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Original Research Article

Spectrum of Drug-Induced Liver Injury (DILI) in a Tertiary Care Hospital: A Retrospective Analysis

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Abstract:

Background: Drug-induced liver injury (DILI) is an important cause of liver disease with variable clinical presentations, ranging from mild enzyme elevation to acute liver failure. Limited region-specific data exist on the spectrum of DILI in tertiary care settings.

Aim: To evaluate the demographic profile, clinical features, implicated drugs, histopathology, management, and outcomes of DILI in patients admitted to a tertiary care hospital.

Methodology: A retrospective observational study was conducted at Darbhanga Medical College and Hospital, India, including 150 patients diagnosed with DILI. Data on demographics, clinical presentation, laboratory tests, drug history, histopathology, and outcomes were extracted from hospital records. Causality was assessed using the RUCAM scale. Descriptive statistics summarized findings.

Results: The mean age was 51 ± 11 years, with 56% males. Jaundice (65.3%), fatigue (50.7%), and abdominal pain (45.3%) were common. Hypertension (24%) and diabetes (18%) were frequent comorbidities. Antibiotics (32%), NSAIDs (24.7%), and herbal supplements (17.3%) were the most implicated drugs. Mean ALT and AST were markedly elevated (820 ± 390 U/L and 700 ± 340 U/L, respectively). Liver biopsy showed hepatocellular injury (45%), cholestatic (35%), and mixed patterns (20%). Management involved discontinuation of offending drugs (100%) and supportive care; 8 patients underwent liver transplantation, and 12 (8%) died.

Conclusion: DILI exhibits diverse clinical and histopathological patterns. Prompt drug withdrawal and supportive care are essential, though severe outcomes, including transplantation and mortality, may occur.

Keywords: Drug-induced liver injury, hepatotoxicity, antibiotics, NSAIDs, hepatocellular injury, tertiary care hospital.

Introduction

Drug-induced liver injury (DILI) is becoming more and more the leading cause of liver disease and a serious issue in the world in terms of public health concerns [1]. It involves a heterogeneous cluster of hepatic diseases caused by the exposure to a number of pharmacological agents, such as prescription drugs, over-the-counter drugs, herbal and dietary supplements, and chemotherapeutic drugs [2]. DILI is said to have a wide range of clinical manifestations that include asymptomatic liver enzyme elevation up to intense, potentially fatal hepatic failure needing liver transplant. In spite of the fact that the total incidence of DILI is comparatively low, its unpredictability and the possibility of the rapid onset make the timely recognition and intervention an urgent issue [3].

DILI pathophysiology is a multifactorial process that entails both direct hepatotoxic effects, idiosyncratic reactions and immunologically mediated processes [4]. Direct hepatotoxicity is usually dose-related and predictable as in the case with acetaminophen. On the contrary, idiosyncratic responses are less predictable and are seen in a small proportion of exposed individuals and usually dependent on genetic predisposition, age, gender, comorbidities and concomitant medications [5]. This heterogeneity contributes to the diagnostic complexity of DILI because its clinical manifestation may resemble that of other resultant causes of liver damage such as viral hepatitis, autoimmune liver disease, and metabolic disorders. It is important to identify the offending drug accurately to ensure that they do not recur and to make therapeutic choices [6].

DILI is a major cause of acute liver failure in developed countries, it causes a significant number of hospitalizations, extended hospital stays, and healthcare expenditures worldwide. DILI is often associated with antibiotics, nonsteroidal anti-inflammatory drugs (NSAIDs), and antiepileptic, and herbal and dietary supplements, causing diverse prevalence and causation by region and healthcare institution [7]. Besides, underlying liver disease, polypharmacy, increased age, or comorbid conditions like diabetes and obesity can put a patient at risk of developing DILI, making the clinical progression even more problematic. Such epidemiological patterns are important to understand to enable the clinicians to have a high index of suspicion and adopt the right preventive and monitoring measures [8].

Tertiary care hospitals are referral centers of patients experiencing complex and severe liver disease, and this is the best place to investigate the infantile to jingoistic of DILI [9]. Most of these centers are exposed to patients with progressive liver damage, multidrug exposure, or poorly defined etiologies, which is a rare chance to assess the variety of manifestations and outcomes of DILI. The retrospective studies in these contexts may be useful in providing important information about the demographic factors, drugs involved, clinical manifestations, laboratory, histopathological, treatment, and patient outcomes. These studies have a crucial role in deriving trends, risk factors, and interventions that could ameliorate patient safety and alleviate the burden of DILI [10].

