma, previous coagulation disorders, chronic liver disease and ischemic heart disease. Written informed consent was obtained from all participants (Annexure A), in accordance to the Institute of research ethical committee of Hayatabad Medical Complex (IREB# 2178).

Data Collection Procedure: 150 patients were encompassed into the study by strictly adherence to inclusion and exclusion criteria, who presented to the Accident and Emergency (A&E) Department with blunt abdominal trauma.

All patients were managed according to the Advanced Trauma Life Support (ATLS) protocol. Primary and secondary surveys were completed including complete investigations such as X-rays of the chest, cervical spine, and pelvis, followed by a Focused Assessment with Sonography for Trauma (FAST) scan. A standardize proforma was used to collect data including demographic details (age, gender, occupation, contact number, address) and mechanism of injury (Road traffic accident, fall from height, sports injury, physical assault), keeping the data confidential and without any sensitive information. A thorough clinical examination was performed, and baseline investigations including complete blood count (CBC), blood group and cross-match, liver function tests, coagulation profile, renal function tests, and hepatitis B and C serology was noted in proforma.

All the patients once stable, a contrast-enhanced computed tomography (CECT) scan of the abdomen was performed, and liver injuries were classified according to the American Association for the Surgery of Trauma (AAST) scale (Grades I–VI).

Those stable individuals who were diagnosed with grade I or grade II injury were monitored and observed in intensive care unit (ICU) or high dependency unit (HDU), until 48 hours stability, then shifted to general ward care protocol. Serial hemoglobin (Hb) levels were checked at 6-hour intervals during the first 24 hours, followed by 12–24 hourly monitoring depending on clinical stability. Vital signs were closely observed, with particular attention to systolic blood pressure (<90 mmHg), persistent tachycardia (>100 beats/min), and signs of ongoing bleeding. Patients were maintained in ICU/HDU for a minimum of 48 hours of clinical stability before transfer to the general ward. Patients

J Postgrad Med Inst 2026;40(2):99-104.
http://doi.org/10.54079/jpmi.40.2.3934

developing severe pain, hemodynamic instability, or a sudden fall in Hb levels were shifted from non-operative management plan to laparotomy. Conservative management was considered successful if the patient improved without surgery and was discharged after observation. All patient data were documented on a pre-designed proforma. Exclusion criteria were strictly followed to minimize bias.

Data Analysis: The data was collected, cleaned and analyzed using IBM SPSS version 23. Descriptive statistics were used to summarize the data. Quantitative variables such as age and length of hospital stay were presented using mean and standard deviation (SD), whereas qualitive variables such as age group, BMI, mechanism of injury and treatment outcomes expressed as frequency and percentages. The mean hospital stay was calculated for non-operatively managed grade I or grade II injuries and results were presented in tabular and graphical form. Stratification of variables such as age, gender, and mechanism of injury was performed to control potential effect modifiers. Comparative analysis between Grade I and Grade II injuries was conducted using independent sample t-test for mean hospital stay. A p-value ≤ 0.05 was considered statistically significant where applicable.

Results

Out of 150 participants, 94 (62.7%) were male and 56 (37.3%) were female. The mean age was 41.56 ± 5.35 years with the higher proportion 51 (34.0%) in the 10–20-year age group as shown in Table 1. Table 2 demonstrated the mechanism of injury with larger proportion of road traffic accident 57 (38.0%), fall from height 52 (34.7%), physical assault 23 (15.3%) and sports injury in 18 (12%).

NOM was successful in 135 (90.7%), whereas 14 (9.3%) required operative intervention after failure of NOM. Overall mortality was observed in 06 patients (4.0%), while 144 (96.0%) improved and survived successfully. Table 3 and Figure 2 highlight the treatment outcomes, clearly demonstrating the significance of successful NOM over operative management for lower grade liver injuries. These findings also highlight that NOM was a safe and effective modality in hemodynamically stable patients.

The mean hospital stay was analyzed separately for Grade I and Grade II blunt liver trauma. Table 4 and Figure 3 represent the hospital stay distribution that grade I injuries generally had shorter hospital stays compared to those with Grade II injuries (p = < 0.05). Therefore, these findings reflected higher the grade, adherent to care protocol and close monitoring is ensured.

