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# FREQUENCY OF REBLEEDING IN THE FIRST 6 MONTHS AFTER BAND LIGATION IN DECOMPENSATED CHRONIC LIVER DISEASE PATIENTS

*Original Research*

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## ABSTRACT

**Background:** Variceal bleeding is one of the most serious complications of decompensated chronic liver disease (DCLD) and is associated with high morbidity and mortality. Endoscopic variceal ligation (EVL) remains the preferred therapeutic option, yet early rebleeding continues to pose significant clinical challenges, particularly in patients with advanced hepatic dysfunction. Identifying predictive factors for recurrent haemorrhage is critical for risk stratification, tailoring surveillance strategies, and improving patient outcomes in high-burden, resource-limited settings.

**Objective:** To determine the clinical, demographic, and disease-related predictors associated with rebleeding within six months after EVL in patients with DCLD managed at Jinnah Postgraduate Medical Centre, Karachi.

**Methods:** This cross-sectional study was conducted between June 2023 and May 2024 and included 144 patients aged 40–70 years with a confirmed diagnosis of DCLD who underwent EVL. Patients with hepatocellular carcinoma, peptic ulcer disease, or significant systemic comorbidities were excluded. Demographic details, comorbid conditions such as diabetes mellitus, hypertension, and dyslipidemia, as well as liver disease severity using the Child–Pugh classification, were recorded. Patients were monitored through outpatient visits and telephone follow-ups for six months. Rebleeding was defined as clinically significant haemorrhage confirmed endoscopically between 24 hours and six months post-procedure. Data were analysed using SPSS version 20, with categorical variables assessed using chi-square tests and a significance level set at $p \leq 0.05$.

**Results:** Rebleeding occurred in 28 out of 144 patients, yielding an incidence of 19.4%. Significant predictors of rebleeding included advanced liver disease (Child–Pugh Class C, $p < 0.001$), diabetes mellitus (18 out of 56 cases, $p = 0.004$), and hypertension (14 out of 48 cases, $p = 0.028$). Patients with Class C disease exhibited markedly higher recurrence, while smoking showed a non-significant association ($p = 0.093$).

**Conclusion:** Rebleeding following EVL remains a frequent complication in patients with advanced hepatic dysfunction and coexisting comorbidities. Early recognition of these high-risk groups is essential for optimizing management strategies and tailoring surveillance to reduce recurrence and improve clinical outcomes.

**Keywords:** Child-Pugh classification; decompensated chronic liver disease; diabetes mellitus; endoscopic variceal ligation; hypertension; rebleeding; variceal haemorrhage.



## INTRODUCTION

Variceal bleeding remains one of the most devastating complications encountered in patients with decompensated chronic liver disease (DCLD), often manifesting as acute upper gastrointestinal haemorrhage that necessitates urgent medical and endoscopic intervention. Cirrhosis, the underlying pathology, is characterized by severe portal hypertension, thrombocytopenia, and profound coagulation abnormalities, creating a fragile haemostatic balance that predisposes patients to recurrent bleeding episodes despite advances in therapy (1,2). The combination of bleeding risk with impaired hepatic reserve significantly increases morbidity and mortality and continues to pose a major challenge for clinicians worldwide. Endoscopic variceal ligation (EVL) has emerged as the preferred therapeutic modality for both the management of acute variceal haemorrhage and secondary prophylaxis. Compared with older methods such as endoscopic sclerotherapy, EVL is regarded as safer and more effective, achieving haemostasis through induction of thrombosis and subsequent fibrotic scarring of varices (3). Nonetheless, the risk of rebleeding within six months of EVL remains a persistent concern, particularly among patients with advanced liver dysfunction and ongoing portal hypertension (4,5). Reported rebleeding rates vary between 15–30% in the early post-procedural phase, largely influenced by baseline disease severity, comorbidities, and endoscopic findings. Clinical predictors of recurrence include hepatocellular carcinoma, large variceal size, dilated portal veins, advanced Child-Pugh classification, and the requirement of multiple EVL sessions for variceal eradication (6,7). Importantly, patients requiring more than three sessions have consistently demonstrated higher rebleeding rates than those successfully treated with fewer interventions. Persistent coagulopathy and platelet dysfunction further compound the problem, as traditional coagulation parameters fail to reflect the dynamic haemostatic alterations in cirrhosis (8,9).

