**Addis Ababa University**

**College of Health Sciences**

**Department of Internal Medicine**

# Assessment of Magnitude and Determinants of Variceal Bleeding among Cirrhotic Patients at Tikur Anbessa Specialized Hospital: A Retrospective Follow up Study

**Principal Investigator:** Dr. Getachew Kassaw (MD, Internal Medicine Resident)

**Advisors:** Dr. Rezene Berhe (Consultant Internist, Gastroenterologist and Hepatologist)

A Thesis to be Submitted to the Department of Internal Medicine, College of Health Sciences, Addis Ababa University in Partial Fulfillment of The Requirements for the Specialty certificate in Internal Medicine

-

March, 2025
Addis Ababa, Ethiopia

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF INTERNAL MEDICINE

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## List of Acronyms

| | |
|---|---|
| AAU | Addis Ababa University |
| AOR | Adjusted Odd Ratio |
| CLD | Chronic Liver Disease |
| CSPH | Clinically Significant Portal Hypertension |
| CTP | Child Tourette-Pugh score |
| COR | Crude Odds Ratio |
| EGVB | Esophagogastric Variceal Bleeding |
| EV | Esophageal Varices |
| GEVH | Gastroesophageal Variceal Hemorrhage |
| GI | Gastrointestinal |
| HCC | Hepatocellular Carcinoma |
| PLT | Platelet |
| RCS | Red Color Sign |
| TASH | Tikur Anbessa Specialized Hospital |
| WBC | White Blood cell |

## Abstract

**Introduction**: Gastroesophageal varices (GEVs) rupture and bleeding are severe complications of chronic liver disease (CLD), often leading to high mortality. Identifying determinant factors associated with gastroesophageal variceal hemorrhage (GEVH) is crucial for the effective management and prevention of these life-threatening complications.

**Objective**: This study aimed to assess the magnitude and determinants of GEVH among patients with cirrhosis at Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia.

**Methods**: An institution-based retrospective follow up study was conducted on 224 patients. Data were entered into Epi-Data version 3.1 and analyzed using STATA version 14. Bivariable logistic regression identified candidate variables for multivariable analysis. In the final model, adjusted odds ratios (AORs) with 95% confidence intervals (CIs) and a p-value <0.05 determined the strength and significance of associations.

**Results**: The mean age of the study participants was 44.45 years (SD ± 14.32). The prevalence of gastroesophageal variceal hemorrhage (GEVH) was 46%. Patients with ascites had 3.4 times higher odds of bleeding compared to those without ascites (AOR: 3.4, 95% CI: 1.10–10.49, p = 0.034). The presence of a red sign was significantly associated with an increased risk of bleeding (AOR: 2.8, 95% CI: 1.06–7.23, p = 0.037). Patients with grade II and grade III varices had 3.7 times (AOR: 3.7, 95% CI: 1.30–10.68, p = 0.014) and 7.6 times (95% CI: 2.24–25.54, p = 0.001) higher odds of bleeding, respectively

**Conclusion**: variceal bleeding is found to be high (46%) in patients with cirrhosis seen at Tikur Anbesa Specialized Hospital. High grade varices, the presence of ascites, and red signs were found to be associated with the increased frequency of bleeding. The condition can be prevented, as the majority of identified risk factors were preventable.



**Key Words:** Variceal bleeding, cirrhosis, Gastrointestina

# 1. Introduction

## 1.1 Background

Cirrhosis is a consequence of chronic liver damage resulting in fibrosis, hepatocyte loss, vascular remodeling, portal hypertension, and decompensation over time (1). Approximately 112 million compensated and 10.6 million decompensated cases estimated globally. Alcohol (~20%) and NAFLD (~62%) are the predominant causes currently. Ascites, variceal hemorrhage, hepatic encephalopathy, hepatocellular carcinoma, spontaneous bacterial peritonitis are some of the cirrhosis complications. Recurrent variceal hemorrhage is the most common fatal complications (4-6).

CLD results in recurrent liver injury, fibrosis of the liver and eventually cirrhosis of the liver (7). Liver fibrosis and cirrhosis of liver induce progressively splanchnic vasodilatation, increased intrahepatic vascular resistance and portal blood flow then end up with increased portal pressure and formation of collaterals (8). 40%-60% of cirrhotic patients are identified as having esophageal varices in cross sectional studies, which is a measure of the clinical severity of the disease (9-10). variceal bleeding was one of the strongest predictors of mortality which follows after liver failure, HCC, infection and hepatorenal syndrome. Timely diagnosis and appropriate treatment are crucial considering its high mortality rate (20%) (11-15).

Variceal bleeding is a serious complication, with 42% mortality rate. In the last 2 decades it has decreased to 15-20% through better treatment combination (16-17). In addition, the incidence of variceal bleeding is a factor which significantly worsens the prognosis for liver cirrhosis patients (18). Several factors frequently found in variceal bleeding are severity of liver dysfunction abnormalities based on Child-Pugh criteria, size of varices, and the presence of red color sign (RCS) through endoscopic examination (19-20).

Acute variceal bleeding is one of the major causes of death in cirrhotic patients (16). It is also the major cause of upper gastrointestinal (GI) bleeding in cirrhotic patients, accounting for 70% of cases (21). Mortality during the first episode is estimated to 15–20%, but is higher in severe patients (Child Pugh C), at around 30%, whereas it is very low in patients with compensated

cirrhosis (Child Pugh A) (22). The main predictors of bleeding in clinical practice are include: large versus small varices, red wale marks, Child Pugh C versus Child Pugh A–B (23).

Acute bleeding varices is the leading causes of mortality in cirrhotic individuals (16). Around 70% of upper gastrointestinal hemorrhage is due to bleeding varices in patients with a diagnosis of liver cirrhosis (21). It has 15-20% mortality rate at first occurrence even higher in Child-Pugh C reaching to 30% but, lower in child-Pugh A (22). Varices with large size, red wall signs and child Pugh C are independent predictors of bleeding in clinical practice (23).

The incidence of developing Varices bleeding rises from 5% after one year to 28% after three years, independently of liver function or compensated/decompensated liver cirrhosis (24). In a cross-sectional study of 494 patients of which 48% had decompensated liver cirrhosis, 38% of patients had Varices bleeding at the time of screening. Thus, Varices bleeding are common in patients with advanced chronic liver disease, and it was shown that patients with Varices bleeding suffer from significantly higher mortality rates and decompensating events than patients without [25]. Based on the above background information, in this thesis, we aim to assess the magnitude and determinants of variceal bleeding among cirrhotic patients in Tikur Anbessa Specialized hospitals.

## 1.2. Statement of the Problem

Bleeding varices is a life-threatening complication of cirrhotic liver and accounts around one-third of deaths for cirrhosis patients (26-27). Mortality after the initial episode is estimated to be 15-20% (30), but raised in cases with decompensated cirrhosis, approximately 30%, while it is very low in compensated cirrhosis patients (Child-Pugh A) (31). Most critical predictors of bleeding in clinical practice are: large vs. small varices, red wale marks, Child-Pugh C vs. Child-Pugh A–B (16).