Lower grade injuries are relatively safe and high success rate if managed with NOM, while mortality was more frequently associated with patients requiring emergency laparotomy. Additionally lower the grade of injury and greater hemodynamically stability, showed quicker recovery and shorter the hospital stays.

er mean hospital stay compared to grade II, reflecting injury severity and recovery time. A local study by Summera Siddique et al. reported similarly that grade

Table 1. Age and Gender Distribution of Patients (n=150)

Variable	Frequency	Percentage %
10–20 years	51	34.0
21–30 years	35	23.3
31–40 years	16	10.7
41–50 years	23	15.3
51–60 years	25	16.7
Male	94	62.7
Female	56	37.3

Table 2. Mechanism of Injury (n=150)

Variable	Frequency	Percentage %
Mechanism	Frequency	Percentage %
Road Traffic Accident	57	38.0
Fall from Height	52	34.7
Sports Injury	18	12.0
Physical Assault	23	15.3

Table 3. Treatment Outcome with management protocols (n=150)

Outcome	Frequency	Percentage %
Successful Conservative Management (NOM)	136	90.7
Operative Intervention (Surgery)	14	9.3
Mortality	06	4.0
Survival	144	96.0

Discussion

This study demonstrated that, in grade I and II liver injury, non operative management (NOM) had quicker improvement and relatively short hospital stays. NOM has become the standard of care for hemodynamically stable patients with low grade hepatic injuries reported similarly by Tariq Alnezi et al. and A Brillantino et al.[8,9] Our results showed that grade I injuries had a short-

Table 4. Mean Hospital Stay of Patients Managed Non-operatively in Blunt Liver Trauma (Grade I & II)

Grade of Injury	N	Minimum (days)	Maximum (days)	Mean (days)	Std. Deviation	p-value
Grade I	75	1	5	3.3	1.2	0.79
Grade II	60	1	8	5.3	1.8	< 0.05*
Total (I + II)	135	1	8	4.39	2.10	0.098

the mean hospital stay of patients with Grade I and Grade II blunt liver trauma managed non-operatively. Grade I patients had a shorter mean stay (3.3 ± 1.2 days) compared to Grade II patients (5.3 ± 1.8 days), with an overall mean of 4.39 ± 2.10 days. Shown in figure 3.
**Independent sample t-test showed a statistically significant difference (p < 0.05).*

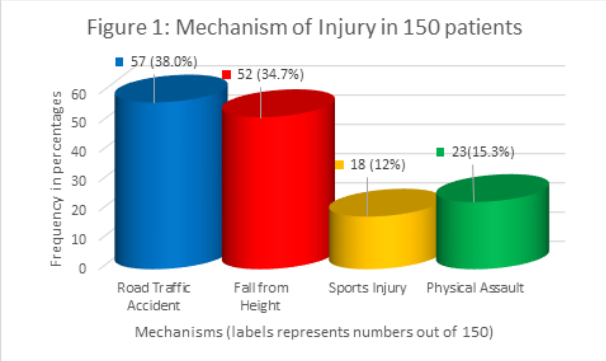

Figure 1: Mechanism of injury in study population.

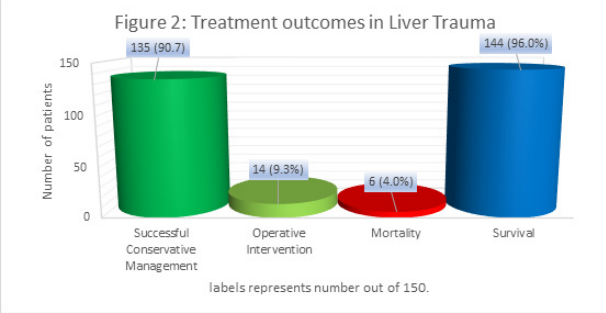

Figure 2: Management Outcomes in Liver injury.

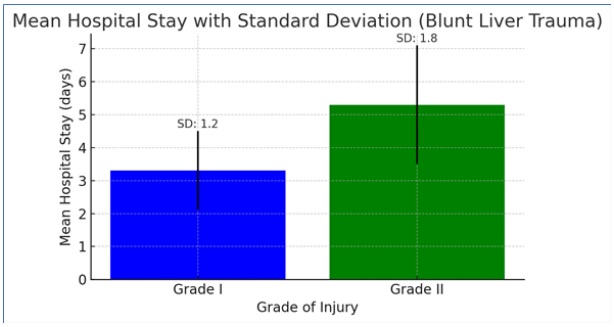

Figure 3: Comparison of Grade I and Grade II injury with Mean Hospital stays.