The consequences of recurrent variceal haemorrhage are far-reaching, extending beyond increased morbidity and mortality to longer hospital stays, greater healthcare expenditure, and an amplified workload for tertiary care centres (10,11). Repeated bleeding episodes also often necessitate escalation to invasive interventions such as transjugular intrahepatic portosystemic shunts (TIPS) or liver transplantation in select patients, underscoring the need for accurate prognostication and timely secondary preventive measures. Despite comprehensive management strategies—including endoscopic therapy, non-selective beta-blockers, proton pump inhibitors, and aggressive ascites control—the prevention of recurrent haemorrhage remains a formidable clinical challenge (5,9). In resource-constrained regions such as Pakistan, these challenges are compounded by infrastructural limitations, delayed presentation, and socioeconomic barriers, highlighting the importance of generating robust regional data. Local insights into rebleeding patterns following EVL are essential for tailoring surveillance strategies, optimizing treatment regimens, and ensuring efficient allocation of limited healthcare resources (12,13). Such evidence can also determine whether existing global guidelines are applicable to local populations or require adaptation to address region-specific clinical realities. Given that variceal haemorrhage remains a leading cause of mortality in cirrhotics, it is of critical importance to determine the recurrence of bleeding within the vulnerable six-month period after EVL. Against this backdrop, the present study seeks to identify predictive clinical, demographic, and endoscopic variables associated with six-month rebleeding after EVL in patients with DCLD managed at Jinnah Postgraduate Medical Centre, Karachi. By establishing locally relevant predictors, the study aims to refine prognostic models, support individualized patient care, and contribute to the development of context-specific guidelines to reduce the burden of recurrent variceal haemorrhage in this high-risk population (5,9).

## METHODS

The study was conducted as a cross-sectional investigation in the Department of Medicine at Jinnah Postgraduate Medical Centre (JPMC), Karachi, over an eleven-month period from June 2023 to May 2024, following approval of the synopsis. A total of 144 patients were enrolled, with the sample size determined using the WHO software, based on a 6.4% reported frequency of post-banding bleeding, a 4% margin of error, and a 95% confidence level. The sampling technique employed was non-probability consecutive sampling, ensuring that all eligible patients presenting during the study period were considered for inclusion. Patients were enrolled according to predefined eligibility criteria. Individuals were eligible if they had decompensated chronic liver disease (DCLD) for at least one year, were between 40 and 70 years of age, and of either gender. Exclusion criteria comprised a history of peptic ulcer disease, the use of non-steroidal anti-inflammatory drugs or anticoagulants, or a history of thromboembolic events. Patients diagnosed with hepatocellular carcinoma were excluded to avoid confounding influences of advanced malignancy. Pregnant women were not included, confirmed by

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a dating scan performed between 8 and 14 weeks of gestation. In addition, those with a history of acute coronary syndrome, renal impairment, chronic obstructive pulmonary disease, asthma, or congestive heart failure were excluded to minimize bias and protect patient safety.

The study protocol was reviewed and approved by the Institutional Ethical Review Committee and the College of Physicians and Surgeons of Pakistan. Written informed consent was obtained from all participants after they were thoroughly briefed about the study objectives, potential risks, and expected benefits. Confidentiality of patient information was strictly maintained throughout the research process in accordance with ethical standards. Eligible patients underwent endoscopic variceal band ligation (EVL) and were followed prospectively. Baseline demographic and clinical data were recorded in a structured proforma. Post-banding follow-up was conducted through both outpatient visits and regular telephone contact to monitor for episodes of rebleeding, which were defined according to standardized operational criteria. Data management and statistical analysis were performed using SPSS version 20. Categorical variables, including gender, residence, Child–Pugh class, comorbidities, and post-banding rebleeding, were expressed as frequencies and percentages. Stratification was applied for key demographic and clinical variables to assess their association with outcomes. Post-stratification comparisons were made using the chi-square test, with statistical significance set at $p \leq 0.05$.

