PREDICTORS OF 1-MONTH AND 3-MONTH READMISSIONS AMONG PATIENTS WITH DECOMPENSATED LIVER CIRRHOSIS ADMITTED AT MUHIMBILI NATIONAL HOSPITAL.

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Department of Internal Medicine

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By

Happiness Judical Swai(MD)

A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Internal Medicine) of

Muhimbili University of Health and Allied Sciences

October, 2024

CERTIFICATION

The undersigned certify that they have read and at this moment recommend for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation entitled: "**Predictors of 1-month and 3-month readmissions among patients with Decompensated Liver Cirrhosis admitted at Muhimbili National Hospital**" in partial fulfillment of the requirements for the degree of Master of Medicine (Internal Medicine) of the Muhimbili University of Health and Allied Sciences.

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DECLARATION & COPYRIGHT

I, Happiness Judical Swai declare that this dissertation is my original work to the best of my knowledge; it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Date: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

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DEDICATION

To my beloved mom Alinda who made all of this possible for her endless love, sacrifices, encouragement, and patience.

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ABSTRACT

Background: Cirrhosis is the end stage of chronic liver disease and is associated with substantial inpatient morbidity and mortality. In Tanzania, Cirrhosis is the 13th most common cause of death. It contributes significantly to morbidity due to complications and frequent readmissions shortly after discharge. This study aims to determine the burden of 1-month and 3-month readmission ratesand associated factors in our setting

Objective: To determine the predictors of 1-month and 3-month readmissions among patients with Decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital.

Methodology: This prospective cohort study was carried out at Muhimbili National Hospital involving a minimum of 110 consenting patients with decompensated liver cirrhosis who were admitted to the gastro-hepatology unit between August and November 2023 and followed up for 3 months post-discharge. Data regarding demographics, laboratory, and disease risk factors were compiled using a structured questionnaire. Continuous variables were summarized as medians (interquartile range) and categorical variables were displayed as percentages. Comparison was done using the Kruskal Wallis test for continuous variables the Chi-squared test and Fisher exact test for categorical variables. The Robust Poisson regression model was used to analyze for factors associated with readmission within 1 and 3 months. A P value of 0.05 was used to denote statistical significance.

Results: Of the 110 enrolled patients' males were 71.8%. The overall median age was 44.5, with IQR [36-59] years. The predominant etiology of cirrhosis was alcohol found in 38.2% of patients, andthe most common decompensating event responsible for index hospitalization was ascites (68.2%)followed by upper GI bleed (66.4%). About 66.4% of the patients presented with 2 complicationsat index hospitalization with an average median MELD-Na score of 23, IQR [17-30].1-month and3-month readmission rates in our study were 20.9% and 30.9% respectively.

Factors independentlyassociated with 1-month readmission were MELD-Na (p=0.029) and for 3 months MELD-Nascore (p=0.006) and thrombocytopenia (p=0.023).

Conclusion and Recommendation: Our study found a comparable burden of readmission at 1-month and 3-months. The identification of the MELD-Na score and thrombocytopenia as factors associated with readmission provides valuable insight into risk factors for poor outcomes in cirrhotic patients. These findings suggest the utilization of the MELD-Na score in our clinical practicein identifying those with the likelihood of being readmitted to improve their outcomes.

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DEFINITION OF TERMS

Decompensated Liver Cirrhosis is described as an abrupt decline in liver function in a cirrhotic patient and is marked by jaundice, ascites, hepatic encephalopathy, hepato-renal syndrome, or variceal hemorrhage. Additional complications include coagulopathy, hepato-pulmonary syndrome, and Porto pulmonary hypertension(2) .

Ascites refers to the abnormal buildup of fluid in the peritoneal cavity. It is the most frequent complication associated with cirrhosis, affecting roughly 50% of patients with decompensated cirrhosis within 10 years. The appearance of ascites marks the progression from compensated to decompensated cirrhosis. According to the International Ascites Club, ascites will be rated as mild, moderate, or severe(3) (4).

Hepatic encephalopathy is a reversible impairment of neuropsychiatric function brought on by metabolic dysfunction in advanced liver failure. Severity was graded using West Haven Criteria, with grade 0 denoting abnormal psychometric findings, grade 1 denoting mild confusion, grade 2 denoting lethargy and moderate confusion, grade 3 denoting stupor with gross disorientation, and grade 4 denoting coma(5) .

Variceal bleeding is gastrointestinal bleeding characterized by abrupt bleeding from ruptured gastro-esophageal varices. Bleeding often occurs because of portal hypertension and is confirmed by endoscopy. Clinically patients present with hematemesis, melena, or both (6).

Hepato-renal syndrome is a rapid development of renal failure in patients with chronic liver disease with ascites as a complication. Classified into type 1 which presents as rapid onset often precipitated by infection, gastrointestinal bleeding, and large volume paracentesis whilst type 2 is spontaneous with slower progression in patients with refractory ascites(3) .

LIST OF ABBREVIATIONS AND ACRONYMS

ALT	Alanine Transaminase
AST	Aspartate aminotransferase
CPL	Central Pathology Lab
CPT	Child Pugh Turcotte
DLC	Decompensated Liver Cirrhosis
DALYs	Disability Adjusted Life Years
HE	Hepatic encephalopathy
INR	International Normalized Ratio
LVP	Large volume paracentesis
MELD	Model for End-stage Liver Disease
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
PT	Prothrombin Time
SBP	Spontaneous Bacterial Peritonitis
TACE	Transaerterial Chemoembolization
UGIB	Upper Gastro-intestinal bleeding
UTI	Urinary Tract Infection
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

1.1.1 The burden of decompensated liver cirrhosis

Cirrhosis of the liver is a long-term, progressive condition that represents the final stage of many chronic liver disease (7). Decompensated liver cirrhosis is the advanced stage of cirrhosis, where the liver can no longer perform its essential functions due to extensive scarring and damage(2). This stage is marked by the development of significant complications, such as Ascites, Hepatic encephalopathy, Variceal bleeding, Renal dysfunction (2)

The onset of liver decompensation is determined by the development of jaundice, ascites, variceal bleeding, or hepatic encephalopathy in patients with liver cirrhosis(8). Decompensated liver cirrhosis (DLC) develops in 11% of patients each year and is associated with a high mortality rate (one-year mortality in compensated cirrhosis is 7% compared to 20% following liver decompensation); This transition may be brought on by the progression of the underlying liver disease or by a superimposed acute insult (8).

Across the entire world, cirrhosis is one of the main causes of mortality and morbidity. In 2016, it was the 11^{th} greatest cause of mortality and the 15^{th} leading cause of morbidity, accounting for 2.2% of fatalities and 1.5% of disability-adjusted life years worldwide (9)

It also contributes significantly to morbidity due to complications and frequent readmissions shortly after discharge. Several studies have reported readmission rates of 20-37% within 1 month and up to 53% in 3 months (10).

Hospital readmission is often seen as an indirect indicator of the quality of healthcare delivery systems. Additionally, readmissions are linked to negative consequences for both patients and their families, and they contribute significantly to overall healthcare (11) .

Some of the socio-demographic factors like age and sex; clinical parameters like Hepatic encephalopathy, and Ascites, and laboratory parameters such as elevated International normalized ratio (INR), and low platelets counts are independently associated with readmission(10) .

Despite the high prevalence of risk factors for cirrhosis in Tanzania and cirrhotic-related complications, there is a paucity of data on the burden of 1-month and 3-month readmission rates and associated factors among patients with decompensated liver cirrhosis in our setting.

1.1.2 Pathophysiology of decompensated liver cirrhosis

Ascites development, gastric or esophageal varices formation and rupture, hepatic encephalopathy, and hepatorenal syndrome are all complications of cirrhosis, which are characterized by increased resistance to portal outflow as the main cause of the rise in portal pressure(2). Key pathomechanisms for acute decompensation have been identified as portal hypertension, hyperdynamic circulation, splanchnic and systemic vasodilation, and hypoxia(7).

1.1.3 The picture in the Tanzanian context

According to the most recent WHO statistics, which were published in 2021, the number of fatalities from liver disease in Tanzania reached 6,586, or 2.23% of all deaths, and it is presently ranked 13^{th} (12).

1.1.4 Therapeutic options & challenges in decompensated liver cirrhosis

The unpredictability of disease onset and the quick transition from acute decompensation to multiorgan failure in these patients highlights how complicated the disease is(13) Worldwide, doctors are perplexed by this syndrome's intricacy and heterogeneity, which creates a difficult patient management environment(13).

Liver transplants are the gold standard treatment for liver cirrhosis; however, they are not available in much of sub-Saharan Africa due to a huge shortage of liver donors, the logistics of transplantation, and the rarity of the entire process (14). Only South Africa has performed liver transplants up to this point due to the high costs, which are out of reach for practically all Sub-Saharan nations (14).

1.2. Problem Statement

According to the most recent WHO statistics, which were published in 2021, the number of fatalities from liver disease in Tanzania reached 6,586, or 2.23% of all deaths, and it is presently ranked 13th (12).

Individuals with cirrhosis who make it through their hospital stay have a high-risk period just after discharge, and the majority of them are readmitted within the first month. However, no study has been done to determine the burden of 1-month and 3-month readmission rates and its associated factors in patients with Decompensated liver cirrhosis in our setting.

1.3 Rationale

Our study aimed to determine the burden of readmission in patients with decompensated liver cirrhosis. And whether the severity of liver disease, the underlying cause of cirrhosis and complications during the initial hospitalization for decompensated cirrhosis can predict early (1-month) or late (3-month) readmissions. It will also explore any subtle differences in risk factor profiles between these two timeframes in our setting.