Ruptured varices is the cause of bleeding for 60-65% of cirrhosis patients (16). The patient's outcome following upper GI hemorrhage due to esophageal varices is based on the severity of the hemorrhage, hepatic functional reserve (stage of cirrhosis), variceal size and location (esophageal or gastric), their age, the presence of co-morbid disease and treatment given. This

condition poses a significant health burden due to its high mortality, recurrence rates, and the complexity of clinical management.

Whereas, in Ethiopia, even though cirrhotic liver diseases are prevalent, there is a lack of comprehensive data on the prevalence and specific factors contributing to variceal bleeding among cirrhotic patients, particularly within specialized healthcare settings like Tikur Anbessa Specialized Hospital. Identifying the magnitude and determinants of variceal bleeding in this context is crucial for developing targeted interventions, optimizing clinical outcomes and reducing mortality associated with this complication. Understanding factors such as the severity of liver dysfunction, variceal size, and endoscopic findings could inform tailored preventive strategies and improve resource allocation within the hospital's gastroenterology and hepatology departments.

Thus, this study aimed to determine the magnitude and identify determinants of variceal bleeding among cirrhotic patients at Tikur Anbessa Specialized Hospital.

## 1.3 Significance of the Research

Various determinant factors contribute to the risk of variceal bleeding in patients with cirrhosis. Investigating these factors is crucial for enhancing risk assessment and developing targeted interventions, which could lead to a reduction in mortality and morbidity due to variceal bleeding. By identifying particular risk factors, personalized treatment plans can be implemented and improve the management of patients at higher risk. Additionally, recognizing early signs of variceal bleeding enables the prompt use of preventive treatments, such as beta-blockers or endoscopic therapy, to prevent bleeding episodes.

Preventing variceal bleeding through early detection and management can significantly decrease the need for expensive emergency treatments, hospital stays, and long-term complications related to cirrhosis. A deeper understanding of the factors involved allows for more effective allocation of healthcare resources, focusing on patients at high risk and potentially easing the strain on healthcare systems.

The findings of this study can also guide public health policies aimed at reducing the incidence and severity of variceal bleeding. The results of the research will also aid clinicians in identifying risk factors for variceal bleeding, leading to more comprehensive care and better overall health outcomes.

Furthermore, the study adds valuable insights to the existing body of knowledge on cirrhosis and its complications, potentially sparking new hypotheses and further research. By pinpointing key determinants, it can lay the groundwork for future studies aimed at exploring preventive strategies for variceal bleeding. More effective prevention and management of variceal bleeding could result in fewer complications for patients with cirrhosis, ultimately enhancing their quality of life.

## 2. Literature Review

In this section, we review and summarize selected related works on the magnitude and determinants of variceal bleeding among cirrhotic patients. A Study done on predictors of large esophageal varices in patients with cirrhosis revealed that the prevalence of large esophageal varices was 20%. Low platelet count and splenomegaly were predictors of large esophageal varices. Cirrhotic were further divided into high- and low-risk patients for large esophageal varices. Patients with a platelet count of ≥88,000/mm3 (median) and without splenomegaly on physical examination had a risk of large esophageal varices of 7.2%. Patients with splenomegaly or platelet count <88,000/mm3 had a risk of large esophageal varices of 28% ($p<0.0001$) (32).

According to a study (33) older people had a higher Child-Pugh score, higher neutrophil count, lower blood Ca+2 level, elevated D-D and ALP levels, and no splenectomy. Furthermore, a higher risk of complications other than cirrhotic esophagogastric variceal bleeding at admission was linked to higher NLR, WBC, and PLT counts as well as higher CLIF-C AD scores (OR= 1.205; $p < 0.05$) (33).

According to a study, esophageal varices were responsible for 255 (93.4%) of the 273 cases of variceal bleeding, while gastric varices were responsible for 18 (6.6%). Episodes of variceal hemorrhage were more common in patients with alcoholic liver cirrhosis (51.28%). Children in classes B or C accounted for 77% of patients with variceal hemorrhage(33).

The study group's variceal hemorrhage-related mortality rate was 2.93%. A total of 125 patients received elastic ligatures and 148 patients received sclerotherapy. In the study group, 65 patients (23.8%)—43 men and 22 women—experienced bleeding relapses. Relapses of variceal bleeding were more common following sclerotherapy than following elastic ligatures (34).

Among 263 variceal hemorrhages, 9.5% were gastric and 90.5% were esophageal varices.73.4% were males with mean age of 57.9 years.53.2% of cases had ascites was found in 28.1%. 44.8% of cases had active bleeding during endoscopy.

Higher bleeding was seen in children with CTP classes C and B (relative risk 6.9 and 2 at week six and one year, respectively, with P<0.04). Rebleeding at week six was predicted by the following factors: age >60 years (OR 2.3); CTP score>7 (OR 3.8); MELD score>16 (OR 3.0); renal injury (creatinine>1.5 mg/dL) (OR 2.4); albumin <2.8g/dL (OR 5.8); bilirubin>3 mg/dL (OR=3.9); ascites (OR=6.0); hepatic encephalopathy (OR 2.3); endoscopic active bleeding (OR=5.8); bacterial infection (OR 4.5); HCC (OR=3.7); and portal vein thrombosis (OR 3.7) with P value<0.05.

Alcohol consumption, non-selective beta-blockade therapy, and thrombocytopenia did not predict the mortality rate. Rebleeding at one year was predicted by CTP score>7 (OR=2.9), albumin<2.8g/dL (OR 1.9), bilirubin>3mg/dL (OR=3.4), and active bleeding (P value<0.035). After an episode of variceal bleeding, the mortality rate was 3.8% (n=10 patients) at day five, 14.1% (n=37) at week six, and 25.8% (n=68) at one year. Age >60 years (OR 2.3), CTP score >7 (OR 7.3), renal injury (OR 4.9), albumin<2.8g/dL (OR 4.7), bilirubin>3 mg/dL (OR 5.2), ascites (OR 6.9), encephalopathy (OR 2.8), bacterial infection (OR 7.4), HCC (OR 4.6), and variceal re-bleeding (OR 4.1) were the variables that predicted mortality in week six. The P value was less than 0.035. 6-week mortality was unaffected by portal vein thrombosis, alcohol consumption, or active endoscopic bleeding. Age over 60 (OR 2.3) was a year one predictor of death, CTP score >7 (OR 4.9), renal injury (OR 3.2), albumin <2.8g/dL (OR 3.7), bilirubin >3mg/dL (OR 3.2), ascites (OR 3.2), bacterial infection (OR 4.9), HCC (OR 6.3), PVT (OR 3.5), and P value <0.013.Active bleeding during endoscopy, thrombocytopenia, and hepatic encephalopathy were not year one risk factors for death(35).