II injuries had longer hospital stays than grade I.[10] This reinforce the higher grades of injury have significant role in determining the length of hospital stays and resource utilizations.

Similar observations have been reported in Coccolini et al. and Buci et al. where higher AAST grade of injury and more unstable, were associated with longer hospitalization and increased risk of complications.[6,11] The overall success rate of conservative management in our cohort was 136 (90.7%) which aligns with Alanezi et al. and Said et al. reports documented success rates ranging from 68% to over 90% in stable patients.[7,9] Thus prompt diagnosis with imaging like CT and ultrasound which help in accurate diagnosis and follow-up, shows that NOM has high success rate, safe and effective.

Our study adopted operative management for hemodynamically unstable patients regardless of initial grade of injury is similarly reported by Coccolini et al. and Sawhney et al.[6,12]

Grade II injuries were more common among patients undergoing laparotomy or conversion from NOM. However, only grade of injury is not enough several other factors must also be considered, such as institutional setting and availability of trauma center multidisciplinary team. Cocccolini et al., Ward et al. and Tappar et al. reported several factors play a pivotal role in optimizing patients outcomes in liver trauma such as the institutional settings and the availability of a multidisciplinary trauma care team.[3,6,13]

Long et al. and Carter et al. similar to our study, reported that half of the OM group arrived hemodynamically unstable, many with associated other organ injuries, and most had positive E FAST positive findings, factors that appropriately favored surgical intervention despite lower grades.[14,15]

In blunt and penetrating hepatic traumas there have been dramatic improvements in mortality rates, having similar mortality reported by Keizer et al.[16] In contrast our study demonstrated that those who required operative management at arrival or NOM conversion had more mortality rate, similar findings reported by Sawhney et al. and Yadollahi and Hamdani et al.[12,17] This emphasizes that limited hospital resources, delayed presentation, and lack of standardized protocols for conservative management in resource constrained settings are predictor for high mortality rate in blunt

J Postgrad Med Inst 2026;40(2):99-104.
http://doi.org/10.54079/jpmi.40.2.3934

liver trauma as reported similarly by Yue-Rong Zhang et al. and Ward et al.[3,18]

In summery the higher the grade of injury, slower is the improvement in patients' conditions and relatively longer the hospitals stays and vice versa. Higher the grade of injury poor will be the outcomes like higher will be the mortality rate. Higher the grade of injury, more will be the hemodynamical unstable higher is the failure of NOM. This highlights younger age distribution, higher proportion of falls from height, and limited institutional resources can directly influence hospital stays and management outcomes.

Limitations of this study include its single center design, relatively small sample size, exclusion of underweight and obese and resource constraints, which may affect the generalizability of results. The estimated sample size may have led to overestimation of sample size because the previous standard deviation reported in literature was higher than observed variability in this study.

Conclusion

In conclusion, the mean hospital stays for patients with Grade I and II blunt liver trauma managed non-operatively was 4.39 ± 2.10 days. Grade II was observed to have longer hospital stay compare to grade I. These findings ensure the effective non-operative management in lower grade injury and stable patients.