Though there is improvement in diagnostic methods such as biochemical tests, radiological procedures, and liver biopsy, DILI is a clinical dilemma because it has nonspecific symptoms and resembles other conditions of the liver [11]. Diagnosis of the causative agent and a diagnosis based on clinical, laboratory, and histopathological findings is essential to make a systematic assessment of the clinical, laboratory, and histopathology findings. Furthermore, the early removal of the offending drug, supportive care and liver monitoring are the key in the management of DILI and preventive measures can be used to reduce the incidence of the incident, which include drug prescribing cautiously and educating patients [12].

Considering the clinical conditions and importance of DILI and the absence of information about the region-specific data, the study is expected to present the spectrum of drug-induced liver injury in a tertiary care hospital in a retrospective study. The questions are to examine demographics and clinical features of the patients with DILI, determine the most frequently used drugs with the condition, discuss laboratory and histopathological results, characterize the management practice, and interpret clinical results. Offering the broad general context of DILI within such a context, the study aims to raise awareness rates among clinicians, educate on mitigation of risks, and add to better patient care and safety.

Methodology

Study Design: This retrospective observational study was conducted in the Department of Pharmacology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India.

Study Area: The study was carried out at the Department of Pharmacology, Darbhanga Medical College and Hospital, a tertiary care teaching hospital in Bihar, India.

Study Duration: Data collection and analysis were performed over a period of 7 months, from April 2025 to October 2025.

Sample Size: A total of 150 patients diagnosed with DILI were included in the study based on the hospital records and inclusion criteria.

Study Population: The study population included all patients diagnosed with drug-induced liver injury (DILI) during the study period, irrespective of age or gender.

Patient Selection: Patients were identified through electronic medical records using International Classification of Diseases (ICD) codes for hepatobiliary disorders (ICD-10 codes K71–K77).

Inclusion Criteria

- Patients of all ages with clinical and laboratory evidence of liver injury attributed to medications.
- Documented use of any prescription or over-the-counter drug prior to liver injury.
- Availability of complete medical records including laboratory, imaging, and clinical data.

Exclusion Criteria

- Patients with pre-existing liver diseases such as viral hepatitis, autoimmune liver disease, or alcoholic liver disease.
- Patients with incomplete medical records or missing key laboratory data

Data Collection: Data were collected retrospectively from the electronic medical records of patients diagnosed with DILI at Darbhanga Medical College and Hospital. A structured data collection form was used to extract relevant information, including demographic details (age and gender), clinical characteristics (presenting symptoms, past medical history, and comorbidities), laboratory investigations such as liver function tests (ALT, AST, ALP, bilirubin) and serological markers, as well as imaging studies like ultrasound and computed tomography where available. Histopathological findings from liver biopsies, when performed, were also recorded. Detailed drug histories were obtained from the records,

including the type of drug, duration of exposure, and any concomitant medications. Clinical outcomes, including duration of hospitalization, recovery status, complications, and mortality, were documented for all patients. This comprehensive data collection enabled a thorough characterization of the spectrum and severity of DILI in the study population.

Causality Assessment: The causality of DILI was assessed using the Roussel Uclaf Causality Assessment Method (RUCAM) scale. Cases were classified as definite, probable, possible, or excluded DILI based on temporal association with the drug, exclusion of alternative causes, and previous reports of hepatotoxicity associated with the suspected medication.

Procedure: The study procedure involved a systematic review of hospital records to identify patients diagnosed with DILI using ICD-10 codes K71–K77. Each patient's record was carefully examined to confirm the diagnosis based on clinical presentation, laboratory findings, and imaging results. The suspected drugs responsible for liver injury were documented, along with the duration of exposure and temporal relationship to symptom onset. Causality assessment was performed using the Roussel Uclaf Causality Assessment Method (RUCAM), which categorized each case as definite, probable, possible, or excluded DILI based on the likelihood that the drug caused the liver injury, exclusion of alternative etiologies, and previous evidence of hepatotoxicity. All relevant information was entered into a predesigned spreadsheet for subsequent statistical analysis.

Statistical Analysis: Data analysis was performed using SPSS software (version [specify]). Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR), depending on data distribution, while categorical variables were presented as frequencies and percentages. Descriptive statistics were used to summarize demographic characteristics, clinical presentations, laboratory findings, and outcomes of the study population. Comparative analyses between subgroups, such as different classes of implicated drugs or varying severity of liver injury, were conducted using the Chi-square test or Fisher's exact test for categorical variables, and t-test or Mann–Whitney U test for continuous variables as appropriate. A p-value of less than 0.05 was considered statistically significant."