1.4 Conceptual Framework

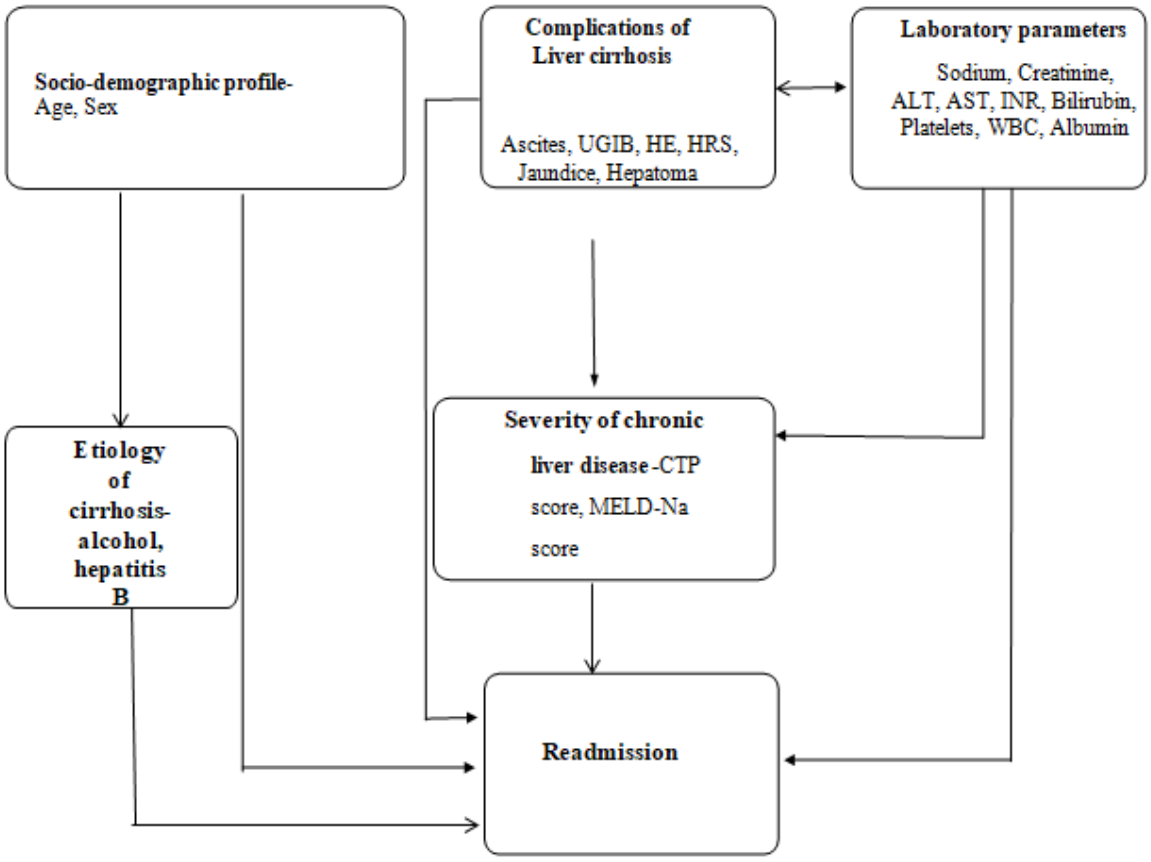


Figure 1: Conceptual Framework showing interactions of socio-demographic characteristics, etiology of cirrhosis, complications of liver cirrhosis, laboratory parameters, and severity of chronic liver disease towards readmission.

Explanation of the conceptual framework

Studies done on factors associated with 1-month and 3-month readmission among patients with decompensated liver cirrhosis have shown a strong correlation with demographic factors like (sex, whereby it was shown that males had more than one risk factor which predisposed them to frequent readmission and had chronic viral infections more than females.

Other factors included chronic alcohol use, chronic viral infection, obesity, previous schistosomiasis infection, and herbal use however if one had more than one risk factor patients decompensated earlier and presented with more than one complication which influenced readmissions and mortality overall. The strength of the association varies between studies due to geographical location, study design, and population.

These patients with co-existing risk factors and established chronic liver disease will decompensate over time due to the chronicity of the disease and present with either complication under the umbrella of DLC. The majority of the patients with DLC will present with ascites as part of the complications coexisting with other complications like variceal bleeding, hepatic encephalopathy, or infections. Ascites is the leading readmission cause in the majority of studies done and have contributed to the majority of future Spontaneous Bacterial Peritonitis (SBP).

The severity of the disease which includes CTP and MELD-Na score further contributes to morbidity and mortality among patients with Decompensated liver cirrhosis. CTP score includes both clinical complications such as HE and ascites and laboratory parameters such as INR, and Bilirubin. MELD-Na score includes creatinine, bilirubin, sodium, and INR. Those with Child-Pugh C had 35% reduced survival in 2 years after the onset of decompensation. Whereas those with a Model for End-Stage Liver disease (MELD) score >15 had higher rates of readmission and worse prognosis.

1.5 Research Question

1.5.1 Main question

What are the predictors of 1-month and 3-month readmission rates among patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital from August to November 2023?

1.5.2 Specific question

1. What is the 1-month readmission rate in patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital?
2. What is the 3-month readmission rate in patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital?
3. What are the predictors associated with 1-month readmission among patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital?
4. What are the predictors associated with 3-month readmission among patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital?

1.6. Objectives

1.6.1 Broad Objective

To determine the predictors of 1-month and 3-month readmission rate among patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital from August to November 2023.

1.6.2 Specific objectives

1. To determine the 1-month readmission rate among patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital.
2. To determine the 3-month readmission rate among patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital.
3. To determine the predictors associated with 1-month readmission among patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital.
4. To determine the predictors associated with 3-month readmission among patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital.

1.7. Study Hypothesis

Patients with decompensated liver cirrhosis have high readmission rates in the medical ward at Muhimbili National Hospital.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 1-month and 3-month readmission rate among patients with decompensated liver cirrhosis

Harish P et al, 2020 conducted a study on predictors of 1-month and 3-month hospital readmissions in decompensated cirrhosis and found that the 1-month readmission rate and 3-month readmission rate were 27.8% and 42.3% respectively and the MELD score at discharge together with serum sodium independently predicted the 1-month readmissions (15).

Sakkarin C et al, 2020 conducted a study on thirty-day readmissions and cost analysis in patients with decompensated cirrhosis and found that out of 134,038 patients hospitalized with cirrhosis, the overall 30-day readmission rate was 17%. Common causes of readmission consisted of complications of portal hypertension (47%) and infections (17%)(16) .

Xiaomei X et al, 2021 conducted a study on risk stratification scores to predict the readmission of patients with acute decompensated cirrhosis within 90 days. Among 956 patients, readmission rates were 24.58, 42.99, and 51.78%, at 30, 60, and 90 days, respectively. Bacterial infection was the main reason for index hospitalization and readmission(11) .

2.2 Factors associated with readmission among patients with decompensated liver cirrhosis

2.2.1 Socio-demographic characteristics of patients admitted with DLC

After decompensation sets in, frequent hospitalization (admissions and hospital stays) has an impact on patient's quality of life, and eventually, few patients undergo liver transplants, which are a more expensive choice for patients, the healthcare system, and the government. The following socio-demographic characteristics have been emphasized:

2.2.1.2 Sex

A study done by Patel R et al,2019 whilst evaluating predictors of 1-month and 3-month readmission in decompensated liver cirrhosis found that *male gender* (OR:2.19, p-0.008) and MELD score (OR:1.11, p-0.003), serum sodium (OR:0.94, p-0.027) independently predicted 3-months readmissions(17).

2.2.1.3 Age

In a study done by Sushil G et al. (2021) as they were assessing Incidence and predictors of 30-day hospital readmissions for liver cirrhosis from the United States National Readmissions Database, they found that compared with patients aged 18–44 years, patients in other age groups had lower odds of readmission, with the risk being the lowest among patients older than 84 years (OR, 0.51; 95% CI, 0.46–0.58; P<0.001)(18).

2.2.2 Etiology of the patients admitted with decompensated liver cirrhosis

2.2.2.1 Alcohol

In 2019 a study was done in Asia by Ruchir P; While evaluating 1-month and 3-month predictors of readmission found that alcohol consumption was the most prevalent etiology of chronic liver disease, accounting for 47.33% of patients (133/281) and 35.3% (28/78) were readmitted within 1 month(17).

Moreover, in 2020 a study done in the USA by Patel H while evaluating the risk factors for liver cirrhosis-related readmissions found that a history of alcohol use within a month before admission (55% vs. 33%, p=0.002) was identified risk factor by multivariate analysis(15).

2.2.2.2 Chronic Hepatitis

Also, a study by Harish Patel in 2020 that examined risk factors linked to an increase in readmissions in the USA discovered that about 6.33% of patients who were readmitted within 3 months had chronic hepatitis(15).

2.3 Laboratory findings in patients with decompensated liver cirrhosis

2.3.1 Elevated Liver Enzymes and Prolonged Prothrombin time (PT)

A study by Patel R et al, 2019, found that alanine aminotransferase (p= 0.001), aspartate aminotransferase (p= 0.021), and *higher INR levels* (INR > 1.3) were highly linked with 1-month readmission in patients with Decompensated cirrhosis(17).

2.3.2 Thrombocytopenia

Patel H and his colleagues 2020 evaluated risk Factors for Liver Cirrhosis-Related Readmissions in the United States and found that a lower platelet count at discharge (89,000 vs. 124,000, P = 0.003) was identified as risk factor for readmissions by multivariate analysis(15).

2.4 Presenting complications among patients with decompensated liver cirrhosis

2.4.1 Ascites

Ascites was the most common reason for admission, present in 95.3% of patients, according to a study conducted by Apica BS in 2013 on the frequency and clinical features of patients with decompensated cirrhosis in Uganda(19). Similar findings were made in Asia, where 27.05% had ascites followed by upper GI bleeding, renal failure, spontaneous bacterial peritonitis, and hepatic encephalopathy as the most frequent decompensation events that led to index hospitalization(17).

For people with mild to moderate ascites, a low-sodium diet and diuretic medication are the first lines of treatment. Spironolactone (50–100 mg/day) and furosemide (20–40 mg/day) are a good starting regimen for patients with normal renal function and can be increased as tolerated and by response. Electrolyte monitoring needs to be done with caution after starting a diuretic and for people with renal dysfunction. For tense ascites, a large-volume paracentesis is recommended, along with intravenous albumin replacement(20).

2.4.2 Variceal Bleeding

In addition, a study by Powell et al, 2019 indicated that the most often reported admission-related complications were gastro-esophageal hemorrhage (34.5%) and that 10.5% of these required endoscopic variceal ligations. Additional therapeutic options include secondary prophylaxis after variceal band ligation, a trans-jugular intrahepatic Porto-systemic shunt, and a combination of non-selective beta-blockers(21)(6)

In cirrhotic individuals, gastro-esophageal varices are responsible for 50% of gastrointestinal bleeding and are associated with significant mortality. To manage variceal bleeds, the mainstay is to start fluid resuscitation and blood product transfusion procedures (liberal versus restrictive). In a patient who is actively bleeding, INR > 1.5 seconds (fresh-frozen plasma), platelets $50*10^9$/L, and fibrinogen 1 g/L (cryoprecipitate) are indicated(22,23).