99 cirrhotic patients with esophageal varices were included in a study on non-invasive parameters as predictors of high risk of variceal bleeding in cirrhotic patients; 56 (56.6%) of these patients were female, and their mean age was 57.8 ± 12.2. Regarding variceal size, 54 patients (54.5%) had large varices. 46 people (46.5%) reported having VB. The best predictor of VB in the endoscopic study was the presence of large varices (OR = 11.1; P < 0.0001). When the portal vein diameter is greater than 13 mm, the OR is 5.0 and the P is 0.03(36).

Serum albumin, serum bilirubin, prothrombin concentration, Child-Pugh score, platelet count, spleen diameter, ascites, portal vein diameter and velocity, varices size, varix's location, and red color sign were all statistically significant predictors of early variceal rebleed, according to a study titled Predictors of early rebleeding after endoscopic treatment of initial variceal bleeding in liver cirrhosis. The Child-Pugh score (sig: 0.001 and OR: 1.661), platelets count (sig: 0.000 and OR: 0.956), portal vein velocity (sig: 0.000 and OR: 0.664), variceal grading (sig: 0.000 and OR: 3.964), and red color sign of varices (sig: 0.000 and OR: 4.964) were the strongest independent predictors using multivariate regression. To generate an early variceal rebleeding risk (EVRR) score with superior discriminatory performance (AUC: 0.965), we utilized the multivariate regression coefficients of the significant predictors (37).

The bleeding patients were slightly older than the non-bleeding patients (55.58 ± 5.89 vs. 52.54 ± 9.01 years), p = 0.049, according to research on predictors of bleeding in esophagogastric varices in patients with HCV-induced liver cirrhosis. Esophagogastric variceal bleeding was independently predicted by mild ascites, H. pylori, and Child-Pugh scores B and C (OR = 0.036, OR = 7.36, OR = 19.0, and OR = 40.51). The model's sensitivity was 93.88%, its specificity was 53.85%, its PPV was 88.46%, its NPV was 70.0%, 85.48% of patients were correctly classified, and its AUC was 90.27%. Esophagogastric variceal bleeding was independently predicted by pepsinogen levels greater than 43.5 μg/l, AST levels greater than 54.5, bilirubin levels greater than 1.45, and hemoglobin levels greater than 11.5 (OR = 1.18, OR = 1.14, OR = 5.55, and OR = 0.05), respectively. This model's sensitivity and specificity were 92% and 98%, respectively. (38).

A study done at the University of Gondar Specialized comprehensive hospital Gastroesophageal variceal hemorrhage in patients with chronic liver diseases revealed that the mean age of the study subjects was found to be 37.76 years (SD ± 11.62). The prevalence of gastroesophageal variceal hemorrhage (GEVH) was found to be 52% (95% CI: 49.6–54.2). Patients with grade F2 and F3 varices have 3.41 times (AOR: 3.41, 95% CI: 2.33–4.74) and 3.33 times (AOR: 3.33, 95% CI: 2.55–4.12) higher odds of bleeding, respectively. Patients not taking beta-blocker have 2.38 times (AOR: 2.38, 95% CI: 1.82–3.90) increased odds of bleeding. Patients with more than three years of duration of illness have 2 times (AOR: 2.19, 95% CI: 1.39–3.99) increased odds of bleeding. Patients with platelet numbers less than 50,000/μl have 3.46 times (AOR: 3.46, 95% CI: 2.55–4.17) higher odds of bleeding (39).

## 3. Conceptual framework

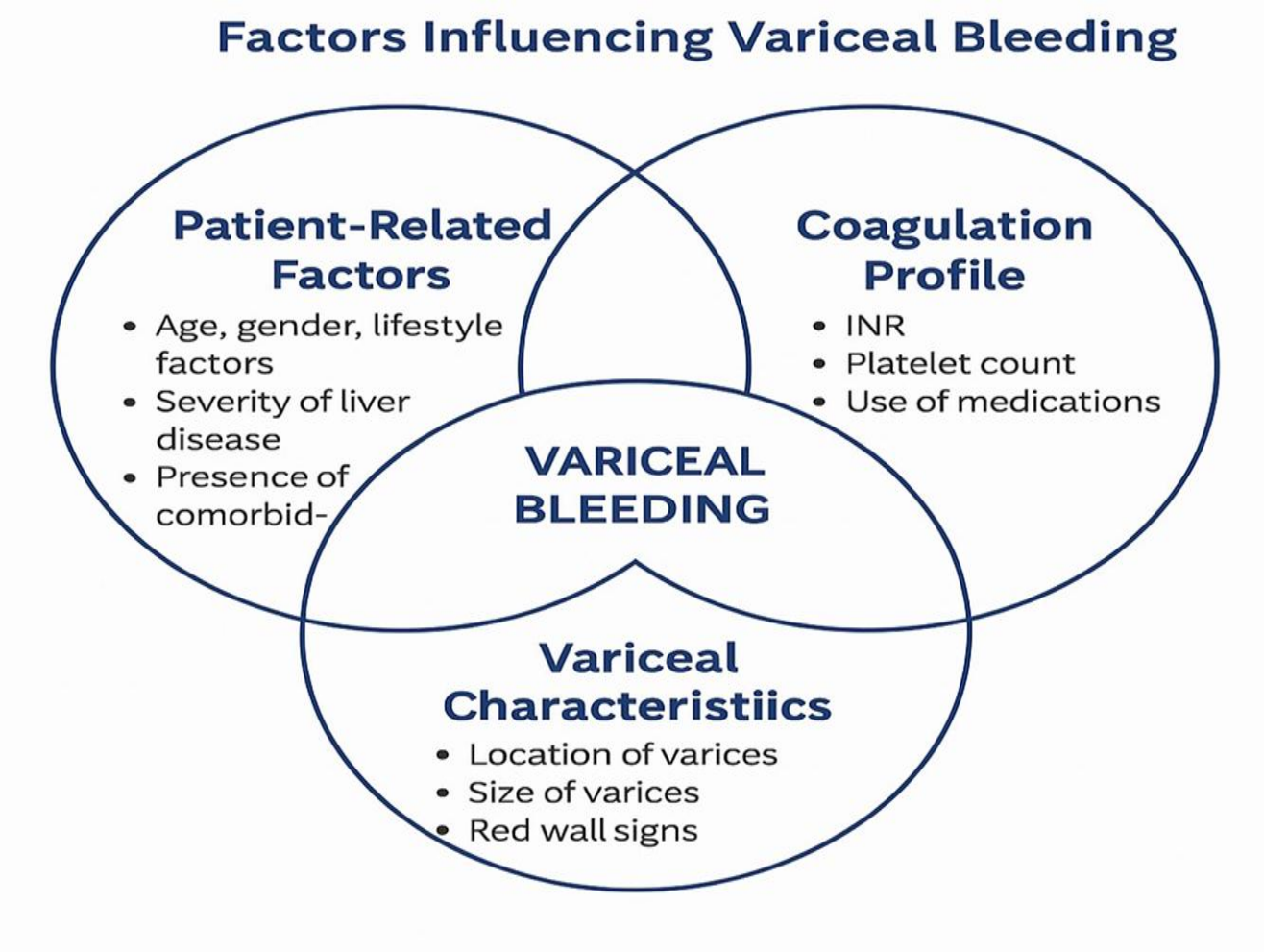



Figure 1: conceptual frame work of variceal bleeding and associated factors of Cirrhosis

# 4. Objective of the Thesis

## 4.1 General Objective

The general objective of this thesis was to assess the magnitude and determinants of variceal bleeding among cirrhotic patients at Tikur Anbessa Specialized Hospital.