## RESULTS

The study included 144 patients with decompensated chronic liver disease who underwent endoscopic variceal ligation. Among them, 92 (63.9%) were male and 52 (36.1%) were female. The majority of patients fell into the 51–60 year age group, accounting for 61 individuals (42.4%), followed by 45 (31.2%) between 61–70 years and 38 (26.4%) between 40–50 years. Most participants, 84 (58.3%), were residents of urban areas, whereas 60 (41.7%) belonged to rural settings. Comorbidities were frequent in this population. Diabetes mellitus was reported in 56 patients (38.9%), hypertension in 48 (33.3%), and dyslipidemia in 42 (29.2%). Smoking, either current or former, was reported by 37 patients (25.7%). Additionally, 90 patients (62.5%) had been living with chronic liver disease for more than three years, highlighting the chronicity of illness in the majority of the cohort. Assessment of disease severity through the Child–Pugh scoring system revealed that 28 patients (19.4%) were classified as Child–Pugh Class A, 62 (43.1%) as Class B, and 54 (37.5%) as Class C, confirming that most of the population suffered from moderate to severe hepatic dysfunction. Post-procedural outcomes showed that rebleeding within six months occurred in 28 patients (19.4%), while 116 (80.6%) did not experience recurrence. Comparative analysis demonstrated statistically significant associations between rebleeding and the presence of diabetes mellitus ($p = 0.004$), hypertension ($p = 0.028$), and advanced liver disease (Child–Pugh Class C, $p < 0.001$). Smoking showed a non-significant trend towards higher rebleeding rates ($p = 0.093$). These findings identified critical clinical predictors associated with recurrence after EVL.

**Table 1: Demographic Characteristics of the Participants**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 92 | 63.9% |
| | Female | 52 | 36.1% |
| **Age Group** | 40–50 years | 38 | 26.4% |
| | 51–60 years | 61 | 42.4% |
| | 61–70 years | 45 | 31.2% |
| **Residence** | Urban | 84 | 58.3% |
| | Rural | 60 | 41.7% |

**Table 2: Clinical Comorbidities and Duration of Illness**

| Clinical Variable | Yes (n) | No (n) | % with Condition |
|---|---|---|---|
| Diabetes Mellitus | 56 | 88 | 38.9% |
| Hypertension | 48 | 96 | 33.3% |
| Dyslipidemia | 42 | 102 | 29.2% |
| Smoking (Current or Former) | 37 | 107 | 25.7% |
| DCLD Duration > 3 Years | 90 | 54 | 62.5% |

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**Table 3: Severity of Liver Disease Based on Child–Pugh Classification**

| Child–Pugh Class | Number of Patients (n) | Percentage (%) |
|---|---|---|
| Class A (Score < 6) | 28 | 19.4% |
| Class B (Score 7–9) | 62 | 43.1% |
| Class C (Score 10–15) | 54 | 37.5% |

**Table 4: Association of Risk Factors with Post-Banding Rebleeding**

| Risk Factor | Rebleeding (n = 28) | No Rebleeding (n = 116) | p-value |
|---|---|---|---|
| Diabetes Mellitus | 18 | 38 | 0.004 |
| Hypertension | 14 | 34 | 0.028 |
| Child–Pugh Class C | 21 | 33 | <0.001 |
| Smoking | 12 | 25 | 0.093 |

**Table 5: Frequency of Rebleeding Within Six Months Post-EVL**

| Outcome | Frequency (n) | Percentage (%) |
|---|---|---|
| No Rebleeding | 116 | 80.6% |
| Rebleeding (within 6 months) | 28 | 19.4% |