2.4.3 Infections

Infections are one of the frequent causes of hepatic decompensation in cirrhotic patients due to the immunosuppression present in these patients. The majority of these individuals are at risk for SBP, UTIs, pneumonia, and cellulitis, according to studies(24). Among those with SBP, one-third may not exhibit any symptoms, but some may exhibit encephalopathy, hypotension, fever, and stomach pain. After the sample has been collected for examination, if SBP is suspected, broad-spectrum antibiotics (cephalosporin or co-amoxiclav or quinolones) should be begun and adjusted according to sensitivities(24).

A study done in Thailand by Chirapongsathorn S et al, in 2020 found that for the 134,038 patients hospitalized with cirrhosis, the overall 30-day readmission rate was 17%. Common causes of readmission consisted of complications of portal hypertension (47%) and infections (17%). Among the infections, gastrointestinal infection and sepsis were the most common causes of infection(16).

2.4.4 Hepatic encephalopathy

In a study by Eric O et al, in 2019, they looked at Trends in Characteristics, Mortality, and other outcomes of patients with newly identified cirrhosis. They found that among those who had decompensation, 1613 (51.2%) had hepatic encephalopathy, and this finding was consistent across all age groups(25).

The primary course of treatment for HE entails correction of precipitants, such as infection, constipation, electrolyte disturbance (particularly hypokalemia), sedative drugs, and GI bleeding, as well as elimination of toxins using lactulose (either orally or via nasogastric tube, titrated to bowel frequency, aiming for 2-3 soft stools per day) and enemas, if necessary(26).

2.5 Severity of chronic liver disease

According to studies, Child-Pugh Turcotte (CPT) class affects readmission rates; patients with CPT class A had a lower readmission rate than those with CPT classes B and C. As seen in both Asia and the USA, those with CPT C had a poor prognosis and a higher rate of readmission, with a substantial link with early readmissions between 1 and 3 months after discharge(17) (27)

In 2013, Apica BS conducted a study to determine the prevalence and clinical characteristics of people with decompensated liver cirrhosis. The majority of the cirrhotic patients (72.9%) had Child-Pugh class C disease, while 23 (27.1%) had class B disease, implying that the majority had a 50% 5-year survival rate without transplantation(14).

A study by Na Li et al, 2024 evaluating risk factors for hospital readmission among patients with cirrhosis and ascites in China found that Patients with cirrhosis who have ascites are frequently hospitalized within 90 days after discharge. Lower hemoglobin or albumin and higher MELD-Na scores at discharge was the main risk factors for hospital readmission(28).

Moreover a study by Volk M et al, 2012 while evaluating the hospital readmissions it was determined that predictors of time to first re-admission included MELD score, serum sodium, and number of medications on discharge; predictors of hospitalization rate included these variables as well as the number of cirrhosis complications and being on the transplant list at discharge(29)

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

This was a prospective cohort study

3.2 Study Area

Muhimbili National Hospital is Tanzania's primary national referral hospital, university teaching hospital, and national reference laboratory. It is situated in Dar es Salaam and serves a populationof over 4 million people. With a 1400-bed capacity, it is without a doubt Tanzania's largest hospitalin terms of both facilities and staffing, seeing over 1000 outpatients and 1000 inpatients each week.The largest and wealthiest city in Tanzania, Dar es Salaam is situated on the East African coast and built around a sizable harbor of the Indian Ocean.

The internal medicine department is subdivided into 8 clinical units which span over 8 wards. With a bed capacity of more than 50 in each ward. The Gastro-hepatology unit is a subunit of Medical Ward in MNH which is a specialized facility running and serving a variety of services andtreatment to patients with gastroenterology and hepatology-related conditions from different referral hospitals in Tanzania regions. The gastroenterology unit has an allocation of 14 beds.

The internal medicine department of MNH receives on average approximately 20 to 25 admissions each day, out of which 3-5 patients are admitted with DLC in the gastro-hepatology unit.

3.3 Study period

The study was conducted over 4 months from August 2023 and November 2023, followed by 3-month follow-up until the end of February 2024.

3.4 Study population

Patients hospitalized with the diagnosis of decompensated liver cirrhosis.

3.5 Sampling technique

All patients admitted in the MNH medical wards specifically in the Gastro-hepatic unit were sequentially enrolled.

3.6 Inclusion criteria

- Patients admitted in the MNH medical wards aged 18 and above with Decompensated Liver Cirrhosis consented to participate in the study

NB: For patients with hepatic encephalopathy, written consent was sought from the next of kin on behalf.

3.7 Exclusion criteria

- Patients discharged against medical advice
- Patients who underwent liver transplantation or died during the index hospitalization
- Patients admitted for elective reasons (i.e. cirrhotic patient with hepatocellular carcinoma admitted for Transarterial chemoembolization (TACE) or those admitted for conditions unrelated to liver cirrhosis)

3.8 Sample size determination

Based on hospital records from MNH it is estimated out of 100 admissions in a month in the Gastro-hepatology unit, almost 50 patients who are admitted have DLC.

Harish P et al, 2019 conducted a study on predictors of 1-month and 3-month hospital readmissions in decompensated cirrhosis and found that the 1-month readmission rate and 3-month readmission rate were 27.8% and 42.3% respectively(17).

3.8.1 Sample size

The sample size required for this study was calculated by using the formula below:

n =N (Z2x p x (1-p)/e2)/(N-1+(Z2 x p (1-p)/e2)

Where;

n=minimum sample required

Z=SD at 1.96(CI of 95%)

p= proportion of patients with decompensated liver cirrhosis readmitted within 30-day follow-up was 0.278

e= margin of error 0.05

N= Total number of decompensated cirrhotic patients expected to be available in 120 days is 200

n=110

The sample size was 110

3.9 Study Variables

For this study, the following variables were used:

3.9.1 Dependent Variables

- 30 days readmission rate
- 90 days Readmission rate

3.9.2 Independent Variables

Social demographic characteristics:

- Age(years)
- Sex(Male or Female)
- Health insurance status
- Alcohol consumption

Clinical parameters:

- Ascites
- UGIB
- Hepatic Encephalopathy
- Hepato-renal syndrome
- Splenomegaly
- Tumor (Hepatoma)
- Child-Pugh score
- MELD-Na score

Laboratory parameters:

- WBC levels(k/µl)
- Hemoglobin levels(g/dl)
- Platelet levels(k/µl)
- Liver enzyme levels-ALT and AST in (U/L)
- Serum Albumin levels(g/L)
- INR
- Serology results for HIV, Hepatitis B and C(positive or negative)
- Total Bilirubin levels(µmol/L)
- Urea levels(g/dL)
- Creatinine levels(µmol/L)
- Serum Electrolytes-Sodium, Potassium, Chloride levels in mEq/L

3.10. Study Procedures

3.10.1 Recruitment

The Muhimbili-Mwaisela building was the study's catchment area (wards 3, 5, 7, and 8). The recruitment period for all admissions to the MNH's gastrointestinal and hepatology unit runs fromAug 2023 to November 2023. Admitting diagnosis from EMD was first confirmed by the attending physician in the medical ward. After consenting to participate; the socio-demographic, clinical, andinvestigation profile was gathered during the admission period and not at discharge.Patients with suspected liver disease who had laboratory and radiographic indicators of cirrhosis, such as low serum albumin or low platelet count, as well as radiographic signs of cirrhosis, such as nodular surface of the liver, heterogeneity of the liver parenchyma, or liver atrophy, was assessed for decompensation features such as ascites, jaundice, upper GI bleeding or hepatic encephalopathy.

3.10.2 Follow up

Each recruited participant was followed up from discharge. Follow-up was conducted via phone calls at 30 days and 90 days post-discharge. Both patient's and next of kin’s mobile phone numbers were sought during recruitment and interviews. Details extracted during follow-up included whether the patient was readmitted after the index admission (including those at other health facilities apart from MNH) and reasons for readmission.

For this study, if a patient had more than one readmission within 30 days or 90 days of the initial discharge, only the first episode of readmission was included in the final analysis. Participant wasdeemed lost to follow-up if both patients’ phone and that of next of kin(s) were unreachable at three consecutive attempts within 30 days. Patients with incomplete follow-up, death during indexadmission, those admitted for elective procedures, or those with >30% missing data were not included inthe final analysis.

3.10.3 Definition of terms

- **Decompensated Liver Cirrhosis** was defined by the presence of either ascites, hepatic encephalopathy, jaundice, or variceal bleeding together with supporting laboratory (low serum albumin, or deranged liver enzymes) and radiographic images from either Abdominal Ultrasound, CT scan, or MRI (nodular surface of the liver, heterogeneity of liver parenchyma or liver atrophy)
- **The 1-month readmission rate** was defined as the percentage of admitted patients who return to the hospital within 30 days post-discharge with conditions related to decompensated liver cirrhosis.
- **The 3-month readmission rate** was defined as the percentage of admitted patients who return to the hospital within 90 days post-discharge with conditions related to decompensated liver cirrhosis.
- **Ascites** was defined as the presence of excessive fluid in the peritoneal cavity and will be graded as mild, moderate, or severe based on the criteria of the International Ascites club(20)
    - ✓ **Mild-** detected by ultrasound
    - ✓ **Moderate**- Moderate symmetrical distension of the abdomen
    - ✓ **Severe**- Large or gross ascites with marked abdominal distension
- **Hepatic encephalopathy** will be defined by the detection of mental status or neuropsychiatric abnormalities in the presence of liver cirrhosis after exclusion of other causes. Level of consciousness as described by West Haven criteria (5);
    - ✓ grade 0 = no clinical manifestation but some abnormalities on psychometric testing
    - ✓ grade 1 = mild confusion, slurred speech, disordered sleep
    - ✓ grade 2 = lethargy, moderate confusion
    - ✓ grade 3 = stupor, incoherent speech, sleeping
    - ✓ grade 4 = coma, unresponsiveness

      NB: Patients with asterixis only were classified as having grade 1 encephalopathy.