## 4.2 Specific Objectives

To fulfil the above general objective, the following specific objectives will be accomplished.

- To determine the magnitude of variceal bleeding among cirrhotic patients in Tikur Anbessa Specialized Hospital.
- To identify determinants of variceal bleeding among cirrhotic patients in Tikur Anbessa Specialized hospital.

# 5. Methodology of the Research

## 5.1 Study Setting

The study was conducted at TASH, Ethiopia's main referral hospital, which is situated in Addis Ababa, the country's capital. In 1972, the hospital opened, and in 1998, the Federal Ministry of Health moved it to the School of Medicine. Since then, it has evolved into a teaching hospital affiliated with Addis Ababa University. Today, it serves as the primary teaching hospital for the majority of specialties' preclinical and clinical training.

Approximately half a million patients receive comprehensive medical care from the hospital each year through inpatient service departments and specialty clinics. Its inpatient, outpatient, and emergency departments include more than 700 beds and 1,700 trained and helpful staff members. It is also an institution that provides the entire country with specialized therapeutic services that are not offered by other public or private organizations. The School of Medicine's numerous departments, faculty members, and residents undergoing specialized training provide hospital patient care. Gastroenterology and hepatology are one of the units of internal medicine department that provide specialized care.

## 5.2 Study Design and period

An institutional-based retrospective follow-up study was conducted. The study period was from January to February 2025.

## 5.3 Source Population

All adult patients with cirrhosis attended at TASH gastrointestinal and hepatology follow-up clinic during the study period.

## 5.4 Study Population

All adult patients with cirrhosis attended at TASH gastrointestinal and hepatology clinic who fulfilled the inclusion criteria during the study period

## 5.5 Eligibility Criteria

### 5.5.1 Inclusion Criteria

The inclusion criteria of the study were:

- All adult age >=18 years patients with cirrhotic liver who were attending gastrointestinal and hepatology clinic from January 2020 to June 2024.

### 5.5.2 Exclusion Criteria

The exclusion criteria of the study were:

- Patients with no Esophagogastroduodenoscopy (EGD)
- Prior variceal hemorrhage at baseline
- Non-variceal hemorrhage
- Patients with incomplete data

## 5.6 Sample Size Calculation and Sampling Method

The sample size was calculated using a single proportion formula under the assumptions that; 95% confidence level, the margin of error (0.05), p=52% of patients having GEVH, taken from a study done at University of Gondar Specialized Comprehensive Hospital (1).

$n = (Z\alpha/2)^2\ p\ (1-p)/\ d^2 = (1.96)^2\ (0.52)\ (1-0.52)/\ (0.05)^2 = 384$

Where:

n= desired sample size

P= estimated prevalence

Z= standard normal score at 95% confidence level (1.96)

D= margin of error (5% or 0.05)

Since the source population (N = 427 cirrhotic patients obtained from the hospital HIS) was less than 10,000, a correction formula was used to adjust the sample size:

nf= n/(1+(n-1/N))=203

With the addition of 10 % for incomplete data the final sample size became 224.

## 5.7 Study Variables

### 5.7.1 Dependent Variable

The dependent variable for the study was the occurrence of variceal bleeding

### 5.7.2 Independent Variables

The independent variables of the study include demographic factors, etiology cirrhosis, liver function, portal hypertension, platelet count and coagulation, presence of ascites, use of medication, nutritional status and alcohol consumption. The details of each variable are shown in Annex I.

## 5.8 Operational Definitions

- **Cirrhosis:** Scarring of the liver secondary to various causes diagnosed by ultrasound, CT scan, MRI, liver fibro scan or biopsy.
- **Variceal bleeding:** It is an upper GI bleeding confirmed by upper GI endoscopy.
- **Chronic liver disease (CLD)**: It refers to a broad spectrum of progressive liver conditions characterized by the gradual deterioration of liver function over a long period, often months to years. Chronic liver diseases persist and worsen over time, potentially leading to irreversible liver damage, cirrhosis, liver failure, or liver cancer.
- **Child-Pugh score:** It is used to prognosticate chronic liver disease, particularly cirrhosis. It helps to estimate the severity of liver dysfunction and predict the outcome of liver disease, including the risk of complications and survival.
- **Child-Pugh Score Components:** It has five parameters (clinical and laboratory) having 1-3 points each based on severity. The total score is then used to classify the severity of liver disease into three classes: A, B, and C. The detail parameters of the Child-Pugh Score Components are shown in Annex II.
- **Child-Pugh Classification:** The total score is computed by summing the points from each parameter:

Class A (Score 5-6): Mild liver disease with good prognosis. The patient typically has a longer survival rate and fewer complications.

Class B (Score 7-9): Moderate liver disease with a medium prognosis. The patient is at a higher risk for complications and may have a shorter survival rate.

Class C (Score 10-15): Severe liver disease with poor prognosis. The patient is at a very high risk for complications, and the survival rate is significantly reduced.

## 5.9 Data Collection Procedure and Management

Data was obtained from electronic medical records. Two general practitioners served as data collectors, and they received a one-day training session on data collection procedures and proper handling of collected data. Initially, an "I Care" number was selected from the unit's medical record logbook, and data was then gathered using a purposive sampling method from the electronic medical records. The study likely included patients for whom complete medical records and relevant data were available, as it was a retrospective study analyzing existing data from the hospital.

## 5.10 Data Collection Instrument

A questionnaire (data abstraction format) was developed by compiling several questions adopted from similar study materials, review of relevant literature and articles that could address the objectives of the study. Data abstraction format was generally designed to include information about sociodemographic characteristics, comorbidity, concomitant drugs and laboratory results. Data was collected and medical records will be scrutinized to pursue all variceal bleeding.

## 5.11 Data Quality Assurance

The data collectors were two general practitioners. They were trained for one day about the objective of the study, how to collect data and ways of handling the collected data. We utilized data abstraction format (checklist). Five percent of the survey was pretested in different hospitals, and the questioner's clarity was examined. Supervision of the activity was provided by the primary investigator.

The primary investigator verified the completeness, consistency, clarity and skip patterns of completed questionnaires and check lists at the conclusion of each data collecting day. When needed, a meeting with the data collectors held to discuss and resolve any ambiguities.