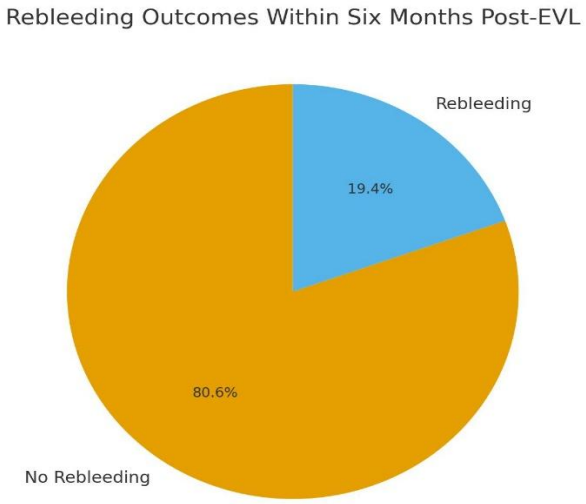


*Figure 1 Rebleeding Outcomes with Six Months Post-EVL*

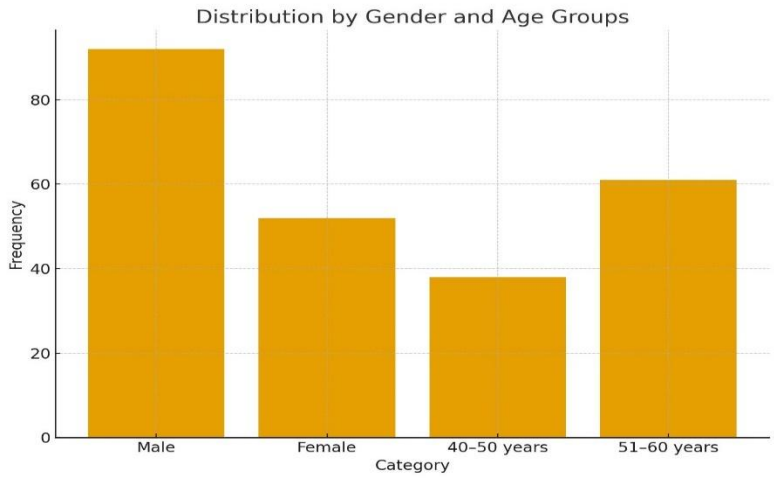


*Figure 2 Distribution by Gender and Age groups*

## DISCUSSION

The present study demonstrated that the frequency of rebleeding within six months following endoscopic variceal ligation was 19.4%, a finding that aligns with international reports where early post-EVL rebleeding rates range between 15% and 25% (14). This rate highlights the persistent clinical challenge in the management of oesophageal varices among patients with decompensated chronic liver disease, even when endoscopic interventions are technically successful. The recurrence of haemorrhage in this context continues to contribute significantly to morbidity and mortality, particularly in resource-constrained settings where access to timely follow-up and advanced interventions may be limited. The study confirmed that advanced hepatic dysfunction, particularly Child–Pugh Class C, was strongly associated with rebleeding. This is consistent with previous research that identified the severity of hepatic decompensation as a crucial determinant of post-EVL outcomes (15-17). Patients with Child–Pugh Class C disease typically have greater coagulopathy, elevated portal hypertension, and impaired hepatic synthetic function, all of which predispose to recurrent bleeding. Additionally, mucosal fragility and compromised tissue healing capacity in this group exacerbate the risk of post-ligation ulceration and delayed recovery, thereby increasing vulnerability to recurrent haemorrhage. Comorbidities such as diabetes mellitus and hypertension were also

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significantly associated with rebleeding (18,19). The impact of diabetes likely stems from impaired vascular integrity and delayed wound healing, which interfere with the normal healing of post-ligation ulcers and amplify bleeding risk. Hypertension, although not traditionally emphasized in the pathogenesis of cirrhotic haemorrhage, demonstrated a statistically significant relationship with rebleeding in this study. This may reflect the contribution of systemic vascular stress and its potential to aggravate portal hypertension or disrupt hemodynamic compensation after endoscopic therapy (20-22). These findings suggest that comorbid conditions, often overlooked in conventional risk models, may play an important role in patient prognosis and should be integrated into risk stratification protocols.