- **The presence of esophageal varices** was confirmed by endoscopy in some patients who presented with UGIB and graded according to the classification advocated by Beppu et al; (grade 1= small and straight, grade 2 = moderately sized, tortuous, and occupying less than one-third of the esophageal lumen or grade 3= large, coiled and occupying one third or more of the lumen). In the remaining patients, abdominal collaterals with ascites plus hematemesis and or melena were construed as variceal bleeding(30)

- **The presence of Renal failure** was defined as Serum creatinine > 1.5 mg/dL or a rise in serum creatinine > 0.3 mg/dL from the baseline in patients with ascites(3).

NB; In the presence of more than one complication in one patient, the principal cause of hospitalization was defined as the following: Patients with renal failure in the presence of ascites were considered in the renal failure group. Likewise, admissions with HE in the presence of precipitating factors like GI bleed, SBP, or renal failure were attributed to the respective precipitating factor. SBP in the presence of GI bleed or renal failure was taken as SBP(17).

- **The severity of liver disease** was determined using the **Child-Pugh score and MELD-Na score**
    - **Child-Pugh Score** involves the evaluation of 5 parameters including ascites, encephalopathy, serum bilirubin, serum albumin, and International Normalized Ratio. It's a validated score for predicting all-cause mortality risk and the development of other complications (28). Classification was
        - **Child-Pugh A-**5-6 points (good hepatic function)
        - **Child-Pugh B-**7-9 points (moderately impaired hepatic function)
        - **Child-Pugh C-**10-15 points (advanced hepatic dysfunction)

- **MELD-Na score (Model for End-stage Liver Disease Sodium** score is a validated prognostic scoring system based on laboratory parameters used to predict 3-month mortality due to liver disease. The score ranges from 6 to 40; the higher the score the higher the 3-month mortality related to liver disease(1)
  .

SCORE	90-days mortality (%)
✓ ≥ 40	71.3
✓ 30-39	52.6
✓ 20-29	19.6
✓ 10-19	6
✓ ≤ 9	1.9

3.11. Data Collection Process

3.11.1 Data Collection Tool

All participants were entered into the study following informed consent.

A standard structured questionnaire in English was used as a research tool. It consisted of five Sections:

1. The first section was on socio-demographic information (name, sex, date, age, permanent address, marital status, occupation, insurance status, smoking, alcohol use, and date of enrollment in the study).
2. The second section had questions regarding the clinical profile and complications of Liver cirrhosis which included Ascites, UGIB, HE, HRS, etc.
3. The third section was on laboratory investigation results (FBP, AST, ALT, Albumin, Total Bilirubin, Creatinine, Urea, Sodium, Potassium, INR). These investigations were done upon index admission. The results were then obtained from the JEEVA system by the principal investigator.
4. The fourth section was on diagnostic confirmation which was subdivided into two sections- radiographic findings and histology findings

5. The last section included in-hospital outcome, 30 days and 90 days of follow-up period if the patient was readmitted, survived, lost to follow up or passed away.
   Data was collected by the principal investigator and trained research assistant.
   CTP Score and MELD-Na score were calculated for all study participants. Patients werethen followed up to 90 days post discharge to assess for readmissions.

3.12. Data processing and analysis

Data was coded and entered into Microsoft Excel spreadsheet. For analysis, it was then cleaned and imported into STATA Version 15.1. Appropriate tables and frequencies were produced for all variables. Demographic data was reported as median with inter-quartile ranges or number and percentage for categorical variables. Continuous variables such as age, laboratory parameters such as (liver enzymes, serum albumin levels, coagulation profile, renal function tests) were compared using Kruskal Wallis test and categorical variables such as sex, serology results for HIV, Hepatitis B or C, Physical findings and Severity scores (CPT Score and MELD-Na score) using chi-squared test and fisher exact test.

Modified Poisson regression was employed in the determination of factors associated with readmission within 1- and 3-months post discharge. Factors with a p-value of less than 0.2 on bivariate analyses were then included in multivariate model. Factors with p-value of < 0.05 were considered independently associated with readmission.

The first admission during the study period was considered as the index admission. Incidence of readmission at 1-month and 3-months was calculated as percentage of total eligible readmissions after index admission within the follow up period.

3.13 Ethical Consideration

Ethical clearance was sought from the MUHAS Institutional Review Board and permission was soughtfrom MNH ethical committees/authorities with reference number MUHAS-REC-06-2023-1771. Written informed consent was sought from the participants or their guardians in case the patient was unable to, before recruitment into the study. Recruited study participants were informed of the study objectives as well as their right to participate, withdraw from the study at any time, or not participate at all. During the study period, participants were informed that there would be no compensation offered in exchange for their participation in the study. All study procedures were conducted by the principlesof privacy and confidentiality.

CHAPTER FOUR

4.0 RESULTS

A total of 143 patients were admitted with Decompensated Liver cirrhosis at Muhimbili National Hospital. Among these, 33 patients were excluded (14 died during index admission, 12 were lost to follow up and 7 had missing data). A total of 110 participants were included in the final analysis.

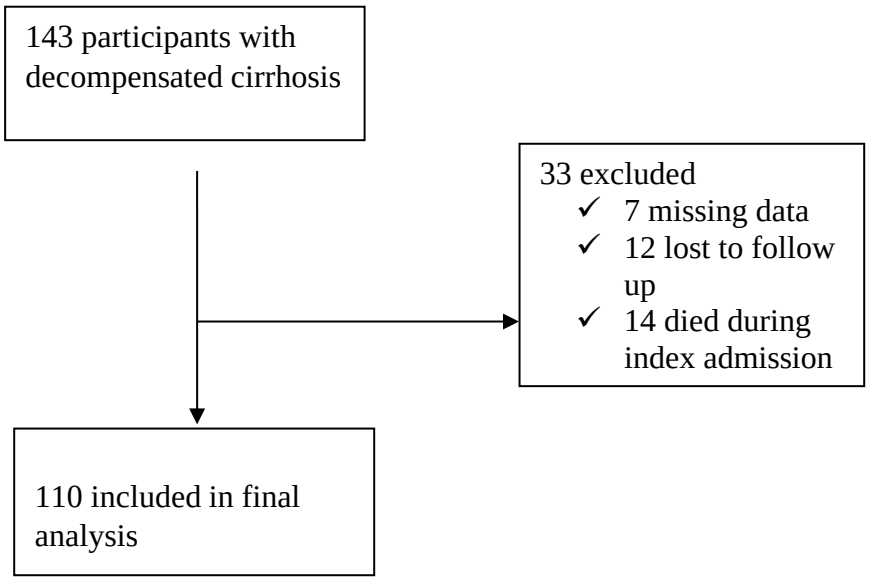


Figure 2: Consort diagram showing flow of participants.

4.1. Index Hospitalization

A total of 110 patients hospitalized with decompensated chronic liver disease with a median age of 44.5, IQR [36-59] years were included in the study analysis. The majority of the patients were male (71.8%) and 60.9% were married 53.6% were from rural residences and had attained primary education and below(72.7%). Of these, the predominant etiology of chronic liver disease was alcohol found in 38.2% of patients, followed by co-existence of alcohol and hepatitis B (23.6%), then hepatitis B only (20.9%). While, the most common decompensating event responsible for index hospitalization was volume overload/ascites (68.2%) followed by upper GI bleed (66.4%), Hepatocellular carcinoma(44.6%), renal failure(26.4%), and hepatic encephalopathy(13.6%). About 66.4% of the patients presented with 2 complications at index hospitalization. Length of hospital stay had a median time of 6, IQR [4-9] days, and average MELD-Na score at index admission had a median score of 23, IQR [17-30]. Demographic, biochemical, and etiological characteristics of the study participants are outlined in Table 1.

Table 1: Social-demographic and clinical profile of patients with decompensated liver cirrhosis admitted in the Gastro-hepatology unit at Muhimbili National Hospital at Index admission

VARIABLE	FREQUENCY, N	Median (IQR)/ PERCENT (%)
i. Continuous variables		
Age in years	44.5	36-59
Length of hospital stay (days)	6	4-9
White Blood Count (k/µl)	7.96	3.99-11.98
Hemoglobin (k/µl)	9.11	6.77-11.59
Platelets (k/µl)	170.7	74.7-274.5
ALT (U/L)	41.28	23.47-82.0
AST (U/L)	99.5	49-210.0
Sodium (mEq/L)	132.0	128.0-136.0
Potassium (mEq/L)	4.1	3.6-4.5
Urea (g/dL)	5.65	3.9-10.0
Creatinine (µmol/L)	81.7	60.4-127.3
Total Bilirubin (µmol/L)	32.95	16.5-98.8
INR	1.55	1.32-1.95
Serum Albumin (g/L)	28	22-31
CPT score	10	9-11
MELD-Na score	23	17-30
(ii) Categorical variables		
Sex		
Female	31	28.2
Male	79	71.8
Residence		
Rural	59	53.6
Urban	51	46.4
Marital status		
Married	67	60.9
Unmarried	43	39.1
Education level		
Primary and below	80	72.7
Secondary and above	30	27.3
Occupation		
Civil servant	12	10.9
Self-employed	90	81.8
Retired	6	5.5
Not employed	2	1.8

Health insurance status		
Not insured	98	89.1
Insured	12	10.9
Cigarette smoking		
No	89	80.9
Yes	21	19.1
IV drug use/ history of tattooing		
No	103	93.6
Yes	7	6.4
Risk factors		
Alcohol	42	38.2
Alcohol + HBV	26	23.6
HBV	23	20.9
Alcohol + HCV	5	4.6
HCV	2	1.8
Unknown	12	10.9
Complications of Liver Cirrhosis		
Jaundice		
No	43	39.1
Yes	67	60.9
Splenomegaly		
No	59	53.6
Yes	51	46.4
HRS		
No	81	73.6
Yes	29	26.4
Ascites		
No	35	31.8
Yes	75	68.2
UGIB		
No	37	33.6
Yes	73	66.4
Tumor (Hepatoma)		
No	61	55.4
Yes	49	44.6
HE		
No	95	86.4
Yes	15	13.6
Number of Complications		
1	8	7.27
2	73	66.37
3	29	26.36
TOTAL	**110**	**100**

4.1.2 Readmission Rates

Overall, cumulative incidence of readmission rates at 1 and 3 months were 20.9% (23/110) and 30.9% (34/110) respectively after discharge.