References

1. World Health Organization. Road traffic injuries. Geneva: WHO; 2025. Available from: https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries
2. Halvachizadeh S, Mariani D, Pfeifer R. Impact of trauma on society. Eur J Trauma Emerg Surg 2025;51(1):155. DOI: 10.1007/s00068-025-02824-8.
3. Ward J, Alarcon L, Peitzman AB. Management of blunt liver injury: what is new? Eur J Trauma Emerg Surg 2015;41(3):229-37. DOI: 10.1007/s00068-015-0521-0.
4. Haider H, Ashraf M, Rafi Y. Complications of liver trauma. Pak J Med Health Sci 2009;1(1):29-31.
5. Jennings GR, Poole GV, Yates NL, Johnson RK, Brock M. Has nonoperative management of solid visceral injuries adversely affected resident operative experience? Am Surg 2001;67(6):597-600.
6. Coccolini F, Coimbra R, Ordonez C, Kluger Y, Vega F, Moore EE, et al. Liver trauma: WSES 2020 guidelines. World J Emerg Surg 2020;15(1):24. DOI: 10.1186/s13017-020-00302-7.
7. Said AM, Elghany RAEA, El-Hady HA, Abd-Elwahab ESM. Blunt liver trauma: the effectiveness and evolution of non-operative managment. J Popul Ther Clin Pharmacol 2022;29(04):5076-83. DOI: 10.53555/05zfnb16.
8. Brillantino A, Iacobellis F, Festa P, Mottola A, Acampora C, Corvino F, et al. Non-operative management of blunt liver trauma: safety, efficacy and complications of a standardized treatment protocol. Bull Emerg Trauma 2019;7(1):49-54. DOI: 10.29252/beat-070107.
9. Alanezi T, Altoijry A, Alanazi A, Aljofan Z, Altuwaijri T, Iqbal K, et al. Management and outcomes of traumatic liver injury: a retrospective analysis from a tertiary care center experience. Healthcare (Basel) 2024;12(2):131. DOI: 10.3390/healthcare12020131.
10. Siddique S, Ali A, Ahmad U. Frequency & grading of liver and spleen injuries following blunt trauma abdomen. Pak J Med Health Sci 2015;9(2):538.
11. Buci S, Torba M, Gjata A, Kajo I, Bushi Gj, Kagjini K. The rate of success of the conservative management of liver trauma in a developing country. World J Emerg Surg 2017;12(1):24. DOI: 10.1186/s13017-017-0135-4.
12. Sawhney C, Kaur M, Gupta B, Singh PM, Gupta A, Kumar S, et al. Critical care issues in solid organ injury: review and experience in a tertiary trauma center. Saudi J Anaesth 2014;8(Suppl 1):S29-35. DOI: 10.4103/1658-354X.144065.
13. Thapar PM, Ghawat RM, Dalvi AN, Rokade ML, Philip RM, Warawdekar GM, et al. Massive liver trauma-multidisciplinary approach and minimal invasive surgery can salvage patients. Indian J Surg 2013;75(Suppl 1):449-52. DOI: 10.1007/s12262-012-0781-4.
14. Long MK, Vohra MK, Bonnette A, Parra PDV, Miller SK, Ayub E, et al. Focused assessment with sonography for trauma in predicting early surgical intervention in hemodynamically unstable children with blunt abdominal trauma. J Am Coll Emerg Physicians Open 2022;3(1):e12650. DOI: 10.1002/emp2.12650.
15. Carter JW, Falco MH, Chopko MS, Flynn WJ, Wiles CE III, Guo WA. Do we really rely on fast for decision-making in the management of blunt abdominal trauma? Injury 2015;46(5):817-21. DOI: 10.1016/j.injury.2014.11.023.
16. Keizer AA, Arkenbosch JHC, Kong VY, Hoencamp R, Bruce JL, Smith MTD, et al. Blunt and penetrating liver trauma have similar outcomes in the modern era. Scand J Surg 2021;110(2):208-13. DOI: 10.1177/1457496920921649.
17. Yadollahi M, Hamedani S. Patterns of traumatic liver injury and mortality: a five-year study at shahid rajaei hospital (2018-2023). Surg Open Dig Adv 2025;19:100211. DOI: 10.1016/j.soda.2025.100211.
18. Zhang YR. A multidisciplinary team approach to the treatment of liver cirrhosis. J Inflamm Res 2021;14:5675-83. Available from: https://www.tandfonline.com/doi/full/10.2147/JIR.S328334

Authors' Contribution Statement

FJ contributed to the design, acquisition, analysis, interpretation of data, drafting of the manuscript, and critical review of the manuscript. MS contributed to the conception, acquisition, analysis, drafting of the manuscript, critical review of the manuscript, and final approval of the version to be published. SM contributed to the acquisition, analysis, interpretation of data, and drafting of the manuscript. GA contributed to the acquisition, analysis, interpretation of data, and drafting of the manuscript. MB contributed to the acquisition, analysis, interpretation of data, and drafting of the manuscript. SS contributed to the acquisition, analysis, interpretation of data, and drafting of the manuscript. All authors are accountable for their work and ensure the accuracy and integrity of the study.

Conflict of Interest

Authors declared no conflict of interest

Grant Support and Financial Disclosure

None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

J Postgrad Med Inst 2026;40(2):99-104.
http://doi.org/10.54079/jpmi.40.2.3934