Although endoscopic parameters such as variceal size, red wale signs, and the number of banding sessions were not evaluated, these have been consistently highlighted in the literature as important predictors of early rebleeding. Their absence in this study limits the scope of interpretation but simultaneously underscores a direction for future research. Detailed documentation of endoscopic features would improve predictive accuracy and help refine therapeutic algorithms. Similarly, transfusion strategies were not explored, although evidence suggests that restrictive transfusion protocols reduce portal pressures and lower the risk of rebleeding compared with liberal transfusion practices. This aspect deserves consideration in future work, particularly in healthcare systems where transfusion resources are scarce and clinical decision-making may be empirical. The findings provide important insights into clinical practice in high-burden, resource-limited settings such as Karachi. Delayed patient presentation, restricted access to continuous care, and socioeconomic barriers likely influence outcomes, reinforcing the need for region-specific evidence to adapt global guidelines to local realities. The strengths of this study include the focus on a well-defined high-risk group of patients with decompensated liver disease, the prospective follow-up for six months, and the identification of specific clinical predictors that are relevant to daily practice in tertiary care hospitals. Nevertheless, several limitations must be acknowledged. The study was conducted at a single centre with a relatively small sample size, restricting the external validity of the findings. The observational design limited the ability to establish causality between the identified risk factors and rebleeding. Important confounding factors, such as nutritional status, medication adherence, and systematic endoscopic evaluations, were not assessed. These limitations may have led to residual confounding and should be addressed in future studies through multicentric designs, larger sample sizes, and more comprehensive data collection. In summary, the study confirmed that rebleeding following EVL remains a frequent and severe complication in patients with decompensated chronic liver disease. Advanced hepatic dysfunction, diabetes mellitus, and hypertension emerged as significant prognostic factors, reinforcing the need to broaden current risk stratification models beyond liver-specific parameters to include systemic comorbidities. Future research should integrate detailed endoscopic grading, biochemical indicators, transfusion practices, and supportive care variables to establish predictive models that better guide individualized management strategies for high-risk populations.

## CONCLUSION

This study concluded that rebleeding after endoscopic variceal ligation remains a significant complication in patients with decompensated chronic liver disease, strongly influenced by the severity of hepatic dysfunction and the presence of comorbidities such as diabetes and hypertension. These findings highlight the importance of incorporating both liver-specific parameters and systemic health conditions into prognostic assessments to better identify high-risk patients. The results underscore the need for individualized management strategies and tailored surveillance protocols that address the complexity of disease progression, ultimately aiming to reduce morbidity and improve outcomes in this vulnerable population.

**AUTHOR CONTRIBUTION**

| Author | Contribution |
|---|---|
| Avinash Kumar* | Substantial Contribution to study design, analysis, acquisition of Data<br>Manuscript Writing<br>Has given Final Approval of the version to be published |
| Shabnam Naveed | Substantial Contribution to study design, acquisition and interpretation of Data<br>Critical Review and Manuscript Writing<br>Has given Final Approval of the version to be published |
| Anjli | Substantial Contribution to acquisition and interpretation of Data<br>Has given Final Approval of the version to be published |

| Author | Contribution |
|---|---|
| Shweta Kumari | Contributed to Data Collection and Analysis<br>Has given Final Approval of the version to be published |
| Shewani Bai | Contributed to Data Collection and Analysis<br>Has given Final Approval of the version to be published |
| Prem Chand | Substantial Contribution to study design and Data Analysis<br>Has given Final Approval of the version to be published |

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