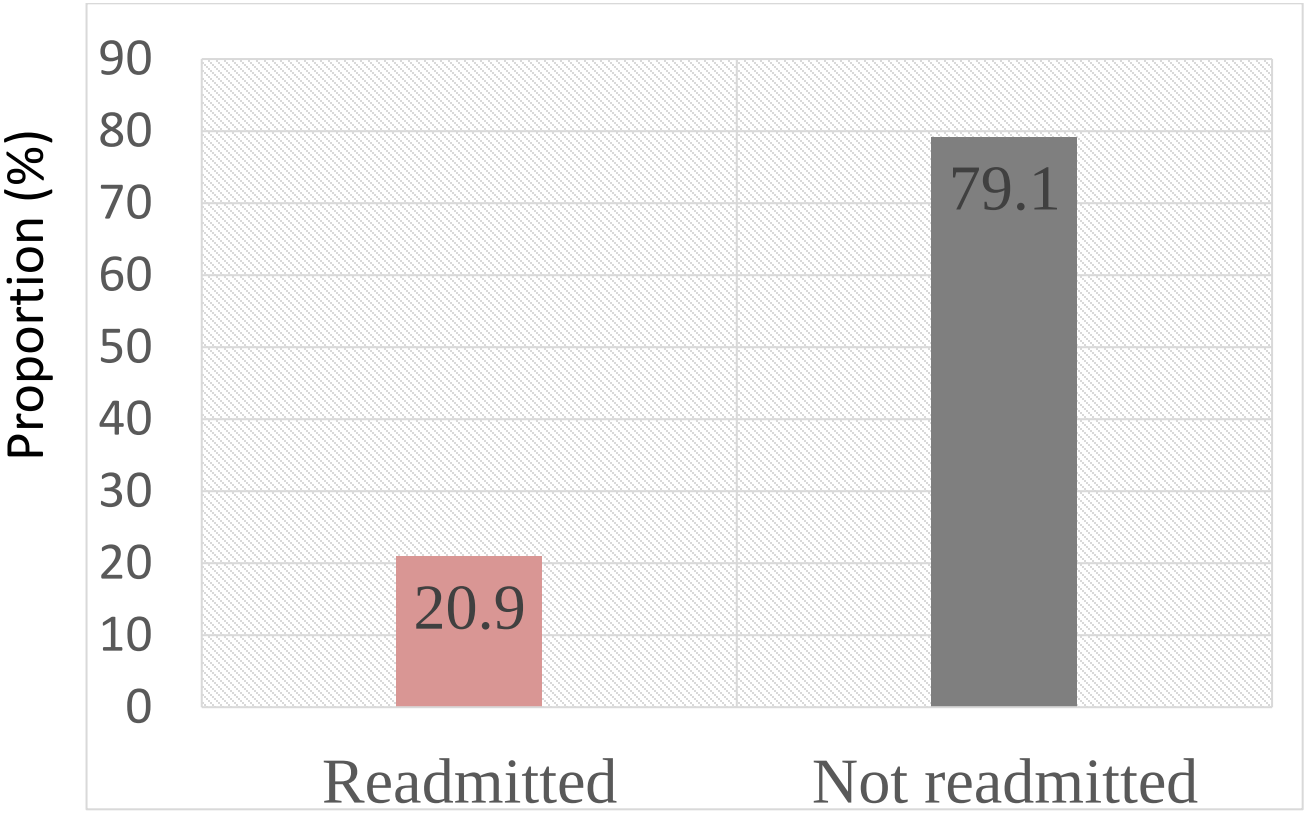


Figure 3: The 1-month readmission rate among patients with decompensated liver cirrhosis admitted in Gastro-hepatology unit at Muhimbili National Hospital.

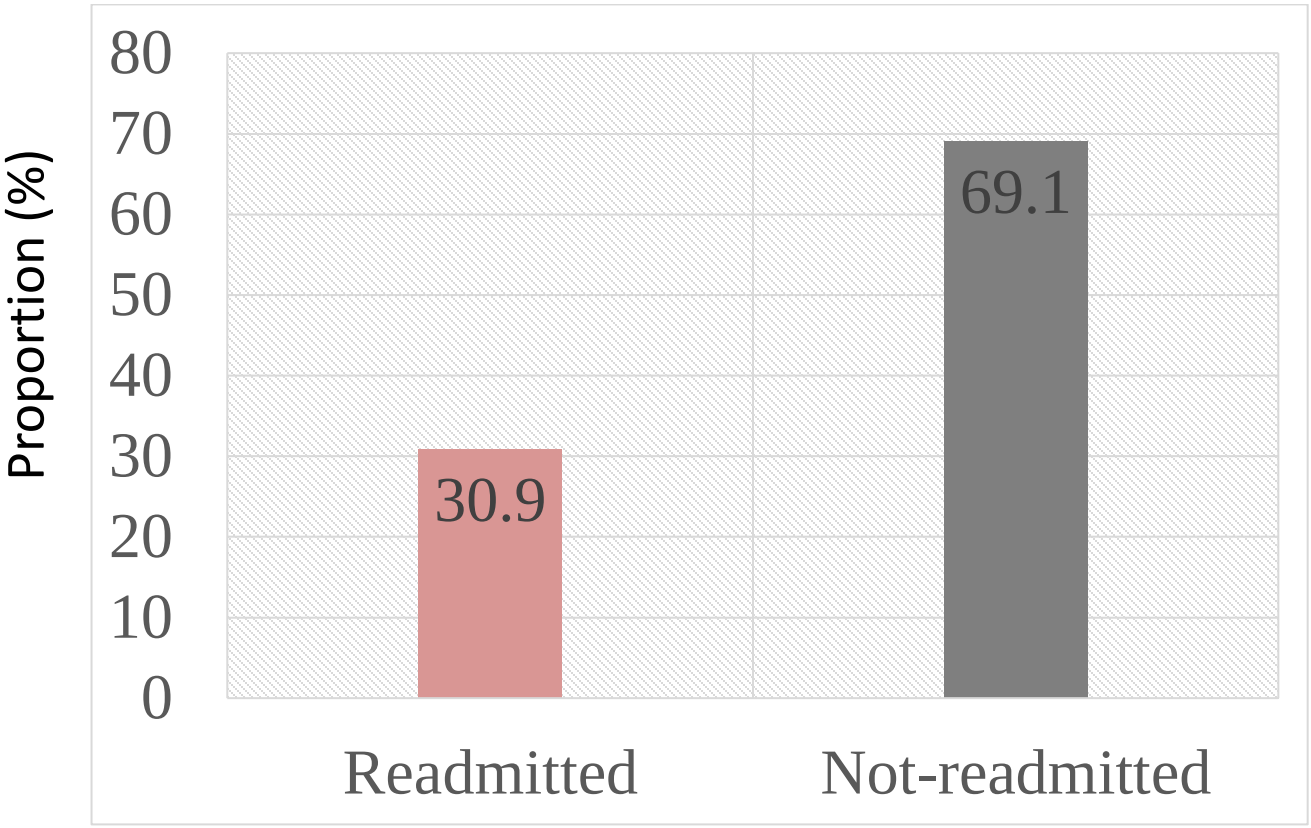


Figure 4: The 3-month readmission rate among patients with decompensated liver cirrhosis admitted in Gastro-hepatology unit at Muhimbili National Hospital.

Of the reported reasons for readmission during the study period; the majority presented with ascites (29.5%), followed by UGIB (26.5%). Other reported reasons were anemia (5.9%) and the rest had more than one reason.

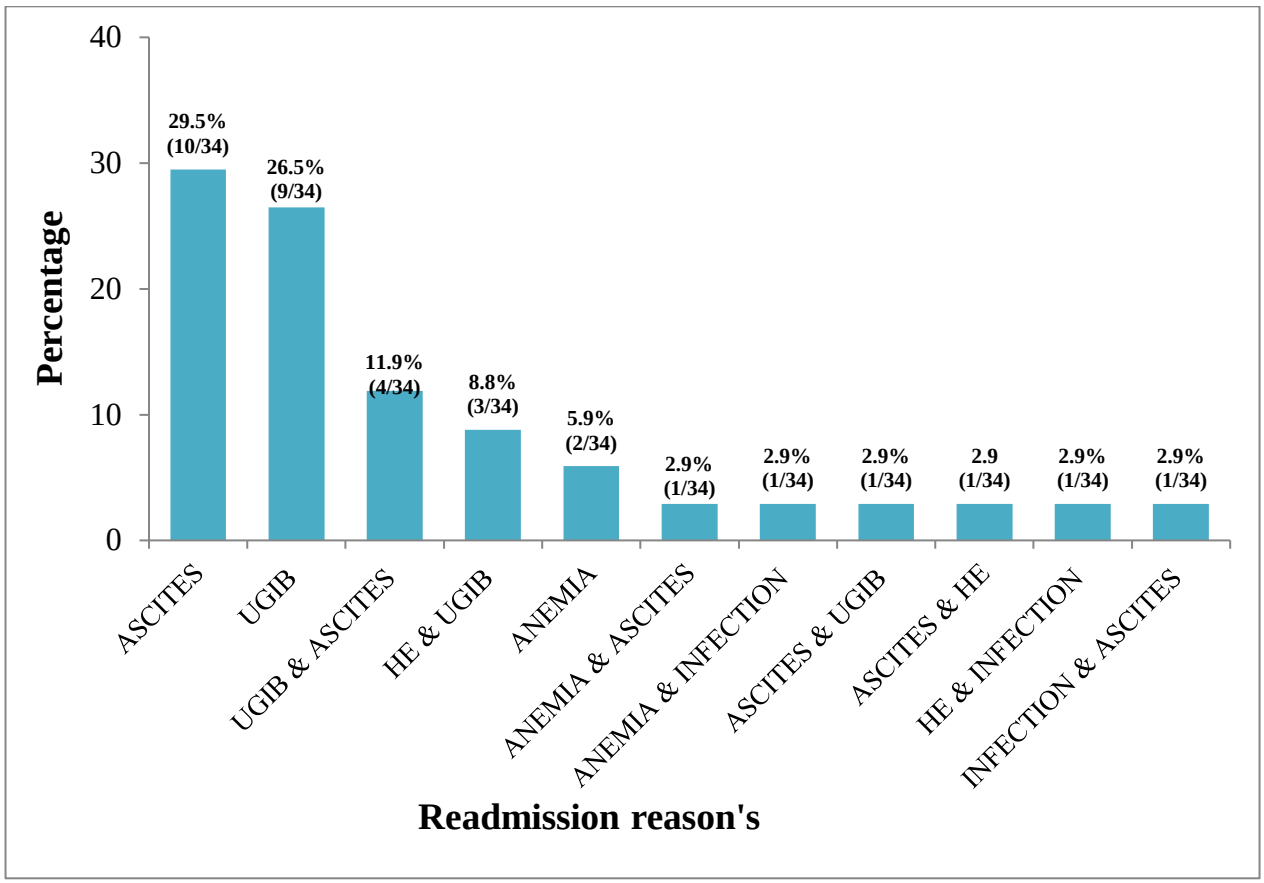


Figure 5: Reason of readmission after index hospitalization among patients with decompensated liver cirrhosis admitted in Gastro-hepatology unit at Muhimbili National Hospital.