## 5.12 Data Analysis Procedure

Data were verified and cleaned for completeness and consistencies and coded, entered and analyzed using SPSS version 27. Descriptive statistic was done for categorical data and was presented using frequencies and percentage. Mean and standard deviation (SD) was computed to present continuous variables. Binary logistic regression model was used to identify predictors of variceal bleeding. A p-value less than 0.25 in the univariate binary logistic regression was selected for multivariate logistic regression analysis. Variable with a p-value <0.05 was declared as statistically significant.

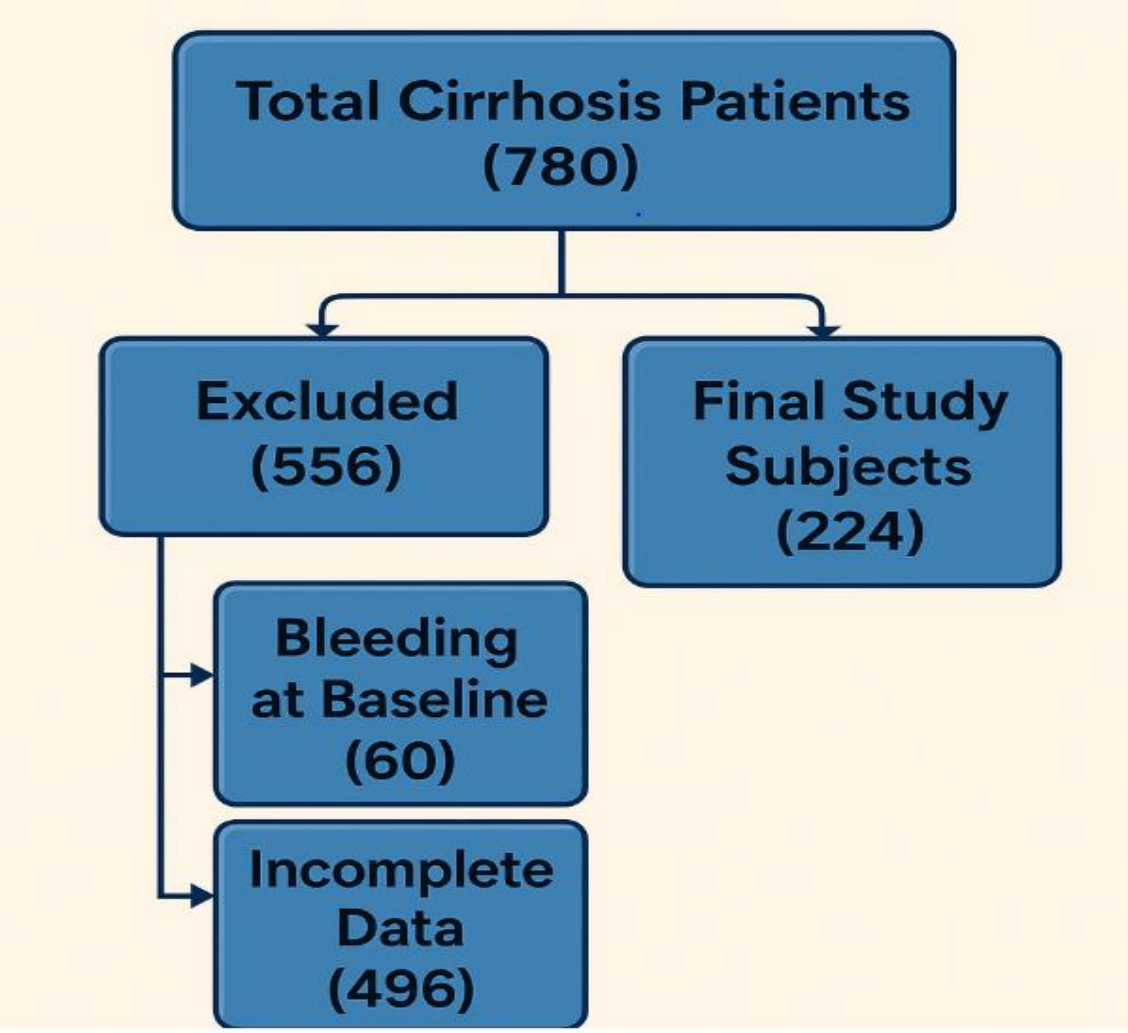
## 5.13 Ethical Consideration

Ethical approval was secured from the research ethics review committee of the Department of Internal Medicine, College of Health Sciences, Addis Ababa University. Additionally, authorization to access patient medical records was acquired from the Department of Internal Medicine, with a commitment to maintaining confidentiality.

## 5.14 Dissemination of Research Finding

After the research is completed, it will be presented for department of internal medicine and will be communicated to all concerned body. All effort will be made to publish the paper in scientific journal.

## 6. Results




### 6.1 Sociodemographic characteristics of patients

224 patients of cirrhosis were enrolled in this study. Mean age was 44.45 years (SD ± 14.32). Majority, more than 68.7% were under the age of 50 years. Fifty seven percent were males. Rural population was more than 75.9% (Table 1).

### 6.2 Clinical characteristics of patients

Severity of CLD was assessed using Child Turcotte Pugh (CTP) score, a validated tool. 42.4% CTP class B and 41.5 % were CTP class A. The remaining 16% were severe CLD (CTP class C).110 (49.1%) of the patient had ascites. 65.6 % of the patients had follow up duration of less than 3 years. 2.70 years was the mean duration of follow up (SD ± 1.08). (Table 2).

### 6.3 Etiology of cirrhosis

ALD was the most common causes of cirrhosis (25.4%) (Fig. 1).

Note: ALD: Alcoholic Liver Diseases

### 6.4 Laboratory characteristics of patients

Higher than 15 % of the patients have hemoglobin < 9 mg/dl and greater than 10 % have platelet count of <50,000/µl .The mean albumin was 3.44 (SD ± 0.78), hemoglobin was 11.08 mg/dl (SD ± 1.90), serum total bilirubin was 1.50 mg/dl (SD ± 0.96), serum creatinine was 0.76 mg/dl (SD ± 0.27), INR was 1.45 IU (SD ± 0.66) and platelet was 106,000/µl (SD ± 52,950.18) (Table 2).

### 6.5 Endoscopic characteristics and intervention practice

Isolated esophageal varices occurred in 143 (87.7 %) patients. Grade III varices accounted around 42.3 % of patients. 48.7 % of patients had treated endoscopically by band ligation (Table 3).

### 6.6 Prevalence of variceal hemorrhage

The prevalence of variceal hemorrhage was nearly half in patients with cirrhosis in our study in patients with endoscopically confirmed varices (Fig. 2).

### 6.7 Determinant of variceal hemorrhage

Diabetes and HTN were the most diagnosed comorbidities. Female sex, ascites, hepatic encephalopathy, grade of varices, advanced Child Pugh class, red signs, comorbidities and thrombocytopenia were significantly related to the development of variceal bleeding in the bivariate analysis. Ascites, grade of varices and red signs in multivariate analysis were significantly associated with bleeding varices (Table 4).