Result

Table 1 summarizes the demographic and clinical characteristics of 150 patients with drug-induced liver injury (DILI). The mean age was 51 ± 11 years, with males comprising 84 patients (56%). The most common presenting symptoms were jaundice (98, 65.3%), fatigue (76, 50.7%), and abdominal pain (68, 45.3%). Relevant medical history included hypertension in 36 patients (24.0%), diabetes mellitus in 27 patients (18.0%), and chronic kidney disease in 12 patients (8.0%). The drugs most frequently implicated in DILI were antibiotics (48, 32.0%), NSAIDs (37, 24.7%), herbal supplements (26, 17.3%), and other drugs (39, 26.0%). Laboratory findings showed markedly elevated liver enzymes, with mean ALT of 820 ± 390 U/L, AST of 700 ± 340 U/L, and total bilirubin of 8.1 ± 4.0 mg/dL, reflecting significant hepatocellular injury.

Table 1: Demographic and Clinical Characteristics of Patients with DILI (N = 150)

Characteristic	Value
Age (years), mean ± SD	51 ± 11
Gender (male), n (%)	84 (56%)
Presenting Symptoms	
Jaundice, n (%)	98 (65.3%)
Fatigue, n (%)	76 (50.7%)
Abdominal Pain, n (%)	68 (45.3%)
Medical History	
Hypertension, n (%)	36 (24.0%)
Diabetes Mellitus, n (%)	27 (18.0%)
Chronic Kidney Disease, n (%)	12 (8.0%)
Implicated Drugs	
Antibiotics, n (%)	48 (32.0%)
NSAIDs, n (%)	37 (24.7%)
Herbal Supplements, n (%)	26 (17.3%)
Others, n (%)	39 (26.0%)
Laboratory Findings	
Alanine Transaminase (ALT), U/L	820 ± 390
Aspartate Transaminase (AST), U/L	700 ± 340
Total Bilirubin, mg/dL	8.1 ± 4.0

Table 2 presents the histopathological findings from liver biopsies of patients with drug-induced liver injury (DILI). Hepatocellular injury was the most common pattern, observed in 27 patients (45.0%), followed by cholestatic injury in 21 patients (35.0%). Mixed hepatocellular-cholestatic injury was seen in 12 patients (20.0%). Overall, the majority of DILI cases exhibited a hepatocellular-dominant pattern, with cholestatic and mixed injuries being less frequent.

Table 2: Histopathological Findings of Liver Biopsy in Patients with DILI	
Histopathological Pattern	**Number of Patients (%)**
Hepatocellular Injury	27 (45.0%)
Cholestatic Injury	21 (35.0%)
Mixed Injury	12 (20.0%)

Table 3 summarizes the management strategies and clinical outcomes of 150 patients with drug-induced liver injury (DILI). All patients (150, 100%) had the offending drug discontinued. Supportive care was provided in the form of fluid and electrolyte management to 124 patients (82.7%) and nutritional support to 108 patients (72.0%). Regarding outcomes, 8 patients (5.3%) required liver transplantation, and 12 patients (8.0%) died. Overall, while discontinuation of the causative agent and supportive care were universally applied, a small proportion of patients progressed to severe outcomes, including transplantation or mortality.

Table 3: Management Strategies and Clinical Outcomes of Patients with DILI (N = 150)	
Management Strategy	**Number of Patients (%)**
Discontinuation of Offending Agent	150 (100%)
Supportive Care	
Fluid and Electrolyte Management	124 (82.7%)
Nutritional Support	108 (72.0%)
Outcome	
Liver Transplantation	8 (5.3%)
Mortality	12 (8.0%)

Discussion

The distribution of drug-induced liver injury (DILI) in the tertiary care hospital where our study was conducted reveals the predominance of the middle-aged group with the mean patient age of 51 ± 11 years, which is consistent with the results presented in several previous studies pointing that DILI is a common occurrence among adults in the fourth to sixth decades of their lives (Bjornsson, 2015) [13] . Such age distribution is an indicator of cumulative exposure to drugs over the course of life as well as the possibility that drug metabolism would change with age. A slight male predisposition (56%) was also identified in our study and correlates with the outcome of the Drug-Induced Liver Injury Network (DILIN) study, where males were 55-60% of the cases, indicating a slight gender predisposition which may be caused by pharmacokinetics / hormonal variations. However, other reports have demonstrated no or increased prevalence in females especially in autoimmune-like DILI and that gender predisposition is possibly drug-specific (Andrade et al., 2009) [14].”

In our group, jaundice (66%), fatigue (50%), and abdominal pain (48%), were all the most common clinical manifestations of the typical triad of hepatocellular injury used in the literature (Fontana et al., 2010) [15]. Similar investigations have documented jaundice in 60-70% of cases with DILI and it has been pointed out that jaundice is very sensitive clinical indicator of substantial hepatocellular dysfunction (Andrade et al., 2009) [14]. Fatigue and abdominal discomfort are also in line with previous studies where they found nonspecific symptoms in 4055 percent of patients indicating that in the early stages, it can be difficult to recognize its presence because these symptoms overlap with other hepatic or systemic infections (Teschke and Danan, 2020) [16]. The prevalence of these symptoms has been high in our study, which highlights the importance of clinicians having a high index of suspicion of DILI in the patients who report such complaints especially in patients with the recent drug exposures.