4.1.3 Factors Associated with readmissions within 1 month

Among the socio-demographic and clinical factors, Splenomegaly (p=0.041) was found to be associated with readmission within 1 month.

Among the laboratory parameters, Platelets (p=0.0029) and MELD-Na score (p=0.0134) was found to be associated with readmission within 1 month.

Table 2: Socio-demographic and clinical factors associated with readmission within 1 month

	READMISSION STATUS (1 month)		**p-value**
FACTOR	**No, Median(IQR)**	**Yes, Median(IQR)**	
i) Continuous variables			
Age in Years	44(36-59)	47(38-59)	0.8512
Length of hospital stay (days)	6(4-9)	5(4-10)	0.7396
White Blood Count (k/µl)	9.16(6.29-11.61)	8.83(7.24-11.23)	0.8283
Hemoglobin (k/µl)	8.33(4.34-12.09)	6.79(2.61-9.65)	0.1107
Platelets (k/µl)	181.3(79.82-287.3)	84.99(39.59-201.3)	0.0029
ALT (U/L)	44(27.77-94.26)	30(23-66)	0.1592
AST (U/L)	108.3(49-237)	79(64-158)	0.3052
Sodium (mEq/L)	132(129-136)	129(126-136)	0.0789
Urea (g/dL)	5.6(3.9-10)	6(3.5-10.6)	0.8255
Creatinine (µmol/L)	81.6(60.1-117.7)	81.8(60.8-194.6)	0.4578
Total Bilirubin (µmol/L)	30(15.4-105.4)	51.8(25.9-88.5)	0.1560
INR	1.55(1.28-1.95)	1.56(1.38-1.97)	0.7214
Serum Albumin (g/L)	28(22-31)	27(21-30)	0.3383
CPT score	10(9-11)	10(9-11)	0.1839
MELD -Na score	21(15-26)	26(19-33)	0.0134
OVERALL			

i) Categorical variables

FACTOR	**N(Total)**	**No,n(%)**	**Yes,n(%)**	**p-value**
Sex				0.787
Female	31	24(77.4)	7(22.6)	
Male	79	63(79.7)	16(20.3)	
Health insurance status				0.712
Not insured	98	78(79.6)	20(20.4)	
Insured	12	9(75.0)	3(25.0)	

Cause of Cirrhosis				0.643
Alcohol	42	31(73.8)	11(26.2)	
HBV	23	18(78.3)	5(2.7)	
HCV	2	1(50)	1(50)	
Alcohol + HBV	26	22(84.6)	4(15.4)	
Alcohol + HCV	5	49(80)	1(20)	
Unknown	12	11(91.7)	1(8.3)	
Complications of Cirrhosis				
Splenomegaly				**0.041**
No	59	51(86.4)	8 (13.6)	
Yes	51	36(70.6)	15(29.4)	
HRS				0.618
No	81	65(80.3)	16(19.7)	
Yes	29	22(75.9)	7(24.1)	
Ascites				0.731
No	35	27(77.1)	8(22.9)	
Yes	75	60(80.0)	15(20)	
UGIB				0.896
No	37	29(78.4)	8(21.6)	
Yes	73	58(79.5)	15(20.5)	
Tumor (Hepatoma)				0.557
No	61	47(77.1)	14(22.9)	
Yes	49	40(81.6)	9(18.4)	
HE				1.000
No	95	75(78.9)	20(21.1)	
Yes	15	12(80.0)	3(20.0)	
Complication				0.425
≤2	81	62(76.5)	19(23.5)	
>2	29	25(86.2)	4(13.8)	
OVERALL	**110**	**87 (79.1)**	**23 (20.9)**	

4.1.3.1 Modified Poisson regression for factors associated with Readmission within 1 month.

Bivariate and Multivariate analysis to identify independent determinants of readmissions within 1 month was done using Modified Poisson Regression analysis. Factors that were shown to be significantly associated with a higher risk of readmission by bivariate analysis were included in the regression model. Multivariate analysis showed that a unit increase of MELD-Na score among patients with Decompensated liver cirrhosis increases the relative risk of being readmitted by 1.06.

Table 3: Modified Poisson regression for factors associated with readmission within 1 month.

		Bi-variable Robust Poisson Regression		Multi-variable Robust Poisson Regression	
VARIABLE	**Readmitted, n (%)**	**RR (95%CI)**	***p*-value**	**RR (95%CI)**	***p*-value**
Platelets	23(20.9)	0.99(0.99-1.00)	0.013	1.00(0.99-1.00)	0.074
ALT	23(20.9)	0.99(0.98-1.00)	0.094	0.99(0.98-1.00)	0.120
Sodium	23(20.9)	0.95(0.90-1.01)	0.100	0.97(0.89-1.05)	0.461
Bilirubin	23(20.9)	1.00(1.00-1.01)	0.770	1.00(1.00-1.00)	0.688
CPT score	23(20.9)	1.14(0.93-1.39)	0.196	1.07(0.85-1.34)	0.586
MELD-Na score	23(20.9)	1.06(1.01-1.11)	0.010	1.06(1.01-1.11)	0.029
Splenomegaly					
No	8(13.6)	Ref		Ref	
Yes	15(29.4)	2.17(1.00-4.71)	0.050	1.26(0.59-2.67)	0.547

***RR is Relative Risk**

4.1.4 Factors Associated with Readmissions within 3 months.

Among the socio-demographic and clinical factors, Splenomegaly (p=0.030) was found to be associated with readmission within 3 months.

Among the laboratory parameters, Platelets (p=0.0032) and MELD-Na score (p=0.0361) was found to be associated with readmission within 3 months.

Table 4: Socio-demographic and clinical factors associated with readmission within 3 months.

	READMISSION STATUS (3 months)		
VARIABLE	**No, Median (IQR)**	**Yes, Median (IQR)**	***p*-value**
i) Continuous variables			
Age in years	45(37-59)	41(36-56)	0.6039
Length of hospital stay (days)	6(5-10)	5(4-9)	0.4393
White Blood Count (k/µl)	8.22(4.2-11.72)	7.32(3.24-11.98)	0.7841
Hemoglobin (k/µl)	9.28(6.86-11.59)	8.59(6.04-11.23)	0.4771
Platelets (k/µl)	194.4(84.92-296.1)	93.0(43.43-201.3)	0.0032
ALT (U/L)	48.0(27.77-101.0)	32.0(23.0-53.39)	0.0663
AST (U/L)	123.0(47.0-237.0)	79(62.0-158.0)	0.2313
Sodium (mEq/L)	133.0(129.0-135.0)	130.0(127.0-136.0)	0.2367
Urea (g/dL)	5.7(3.9-10.0)	5.6(3.5-7.7)	0.4791
Creatinine (µmol/L)	82.6(60.4-117.7)	80.6(60.8-154.6)	0.9272
Total Bilirubin (µmol/L)	30.0(16.5-90.7)	42.0(24.1-98.8)	0.3214
INR	1.6(1.34-1.95)	1.48(1.32-1.82)	0.4730
Serum Albumin (g/L)	28.0(22.0-31.0)	27.0(22.0-30.0)	0.5411
CPT score	10(9-11)	10(9-11)	0.3231
MELD-Na score	21.0(16.0-26.0)	25.0(18.0-31.0)	0.0361
TOTAL			

ii) Categorical Variables

FACTOR	**N(Total)**	**No,n(%)**	**Yes,n(%)**	**p-value**
Sex				0.848
Female	31	21 (67.7)	10 (32.3)	
Male	79	55 (69.6)	24 (30.4)	
Health insurance status				0.847
Not insured	98	68 (69.4)	30 (30.6)	
Insured	12	8 (66.7)	4 (33.3)	

Causes of cirrhosis				0.488
Alcohol	42	27(64.3)	15(35.7)	
HBV	23	16(69.6)	7(30.4)	
HCV	2	1(50.0)	1(50.0)	
Alcohol + HBV	26	18(69.2)	8(30.8)	
Alcohol + HCV	5	3(60.0)	2(40.0)	
Unknown	12	11(91.7)	1(8.3)	
Complications of Cirrhosis				
Splenomegaly				**0.030**
No	59	46(78.0)	13(22.0)	
Yes	51	30(58.8)	21(41.2)	
HRS				0.986
No	81	56 (69.1)	25 (30.9)	
Yes	29	20 (69.0)	9 (31.0)	
Ascites				0.717
No	35	25 (71.4)	10 (28.6)	
Yes	75	51 (68.0)	24 (32.0)	
UGIB				0.287
No	37	28 (75.7)	9 (24.3)	
Yes	73	48 (65.8)	25 (34.2)	
Tumor (Hepatoma)				0.634
No	61	41 (67.2)	20 (32.8)	
Yes	49	35 (71.4)	14 (28.6)	
HE				0.325
No	95	64 (67.4)	31 (32.6)	
Yes	15	12 (80.0)	3 (20.0)	
Number of Complications				0.986
≤2	81	56 (69.1)	25 (30.9)	
>2	29	20 (69.0)	9 (31.0)	
TOTAL	**110**	**76 (69.1)**	**34 (30.9)**	

4.1.4.1 Modified Poisson regression for factors associated with Readmission within 3 months

Bivariate and Multivariate analysis to identify independent determinants of readmissions within 3 months was done using Modified Poisson Regression analysis. Factors that were shown to be significantly associated with a higher risk of readmission by bivariate analysis were included in the regression model. Multivariate analysis showed that a unit increase of MELD-Na score and unit decrease of platelets count among patients with Decompensated liver cirrhosis increases the relative risk of being readmitted by 1.05 and 0.98 respectively.