Table 1: Socio-demographic characteristics of patients with cirrhosis at Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia, 2025(N=224)

| Variables | | Frequency | Percent (%) |
|---|---|---|---|
| Age category | <50 year | 154 | 68.7 |
| | ≥50 year | 70 | 31.3 |
| Sex | Male | 128 | 57.1 |
| | Female | 96 | 42.9 |
| Place of residence | Urban | 54 | 24.1 |
| | Rural | 170 | 75.9 |

Table 2: Clinical and laboratory characteristics of patients with cirrhosis at Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia, 2025(N=224).

| Variables | | Frequency | Percent (%) |
|---|---|---|---|
| Severity of CLD | CTP class A | 93 | 41.5 |
| | CTP class B | 95 | 42.4 |
| | CTP class C | 36 | 16.1 |
| Duration of illness | <3 year | 147 | 65.6 |
| | ≥3 year | 77 | 34.4 |
| Alcohol use | | 58 | 25.9 |
| Comorbidity* | | 81 | 36.2 |
| Ascites | | 110 | 49.1 |
| HE | | 25 | 11.2 |
| SBP | | 8 | 3.6 |
| Bilirubin -total | <2 | 174 | 77.7 |
| | ≥ 2 | 50 | 22.3 |
| Albumin | <2.5 | 34 | 15.2 |
| | ≥ 2.5 | 190 | 84.8 |
| INR | <1.7 | 178 | 79.5 |
| | ≥1.7 | 46 | 20.5 |
| PLT (*1000) | <50 | 23 | 10.3 |
| | 50-100 | 67 | 29.9 |
| | ≥ 100 | 134 | 59.8 |
| Hemoglobin(mg/dl) | <9 | 35 | 15.6 |
| | ≥ 9 | 189 | 84.4 |
| Creatinine(mg/dl) | <1.32 | 211 | 94.2 |
| | ≥ 1.32 | 13 | 5.8 |

HE: Hepatic encephalopathy; SBP: Spontaneous bacterial peritonitis; INR: international normalized ratio

PLT: platelet; *: comorbidities (Heart failure, HTN and Diabetes).

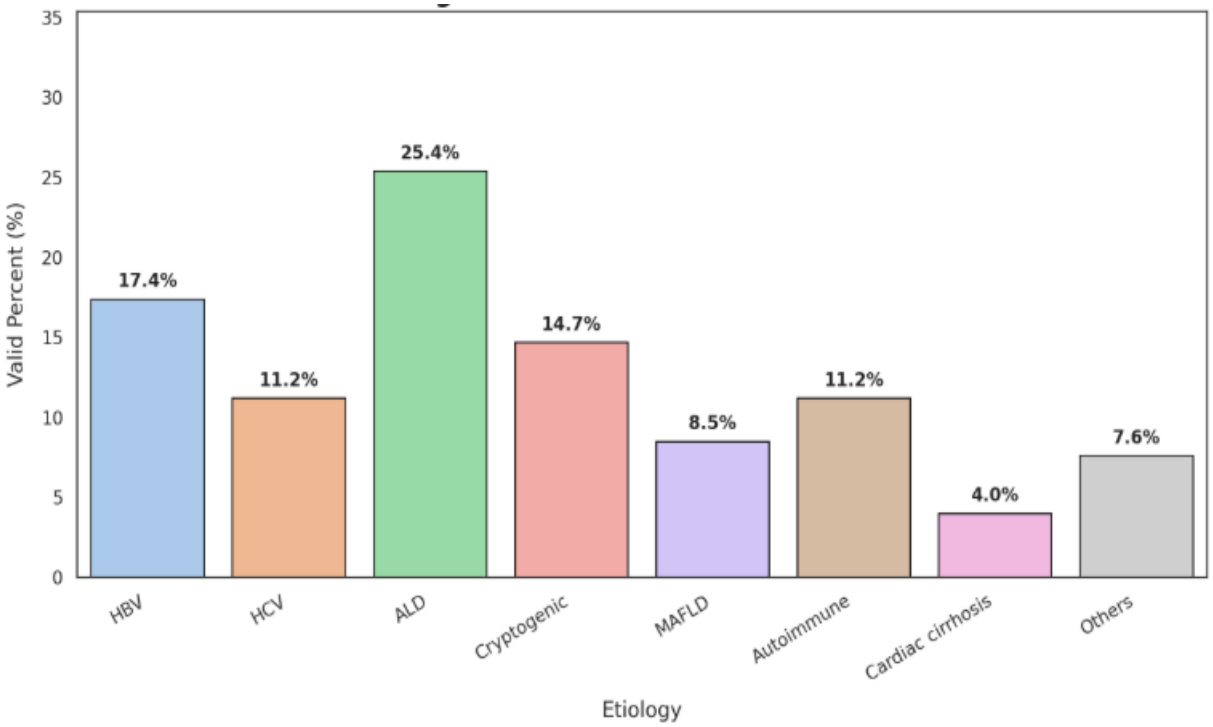



Figure 2: Distribution of the Causes of cirrhosis at Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia, 2025(N=224)

Table 3: Endoscopic feature and intervention practice of varices in patients with cirrhosis at Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia, 2025 (N=224).

| Variables | Category | Frequency | Percent (%) |
|---|---|---|---|
| Locations of varices | Esophageal | 143 | 87.7 |
| | Esophagogastric | 20 | 12.3 |
| Grade of varices | Grade I | 35 | 21.5 |
| | Grade II | 59 | 36.2 |
| | Grade III | 69 | 42.3 |
| Red signs | | 60 | 26.8 |
| Use of beta blocker | | 168 | 75 |
| EVL | | 109 | 48.7 |