The comorbid conditions were also prominent in our cohort with hypertension, diabetes mellitus, and chronic kidney disease of 24, 18, and 8 percent respectively. These results are consistent with other papers that indicate that metabolic comorbidities can pre-dispose the patients to more severe hepatotoxicity since, patients have a change in drug clearance and susceptibility to oxidative stress (Andrade et al., 2009) [14]. In comparison, a multicenter cohort study in Europe estimated comparable prevalence of hypertension (2025) and diabetes (1520) in patients with DILI, a fact that confirms the notion that underlying chronic diseases can predispose as well as impact the outcome(s) of the condition(s) (Bjornsson, 2015) [13].

In the case of causative agents, antibiotics were identified as causative agents as reported in 33 percent, NSAIDs in 25 percent and herbal supplements in 17.3 percent, with the other 26 percent being attributed to other drugs. The distribution is similar to the previous reports where antibiotics and NSAIDs are always among the most common DILI causes, with a 30-40 and 20-25 percent prevalence, respectively (Andrade et al., 2009; Teschke and Danan, 2020) [13,16]. The use of herbal supplements as a cause of DILI has been increasingly identified, with a variation between 10 and 20 percent being reported in similar cohorts, which is an increasing use globally and the possibility of the underreporting of hepatotoxicity by them due to lax regulations (Fontana et al., 2010) [15]. This supports serious drug history taking, which includes over the counter and herbal preparations, when evaluating damaged liver patients.

Lab analysis showed significantly high liver enzymes with a mean of ALT 820 U/L and AST 700 U/L and a mean total bilirubin 8.1mg/dl. These values coincide with the presence of severe hepatocellular damage, and they are comparable to the results of other tertiary care studies, in which the median ALT was 600-900 U/L and the total bilirubin was 6-10 mg/dL in moderate to severe DILI (Bjornsson, 2015; Teske and Danan, 2020) [13,16]. Hepatocellular pattern was the most frequent on histopathology (45 percent), then cholestatic (35 percent), and mixed (15 percent) which again confirms earlier studies which have demonstrated that in 40 percent or 50 percent hepatocellular injury, in 30 percent or 40 percent cholestatic, and, in 15 percent or 25 percent, mixed injury (Fontana et al., 2010) [15]. This underlines the heterogeneity of the DILI pathology, the patterns of which are usually dependent on the drug, exposure duration, and the factors related to the patient.

Our cohort management was based on timely withdrawal of the offending agent and fluid and electrolytes therapy in 83% and nutritional support in 72% of patients. Eight patients required liver transplantation due to severe cases and 12 patients died, thus the overall rate was 8%. The results are similar to the previous research with mortality rates of 5-10 percent in hospitalized DILI patients, which highlights the severe clinical consequences of untimely diagnosis or treatment (Bjornsson, 2015; Teschke and Danan, 2020) [13,16]. The use of supportive care and early withdrawal of hepatotoxic drugs is comparable to the existing recommendations that suggest a quick treatment to reduce the development to liver failure (Andrade et al., 2009) [14].

Altogether, our results support the unifying variable clinical spectrum, demographic attributes, and the outcome of the DILI. Male middle-aged seem a little more vulnerable, antibiotics and NSAIDs are the top causal factors, and the hepatocellular pattern is the most common on a histological one. Laboratory derangements, comorbidities and mortality rates observed are up to date and indicate the need to be vigilant in monitoring, early identification, and overall management approaches in the patients presenting with suspected DILI.

Conclusion

The retrospective survey of the occurrence of liver injury (DILI) due to the use of drugs in a tertiary care hospital, this study shows a considerable range of clinical manifestations, with the most frequent being jaundice, fatigue, and abdominal pain. There was a connection between DILI and a variety of medications, such as antibiotics, NSAIDs, and herbal supplements, which shows the heterogeneity of the condition etiology. A liver biopsy demonstrated specific histopathological phenotypes, mostly hepatocellular, cholestatic, and a minor share of mixed phenotypes. The process of management focused on timely removal of the offending agents and supportive treatment, such as fluid, electrolyte, and nutritional support. Though the majority of patients reacted to these interventions, some cases ended in mortality, and a number of patients had to undergo liver transplantation, which highlights the possible severity of DILI and the necessity to identify it at the earliest possible stage and treat it accordingly to achieve the best possible results.

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