Table 5: Modified Poisson regression for factors associated with readmission within 3 months.

VARIABLE	Readmitted, n (%)	Bivariable Robust Poisson Regression		Multivariable Robust Poisson Regression	
		RR (95%CI)	*p*-value	RR (95%CI)	*p*-value
Platelets	34(30.9)	0.96(0.98-0.99)	0.005	0.98(0.97-0.99)	**0.023**
ALT	34(30.9)	1.00(0.99-1.01)	0.519	1.00(0.99-1.01)	0.684
MELD-Na score	34(30.9)	1.04(1.01-1.08)	0.014	1.05(1.01-1.08)	**0.006**
Splenomegaly					
No	13(22.0)	Ref		Ref	
Yes	21(41.2)	1.87(1.04-3.35)	0.036	1.39(0.75-2.56)	0.298

***RR is Relative Risk**

CHAPTER FIVE

5.0 DISCUSSION

Chronic and potentially fatal liver cirrhosis is characterized by the liver's tissue becoming permanently scarred. Due to the numerous complications brought on by the disease, patients with liver cirrhosis are more likely to be readmitted post-discharge. For better patient outcomes and lower healthcare costs, it is crucial to identify the variables linked with readmissions among patients with liver cirrhosis. In this study, we report the clinical attributes and factors associated with readmissions among patients with liver cirrhosis.

The median age of participants in this study was 44.5 years with IQR[36-59]. Comparable studies done in other parts of India have reported similar findings (1). However, compared to this study, other studies carried out in Western and European nations had a higher median age(28,29)

Most patients in this study were male contributing to two-thirds of the participants. Similar male predominance was reported by Laveker A. et al, 2019. Men's participation in activities that expose them to risk factors for liver cirrhosis, like alcoholism and intravenous drug abuse, could be one explanation for this(1).

Ascites was the most common cirrhosis complication present in 68.8% of the participants, which is consistent with numerous studies. Ascites was found to be the most common presentation seen in 54% of the patients in a 2017 study by Volk M et al in the USA (29,31). The high prevalence of ascites in both these studies may be a result of the subpar environmental health-seeking behavior. Other complications of cirrhosis were UGIB (66.4%), Jaundice (60.9%), and Hepatic encephalopathy (13.6%). Other studies revealed a comparable clinical presentation pattern(17).

The readmission rate within 1 month and 3 months was 20.9% and 30.9%. Comparable findings of 1-month readmission rates were reported in Thailand and USA(16,31). However, some studies in the Western world and Asia have shown relatively higher readmission rates at 90 days comparatively to our study and this could be explained by age distribution in Western and Asia whereby the majority of participants were aged above 50yrs which puts them at higher risk of readmission compounded with the aging process and advanced hepatic dysfunction. This wasn’t

thecase in our study as almost 60% were aged 50 and below. The rates reported from these related studies were higher than those in our study because both studies were conducted at an academic hospital that served as a referral center with a large catchment area(16,31).

Determining the factors associated with readmission among patients admitted with decompensatedliver cirrhosis was the main focus of the study. It identified a higher MELD-Na score to be independently associated with readmission within 1 and 3 months, this was reported in similar studies in the USA and Asia countries as they identified a cut of more than 15 best-predicted readmissions within 1 month (29,32,33).

MELD-Na score has been validated for multiple outcomes in cirrhosis ranging from acute liver failure to prediction of preoperative mortality in other surgical-related procedures, prognosis andtreatment of acute on chronic liver failure, and alcoholic hepatitis (30). The MELD-Na score has been identified as an independent risk factor for readmission in multiple studies;(18,29) this score reflects the severity of liver disease and the patient's overall prognosis. The MELD-Na score is often used to prioritize candidates for liver transplantation, which inherently poses a greater risk of complications requiring readmission.

Thrombocytopenia was independently associated with readmission within 3 months, these findings were similar to those reported in the USA and India(1,15).The pathophysiology of thrombocytopenia in chronic liver disease could be explained by decreased production or increaseddestruction of thrombocytes and splenic sequestration. Severe thrombocytopenia complicates the management of patients with liver disease by increasing the potential risk of bleeding for invasiveprocedures, possibly delaying lifesaving interventions (35). In our study, two-thirds of those who were readmitted had splenomegaly at index admission which could explain the platelets sequestration.

Clinical experience suggests that complications like renal failure or Hepatic encephalopathy are more recurrent than others within one month post-discharge but the majority were readmitted because of overload symptoms. Similarly, the etiology of cirrhosis didn't influence readmission rates, even though very high readmission rates were noted in alcoholic liver disease. Nevertheless, of the CTP score being an index of cirrhosis severity, the CTP score didn't appear as a potential risk factor related to readmission.

CHAPTER SIX

6.0 BIASES AND LIMITATIONS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Biases and Limitations

The sample size wasn't powered based on risk factors but rather readmission rates and thus a larger cohort could have added greater statistical power. This study was conducted in a single tertiary center; hence the results may not be generalizable to other populations or settings.

Some factors and complications include adherence to medications, follow-up to clinic visits as scheduled, number of medications at discharge, and duration of the disease process which would have added more weightage to readmission assessment weren't assessed in this study but can be addressed in future studies.

Identifying the specific complications and progression of the disease that led to readmissions was challenging due to logistics as the majority were from rural residences and relied mostly on what was reported by the patient or caregiver.

6.2 Conclusions

Our study found a comparable burden of readmission with existing literature from other countries. This is a cause of concern and highlights the need for effective management strategies to improve patient outcomes. The identification of MELD-Na score and Platelet count as factors associated with readmission provides valuable insight into the risk factors for poor outcomes in liver cirrhosis patients.

6.3 Recommendations

1. These findings suggest the utilization of the MELD-Na score in our clinical practicein identifying those with the likelihood of being readmitted to improve their outcomes.

2. Future research with a larger sample size can focus on evaluating the best cut-off of MELD-Nascore and Platelets counts for readmission in our setting and exploring other risk factors like medication adherence, and the number of medications at discharge to improve outcomes in livercirrhosis patients.

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Appendix 1-Questionnaire

ID No:_____ Phone No 1 : _____ Phone No 2: _____

Section A-Socio-demographic characteristics

1. Age: ____

2. Sex: □ M □ F Weight-……. Height-……

3. Admission date: _____

4. Residence: □ Urban □ Rural

5. Marital status: □ Single □ Married □ Divorced □ Widowed

6. Religion: □ Christian □Muslim □others……..

7. Educational status:□Informal □Primary □Secondary □Tertiary □unable to read and write

8. Work status: Civil servant □Self-employed□ Retired □No work

9. Insurance status: □Yes □ No

10. Cigarette Smoking history: □Yes □No Duration in pack years……..

11. Herbal medication use history: □Yes □No

12. Alcohol use history: □Active alcoholic For Yes, duration in units/week…… □Inactive alcoholic □Denied

Section B-Clinical characteristics

13. Clinical and Physical findings during admission

i) Symptoms

- ✓ Altered state of awareness (confusion, memory loss, excessive sleepiness or insomnia)
  Yes ( ) No( )
- ✓ Yellow discoloration of skin or eyes (Jaundice) Yes ( ) No( )
- ✓ Abdominal pain Yes ( ) No( )
- ✓ Nausea / vomiting Yes ( ) No( )
- ✓ Itching Yes ( ) No( )
- ✓ Easy bruising and bleeding Yes ( ) No( )

- ✓ Brownish or orange urine Yes ( ) No( )
- ✓ Fever Yes ( ) No( )
- ✓ Fluid build up in abdomen (ascites) Yes ( ) No( )
- ✓ Fluid in ankles and legs (lower limb oedema) Yes ( ) No( )
- ✓ Vomiting blood / Passing black tarry stool Yes ( ) No( )
- ✓ Shaking of hands (tremors) Yes ( ) No( )
- ✓ Losing weight without trying Yes ( ) No( )
- ✓ Feeling tired or weak Yes ( ) No( )

ii) Signs of DLC

- ✓ Splenomegaly Yes ( ) No( )
- ✓ Finger clubbing Yes ( ) No( )
- ✓ Caput medusae Yes ( ) No( )
- ✓ Spider angioma Yes ( ) No( )
- ✓ Purpura Yes ( ) No( )
- ✓ Gynecomastia Yes ( ) No( )
- ✓ Splenomegaly Yes ( ) No( )
- ✓ Reduced liver span (< 15cm) with or without nodularity Yes ( ) No( )
- ✓ Hepatomegaly(liver span > 15cm) Yes ( ) No( )

14. If the patient is diagnosed with DLC at admission, please tick ✓ in the box corresponding to the complication(s)	
Complication(s)	Diagnosis method used
□ Ascites Grade……	□Clinical□USS
□Gastrointestinal bleeding	□Clinical□Endoscopy
□ Hepatic encephalopathy Grade :□I □II □ III □ IV	
□Hepatocellular carcinoma	
□Others (please specify)	

15. What is the etiology of chronic liver disease in this patient?		
□ Alcoholism	□ HBV	□ HCV
□ HIV		□ Others……

SECTION C -Laboratory Profile

<table>
<tr><th>COMPLETE BLOOD COUNT(CBC)</th><th>LIVER FUNCTION TEST (LFT)</th><th>ASCITIC FLUID ANALYSIS</th></tr>
<tr><td rowspan="6">• RBC count:
• WBC count:
• Platelet count:
• Hemoglobin:
• Hematocrit:
• Neutrophil count:
• Lymphocyte count:
• Monocyte count:
• Basophil count:
• Eosinophils:
• MCV:
• MCH:
• MCHC:</td><td>• ALT:
• AST:</td><td>-PMN cells count:</td></tr>
<tr><td>COAGULATION PROFILE</td><td>RENAL FUNCTION TEST(RFT)</td></tr>
<tr><td>• PT:
• INR:
• aPTT:</td><td>• SCR-
• BUN-</td></tr>
<tr><td>SERUM BILIRUBIN</td><td>Serum Electrolytes(mg/dl)</td></tr>
<tr><td>• Direct:
• Total:</td><td>• Sodium-
• Potassium-</td></tr>
<tr><td>• Alpha-fetoProtein (AFP):</td><td>SEVERITY SCORES</td><td>SEROLOGIC TESTS</td></tr>
<tr><td>SERUM ALBUMIN(g/dL):</td><td>• CPT score-
• CPT class-
• MELD-Na Score-</td><td>• HBsAg: □ Positive □ Negative
• Anti-HCV: □ Positive □ Negative
• HIV: □ Reactive □ Non-reactive</td></tr>
</table>