EVL: Esophageal band ligation

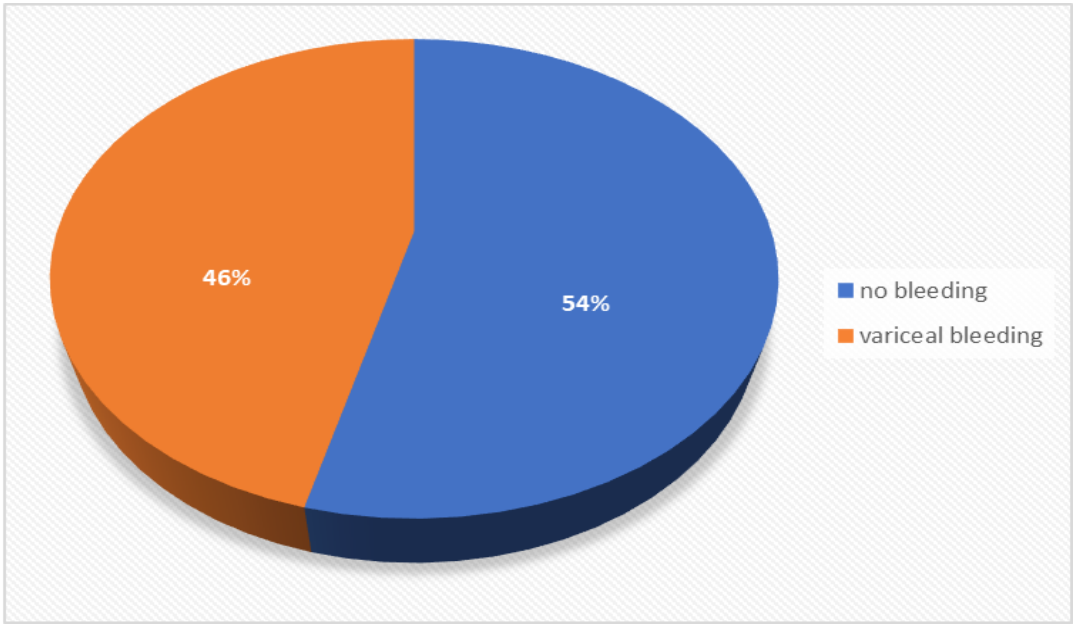



Figure 3 : Prevalence of variceal bleeding among cirrhosis patient at Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia 2025(N-224)

Table 4: Multivariable binary logistic regression analysis of factors associated with variceal bleeding in patients with cirrhosis at Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia, 2025 (N=224).

| Variables | | Variceal bleeding | | COR (95%CI) | AOR (95%CI) | P-Value |
|---|---|---|---|---|---|---|
| | | Yes, N (%) | No, N (%) | | | |
| Gender | Male | 54(52.4) | 74(61.2) | 1 | 1 | |
| | Female | 49(47.6) | 47(38.8) | 1.4(0.84,2.43) | 0.9(0.42,2.18) | 0.924 |
| CTP class | A | 30(29.1) | 63(52.1) | 1 | 1 | |
| | B | 50(48.5) | 45(37.2) | 2.3(1.29,4.22) | 1.1(0.35,3.52) | 0.868 |
| | C | 23(22.3) | 13(10.7) | 3.7(1.66,8.33) | 2.5(0.43,14.18) | 0.308 |
| Ascites | No | 41(39.8) | 73(60.3) | 1 | 1 | |
| | Yes | 62(60.2) | 48(39.7) | 2.3(1.34,3.93) | 3.4(1.10,10.49) | **0.034** |
| HE | No | 84(81.6) | 115(95.0) | 1 | 1 | |
| | Yes | 19(18.4) | 6(5.0) | 4.3(1.66,11.32) | 1.2(0.23,6.15) | 0.826 |
| PLT (*1000) | <50 | 19(18.4) | 4(3.3) | 7.0(2.27,21.83) | 4.3(0.94,19.86) | 0.06 |
| | 50-100 | 30(29.1) | 37(30.6) | 1.2(0.66,2.17) | 0.4(0.17,1.00) | 0.05 |
| | >=100 | 54(52.4) | 80(66.1) | 1 | 1 | |
| comorbidities | No | 70(68.0) | 73(60.3) | 1 | 1 | |
| | Yes | 33(32.0) | 48(39.7) | 0.72(0.41,1.24) | 1.4(0.56,3.44) | 0.476 |
| Red signs | No | 54(52.4) | 110(90.9) | 1 | 1 | |
| | Yes | 49(47.6) | 11(9.1) | 9.0(4.37,18.84) | 2.8(1.06,7.23) | **0.037** |
| Size of EV | Grade I | 10(9.7) | 25(41.7) | 1 | 1 | |
| | Grade II | 39(37.9) | 20(33.3) | 3.9(1.58,9.63) | 3.7(1.30,10.68) | **0.014** |
| | Grade III | 54(52.4) | 15(25.0) | 7.3(2.91,18.35) | 7.6(2.24,25.54) | **0.001** |

CTP: Child Turcott Pugh; HE: Hepatic encephalopathy; EV: Esophageal Varices; PLT: Platelet

# 7. Discussion

Most patients with cirrhosis at the TASH were middle aged men and ALD was the leading etiological factor underlying cirrhosis. Chronic HBV infection was the second commonest cause of liver cirrhosis but HCV and MAFLD were not major causes of cirrhosis at TASH

In our study the prevalence of gastroesophageal variceal hemorrhage in cirrhosis was 46 %. This result aligns closely with findings from a study conducted at the University of Gondar Specialized Hospital (52%) [1] and another study in India (50%) [14].

Our findings indicated that the presence of ascites is significantly associated with an increased risk of variceal bleeding (AOR: 3.4, 95% CI: 1.10–10.49, P = 0.034). This result consistent with finding from study done at Egypt (41).

The severity of CLD is an excellent predictor of variceal bleeding as shown in various studies done in Shenyang, China; Seoul, Korea; Pakistan; Italy; and Texas, USA [21,28]. In our study, on the contrary, no significant relationship was observed between the severity of CLD (as assessed using the Child-Turcotte-Pugh (CTP) score) and the risk of bleeding. Adjusted odds ratio were AOR: 1.1 (95% CI: 0.35–3.52, P = 0.868) for class B and AOR: 2.5 (95% CI: 0.43–14.18, P = 0.308) for class C.

In our study, the size of esophageal varices was found to be significantly associated with bleeding. The odds of bleeding were higher in patients with Grade II varices (AOR: 3.7, 95% CI: 1.30–10.68, P = 0.014) and even greater in those with Grade III varices (AOR: 7.6, 95% CI: 2.24–25.54, P = 0.001). This finding is consistent with research done in Springer, Singapore (40).

This study showed that the presence of red signs was significantly associated with an increased risk of bleeding (AOR: 2.8, 95% CI: 1.06–7.23, P = 0.037).

Various studies conducted at the University of Gondar Hospital, as well as in Egypt, Scotland, Italy, and Poland, have demonstrated that a low platelet count is significantly associated with an increased risk of variceal bleeding (1,38). However, our study did not find a significant association between low platelet count and the risk of bleeding. The adjusted odds ratios were AOR: 4.3 (95% CI: 0.94–19.86, P = 0.06) for platelet count <50,000 and AOR: 0.4 (95% CI: 0.17–1.00, P = 0.05).

Studies done in university of Gondar; Pakistan showed patients with longer duration of illness have significant risk of bleeding (1). But our study did not find a significant association between duration of illness and risk of bleeding. From various studies conducted in Korea and Canada the presence of comorbidities was found to be associated with an increased risk of bleeding (3,34). However, our study did not show significant association between presence of comorbidities and risk of bleeding. The adjusted odds ratio was AOR:1.4(95%CI:0.56-3.44, P=0.476).

In general, all of those factors mentioned in this study are easy to prevent and thus extremely important to prevent this deadly complication. The outcome of this study can even be utilized as an input for policy makers regarding chronic disease. The outcome can also be employed as baseline data by researchers since it is the initial one in the area and in Ethiopia in general. Nevertheless, there were some limitations in our research. Biopsy of the liver and fibro scan were not used due to the absence of expertise and non-availability, respectively. Thus, there is also a potential that most of the unrecognized liver disease could have non-alcoholic liver disease which requires further research.