SECTION E-Imaging and Histology

i) Radiographic Findings

- Ultrasound / CT scan / MRI findings (Please tick ✓ in the corresponding box based on the ultrasound finding
- Ascites
- Smooth liver surface
- Nodular liver surface
- Heterogeneous echotexture
- Hepatic steatosis
- Periportal fibrosis
- Hyperenhancement during arterial phase and delayed venous phase post contrast
- Other(s), please specify briefly

ii) Histology Findings

17- Biopsy / FNAC results confirms presence of HCC (wide trabulae (> 3cells), prominent acinar pattern, cytologicatypia, mitotic activity, vascular invasion, absence of Kupffer cells and loss of reticulin network)

Yes( ) No( )

SECTION E -In-hospital, 30 days and 90-days outcomes

What is the final in-hospital outcome of the patient?	**In-hospital outcome occurrence……..DD/MM**
□Patient discharged □Patient Left against medical advice □Patient passed away	
What had happened to the patient at 30-days of follow up period?	**Thirty-day of follow up period occurrence……..DD/MM**
□Patient readmitted □Patient survived □ Patient passed away □Patient lost to follow-up	
What had happened to the patient at 90-days of follow up period?	**Ninety-day of follow up period occurrence……..DD/MM**
□Patient readmitted □Patient survived □ Patient passed away □Patient lost to follow-up	

Appendix II: Informed Consent Form-English Version

CONSENT TO PARTICIPATE IN THE STUDY REGARDING 1 MONTH AND 3 MONTH READMSSION AND ASSOCIATED FACTORS AMONG PATIENTS WITH DECOMPENSATED LIVER CIRRHOSIS ADMITTED AT MUHIMBILI NATIONAL HOSPITAL.

Name ……

Age ……

Dear Sir/Madam,

My name is Dr. Happiness Swai, a Resident in Internal medicine at Muhimbiliuniversity of health and allied sciences (MUHAS). I am conducting a research study on 1 month and 3 month readmssion and associated factors among patients admitted with decompensated liver cirrhosis among patients with decompensated liver cirrhosis admitted in Muhimbili National Hospital, Dar essalaam. Tanzania.

I would like to conduct this study as a requirement for the fulfillment of my postgraduate studies. Purpose of the study: This study aims to determine 1 month and 3 month readmssion and associated factors among patients admitted with decompensated liver cirrhosis among patients with decompensated liver cirrhosis admitted in Muhimbili National Hospital, Dar essalaam. Tanzania.

How to participate: Participants who are willing to participate in this study will have to sign a consent form.

A short interview and physical examination will be done and investigations (laboratory and radiology) will be taken for further review.

Confidentiality: All findings obtained will not be disclosed to anybody except the attending investigator and participant him/herself.

The information from this study will be beneficial by creating awareness on factors associated with 1 month and 3 month readmission among patients with decompensated liver cirrhosis

admitted in Muhimbili National Hospital, Dar essalaam. Tanzania It will eventually help in undertaking proper measures to treat complications among this group of patients at our hospital and nation at large.

Costs: You will not be required to pay any amount for your participation in this study.

Voluntary participation and the right to withdraw from the study: Your participation is voluntary, and you have the right to withdraw from participating in this study at any time. Whatever your decision may be, it will not affect in any way to your rights to care and treatment.

Risks: There are no risks associated with your participation in the study.

Benefits: Your participation in this study will help you know about whether you have predisposing factors which cause frequent readmissions and thus help us to address them and minimize costs.

It is our hope that the information from this research will help improve the quality of care of patients with liver cirrhosis, I will be grateful if you willingly agree to participate in this study.

Investigator's Statement: I, the investigator, have educated the research participant on the purpose and applications of this

Study.

Signed…… Date…….

Participant's Statement: I am willing to participate in this study on prevalence, associated factors and complications among patients with decompensated liver cirrhosis admitted in Muhimbili National Hospital, Dar essalaam. Tanzania. I do this with a full understanding of the purposes of the study and the procedures involved, which include filling out a study questionnaire, undergoing physical examination and that blood samples will be taken, all of which have been explained to me by Dr.HappinessSwai

Signature of Participant----------

Date----------

If you have questions during the course of the study, you may contact the following:

Dr. Happiness Swai
Principal Investigator
Muhimbili University of Health and Allied Sciences (MUHAS)
Department of Internal Medicine
P.O. Box 65001 Dar es Salaam.
Mobile phone: 0745 430414

OR

DrEwaldo Komba (MD, MMED, MSc)
Supervisor for this research.
Muhimbili University of Health and Allied Sciences (MUHAS)
Department of Internal Medicine
P.O. Box 65001
Dar es Salaam.

Appendix III: Informed Consent Form-Swahili Version

RIDHAA YA KUSHIRIKI KWENYE UTAFITI KUHUSU SABABU ZINAZOPELEKEA KULAZWA MARA KWA MARA KWA WAGONJWA WA KUFELI KWA INI KATIKA HOSPITALI YA TAIFA MUHIMBILI, DAR ES SALAAM. TANZANIA.

Jina .....

Umri……..

Kwa Bibi/Bwana,

Jina langu Ni Dkt. Happiness Swai. Mimi ni mwanafunzi wa shahada ya uzamili ya magonjwa ya ndani hapa MUHAS. Ninafanya utafiti wa kuangalia kuhusu sababu zinazopelekea kulazwa mara kwa mara kwa wagonjwa wa kufeli kwa iniwaliolazwa katika hospitali ya Muhimbili. Dhumuni la utafiti huu ni kuboresha huduma za afya na kuwawezesha wagonjwa kupata matibabu bora Zaidi nahatimaye kuishi maisha bora Zaidi baada ya matibabu."Naomba ushiriki wako katika utafiti huu.

Jinsi ya kushiriki katika utafiti huu: Unaweza kushiriki katika utafiti kwa kujaza kwa hiyari yako fomu ya kuridhia kushiriki.

Utafiti huu utakuwa na mahojiano kwa kutumia dodoso, kufanyiwa uchunguzi wa mwili na vipimo vya damu na picha ya tumbo itachukuliwa kwa uchunguzi zaidi.

Utunzaji wa siri: Taarifa zote zitakazochukuliwa katika utafiti huu zitakuwa ni siri na zitatunzwa kwa usiri na zitatumika katika utafiti huu ili ziweze kusaidia katika kuboresha huduma. Taarifa hizi za matokeo ya uchunguzi zitasaidia jamii kujua kiwango,viashiria vinavoambatana na ugonjwa wa ngozi na athari katika maisha ya kila siku kwa wagonjwa wenye ugonjwa wa kufeli ini kwa muda mrefu wanaopata matibabu katika hospitali ya taifa Muhimbili, Dar es salaam.

Gharama za Ushiriki: Ushiriki katika utafiti huu ni bure yaani hakuna gharama yeyote kwa mshiriki.

Hiyari ya kushiriki na kujitoa katika utafiti huu: Ushiriki katika utafiti huu ni wa hiyari na pia ni haki yako kujitoa katika utafiti huu muda wowote unapohisi kufanya hivyo. Maamuzi yako ya kuamua kutoshiriki au kujitoa katika utafiti huu hayataathiri haki yako ya kupata huduma na matibabu.

Madhara ya kushiriki utafiti: Hakuna madhara yeyote yatakayompata mshiriki wa utafiti huu.

Manufaa ya kushiriki utafiti huu: Ushiriki wako katika utafiti huu utakuwa na faida kwako kwa kuweza kujua kama sababu zilizopelekea uwe unalazwa mara kwa mara kwa sababu ya tatizo la kufeli kwa ini, na kujulishwa kama una viashiria hatarishi pamoja na athari za kufeli kwa ini. Pia matokeo ya utafiti huu yatasaidia kushauri katika matibabu sahihi ya ugonjwa wa kufeli kwa ini kwa muda mrefu na kuwapa mwanga wanasiasa katika kuboresha huduma kwa wagonjwa wa ini.Nitashukuru sana kama kwa hiyari yako utaamua kushiriki katika utafiti huu.

Kauli ya Mtafiti: Mimi mtafiti, nakiri nimemuelewesha mshiriki wa utafiti huu kuhusu huu utafiti.

Sahihi……

Tarehe…….

Kauli ya Mshiriki: Natoa idhini mwenyewe bila aina yoyote ya kushurutishwa au kulazimishwa kushiriki katikautafiti uliotajwa hapa kuhusu utafiti wa kuangalia kiwango, viashiria hatarishi pamoja na athari zitokanazo na kufeli kwa ini katika maisha ya kila siku kwa wagonjwa wa ini katika hospitali ya taifa Muhimbili, Dar es salaam. Nafanya hivi baada ya kuelewa taarifa zote nilizoelezwa na mtafiti, Dr Happiness Swai , na pia amenijibu na kunielewesha zaidi maswali niliyomuuliza.

Nimeelezewa kikamilifu kuhusu madhumuni na hali yake na naelewa kuwa nitaulizwa maswali kadhaa, kufanyiwa uchunguzi wa mwili na kutolewa vipimo vya damu na picha ya tumbo itachukuliwa.

Pia naelewa kuwa naweza kujiondoa wakati wowote iwapo nitabadilisha mawazo.

Sahihi ya mshiriki……

Tarehe……..

Mawasiliano kwa wahusika:

Kwa maswali au maoni kuhusiana na utafiti huu tafadhali wasiliana na wafuatao:
Dr. Happiness Swai
Mtafiti mkuu
Chuo kikuu cha afya na tiba shirikishi Muhimbili
Idara ya Magonjwa ya ndani
S.L.P 65001 Dar es Salaam
Nambari ya simu: 0745 430414

AU

Dr.Ewaldo Komba (MD,MMED,MSc)
Msimamizi wa utafiti huu.
Chuo kikuu cha afya na tiba shirikishi Muhimbili
Idara ya Magonjwa ya ndani
S.L.P 65001 Dar es Salaam.