# 8. Conclusion and recommendation

## 8.1 Conclusions

Gastroesophageal variceal bleeding (GEVB) is a common complication in patients with cirrhosis at Tikur Anbesa Specialized Hospital. The study found that higher grade of varices, the presence of ascites, and the presence of red signs were significantly associated with an increased risk of bleeding. However, since most of these risk factors are preventable, early intervention and proper management could help reduce the occurrence of bleeding in these patients.

## 8.2 **Recommendations**

### To health care community

- Give special attention to patients with cirrhosis
- Perform an EGD for all cirrhosis patients at the time of diagnosis and as needed.
- Prescribe prophylactic beta blockers for at-risk patients
- Improve the treatment and prevention of variceal bleeding, considering its significant severity

### To interested researchers

- Large-scale controlled trials, meta-analyses, and systematic reviews are recommended to validate and implement these findings in clinical practice.
- Evaluating the impact of various factors associated with variceal bleeding in cirrhosis would be highly beneficial

# 9. Strength and limitations

## 9.1. Strength

- Our study utilized a follow up study design, enabling us to track cases for outcome occurrence.
- Long follow-up duration.
- As there is no similar research in Ethiopia, this study can serve as a baseline for future investigations.

## 9.2. Limitations

- Retrospective study design.
- Data collected from a single center.

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# Annexes

## Annex I: List of parameters of the independent variables.

1. Demographic factors
    - Age
    - Gender
    - Residency
    - Comorbidity
2. Etiology of cirrhosis
    - Alcoholic cirrhosis
    - Chronic Hepatitis B virus infection
    - Chronic Hepatitis C virus infection
    - Nonalcoholic fatty liver disease
    - Autoimmune hepatitis
    - Cardiac cirrhosis
    - Cryptogenic
    - Others
3. Liver function
    - Child-pugh score
4. Portal hypertension
    - Hepatic venous pressure gradient
    - Presence and size of esophageal or gastric varices
    - Previous history of variceal bleeding
5. Platelet count and coagulation parameters
    - Platelet count
    - International normalized ratio (INR)
    - Bilirubin-total
    - Albumin
    - Creatinine
    - Hemoglobin
6. Presence of ascites
    - Variceal size
    - Red signs (red wale markings)
7. Use of medications
    - Beta-blockers
    - Use of anticoagulants or antiplatelets
8. Nutritional status
    - Malnutrition
    - Albumin levels
9. Alcohol consumption
    - Current alcohol use
    - Presence of spontaneous bacterial peritonitis

## Annex II: Parameters of the Child-Pugh Score Components

A. Bilirubin (mg/dL)

< 2 mg/Dl: 1 point

2-3 mg/dL: 2 points

> 3 mg/dL: 3 points

B. Albumin (g/dL)

> 3.5 g/dL:1 point

2.8-3.5 g/dL:2 points

< 2.8 g/dL:3 points

C. Prothrombin Time (PT) or INR

PT prolongation < 4 seconds or INR < 1.7: 1 point

PT prolongation 4-6 seconds or INR 1.7-2.3: 2 points

PT prolongation > 6 seconds or INR > 2.3: 3 points

D. Ascites

None: 1 point

Mild or medically controlled :2 points

Moderate to severe or poorly controlled: 3 points

E. Hepatic Encephalopathy

1 point: None

2 points: Grade I-II (or controlled with medication)

3 points: Grade III-IV (or refractory)

## Annex III: Sample questioners/checklists

Study Title: Magnitude and Determinants of Variceal Bleeding in Cirrhotic Patients

Name of the hospital: Tikur Anbessa Specialized Hospital

Date of Abstraction:_____

Data collector: _____

1. Patient Information

1.1.Patient ID: _____

1.2.Age at Diagnosis: [Age in Years]_____

1.3.Gender: [Male/Female]_____

1.4.Place of Residency: _____

2. Date of Initial Diagnosis of Cirrhosis: [DD/MM/YYYY]_____
3. Follow-Up: Follow-Up Visits Documented: [Yes/No]_____

3.1.If yes, frequency of follow ups_____

4. Date of Last Follow-Up: [DD/MM/YYYY]_____
5. Etiology of Cirrhosis
    A. Alcoholic Cirrhosis_____
    B. Hepatitis B related Cirrhosis_____
    C. Hepatitis C related cirrhosis
    D. Cardiac cirrhosis
    E. Nonalcoholic Fatty Liver Disease_____
    F. Autoimmune hepatitis_____
    G. Other, specify _____
    H. Cryptogenic_____
6. comorbidities: yes/no_____

6.1.if yes, specify _____

7. medication for comorbidities_____

8. Liver Function Assessment (Historical Data)

8.1.Child-Pugh Score at Initial Diagnosis:

8.1.1. Class: [A/B/C]:_____

8.1.2. Score: [Score]_____

9. Portal Hypertension

9.1.Hepatic Venous Pressure Gradient (HVPG) (if available): [Value in mmHg]_____

9.2.Presence of Esophageal Varices: [Yes/No]_____

9.3.Size of Esophageal Varices: [Small/Medium/Large]_____

9.4.Presence of Gastric Varices: [Yes/No]_____

9.5.Size of Gastric Varices: [Small/Medium/Large]_____

10. Previous History of Variceal Bleeding: [Yes/No]_____

11. Platelet Count and Coagulation Parameters (Historical Data)

11.1. Platelet Count at Diagnosis: [Count per μL]_____

11.2. International Normalized Ratio (INR) at Diagnosis: [Value]_____

11.3. Bilirubin (Total) at Diagnosis: [Value in mg/dL]_____

11.4. Albumin at Diagnosis: [Value in g/dL]_____

11.5. Creatinine at Diagnosis: [Value in mg/dL]_____

11.6. Hemoglobin at Diagnosis: [Value in g/dL]_____

12. Presence of Ascites

12.1. Ascites Documented at Any Time: [Yes/No]_____

12.2. Ascites Description: [Mild/Moderate/Severe]_____

13. Medications used

13.1. Beta-Blockers Use (at any time): [Yes/No]_____-

13.2. Anticoagulants/Antiplatelets Use (at any time): [Yes/No]_____

Other Medications (if applicable): [Specify]_____

14. Albumin Levels at Diagnosis: [Value in g/dL]_____

15. Alcohol Consumption

15.1. Alcohol Use Documented: [Yes/No]_____

16. Presence of Spontaneous Bacterial Peritonitis: [Yes/No]_____

17. Endoscopic Findings

17.1. Variceal Bleeding Documented: [Active/Recent/None]_____

17.2. Variceal Size (if applicable): [Size]_____

17.3. Red Signs (Red Wale Markings) Observed: [Yes/No]_____

17.4. Endoscopic Treatment Applied (if applicable): [Band Ligation/Sclerotherapy/Other/None]_____

17.5. Comments: [Any additional findings or notes]_____

18. Outcome