Original Article

Association of Grading of Esophageal Varices With Child Turcotte Pugh Class In Patients of Liver Cirrhosis

Husna Khan, Ifnan Shamraiz*, Samina Khan, Saba Idress, Adnan Khan

Department of Paediatric, Combined Military Hospital, Rawalpindi – Pakistan

Article Info

Corresponding Author
Ifnan Shamraiz
Department of Paediatric,
Combined Military Hospital,
Rawalpindi – Pakistan
Email: ifnan185@gmail.com

Date Received: Dec 30, 2023
Date Revised: Mar 30, 2024
Date Accepted: Aug 23, 2024

This article may be cited as:
Khan H, Shamraiz I, Khan S, Idress S, Khan A. Association of grading of esophageal varices with child turcotte pugh class in patients of liver cirrhosis. J Postgrad Med Inst 2024;38(3):234-39. http://doi.org/10.54079/jpmi.38.3.3405

Abstract

Objective: To determine the association between the Child Turcotte Pugh class and the esophageal variceal grade in pediatric patients with liver cirrhosis.

Methodology: This was a cross-sectional study spanning from December 2022 to August 2023, involving children of age 4-14 years with liver cirrhosis at the Pediatric Gastroenterology and Hepatology Department, Department of Paediatric, Combined Military Hospital, Rawalpindi; patients were classified into Child-Pugh-Turcotte Classes A, B, or C based on laboratory and clinical parameters. All underwent upper gastrointestinal endoscopy to screen for varices. Data analysis was performed using SPSS version 20, with a p-value of <0.05 considered significant.

Results: The study involved patients with a mean age of 7.3±3.0 years, 55% male and 45% female. Glycogen Storage Disorder (23%) and Progressive Familial Intrahepatic Cholestasis (17%) were the main causes of liver cirrhosis. Upper gastrointestinal (UGI) endoscopy showed 77.6% had varices, with 30.6% Grade-I and 26.5% Grade-III. Screening for esophageal varices was the most common indication (47%). Among patients with hematemesis, 57% had Grade-III varices, compared to 13% of those screened, 33% with malena, and none with abdominal pain (p=0.03). In the Child-Pugh-Turcotte classification, 42% of Class-A had no varices, while 25% had Grade III; 50% of Class-B had Grade-I, and 40% of Class-C had Grade-III varies (p=0.08).

Conclusion: The Child-Pugh-Turcotte score is a valuable non-invasive tool for assessing morbidity and mortality in pediatric liver cirrhosis. It effectively stratifies patients based on variceal presence and grade, aiding in clinical management and outcome prediction. Routine use of this score can improve prognostic accuracy and treatment planning for these patients.

Keywords: Child-Pugh-Turcotte; Liver Cirrhosis; Esophageal Varices; Endoscopy; Gastrointestinal

Introduction

Cirrhosis is a widespread condition characterized by the development of fibrous tissue and nodules, leading to a disrupted and disorganized structure of the liver.[1] A study published in Canada reported that although still rare, the incidence of liver cirrhosis among the pediatric population has increased over the past two decades.[2] Biliary atresia and some inherited metabolic diseases are the most common causes of liver cirrhosis in neonates and young children, whereas Wilson disease, chronic infectious hepatitis, autoimmune disorders, cardiac, non-alcoholic fatty liver disease, and alpha-1 antitrypsin deficiency remain the main causes in older children and adolescents.[3]

Nearly 50% of individuals with liver cirrhosis encounter episodes of gastrointestinal bleeding. This bleeding often stems from complications such as esophageal varices (EV), which are swollen blood vessels in the esophagus that can rupture due to increased pressure in the portal vein.[4] The prevalence of EV ranges from 30 % to 70 % among those with cirrhosis, and approximately 9–36 % of patients exhibit what are termed "high-risk" varices. Notably, 15 % - 55 % of EV bleeding results in mortality.5 In about 40% of the patients, esophageal varices are present on initial diagnosis in patients with compensated liver cirrhosis and around 60% in those with decompensated liver cirrhosis6. For evaluating the presence, extension, and size of esophageal, gastric, and duodenal varices, endoscopy is the best procedure.[1]

The gold standard for screening of varices is upper gastrointestinal endoscopy, which has a substantial cost and drains the patients and endoscopy units. Due to these reasons, there is a significant interest in developing non-endoscopic methods involving clinical variables to predict the presence of varices.[7] Therefore, Child-Pugh Turcotte, PELD (Pediatric End-Stage Liver Disease), MELD (Model for End-Stage Liver Disease) scores, albuminemia, and body mass index are used to estimate mortality risk in clinical practice.[1]

The paucity of data regarding the clinical risk stratification of esophageal varices in the pediatric population underscores a critical gap in our understanding and management of this condition, particularly in resource-limited settings like Pakistan. Accurate stratification is essential for predicting the risk of variceal hemorrhage and implementing timely preventive and therapeutic measures. In settings where resources and specialized skills are limited, the development and utilization of reliable clinical variables and scoring systems are crucial.

There are studies on this topic in other countries, but on extensive research, we did not find any Pakistani study in pediatrics, although one or two studies on the adult population are available. As there is no data on this topic in pediatrics in our country in the field of pediatric gastroenterology, this study was planned with the aim of addressing this gap by investigating the association between the Child-Pugh Turcotte (CPT) classification and the esophageal variceal grade in pediatric patients with liver cirrhosis.

Methodology

This was a cross-sectional analytical study carried out from December 2022 to August 2023 at the Pediatric Gastroenterology and Hepatology Department, A well-structured, close-ended questionnaire was designed to collect the required information. The questionnaire was finalized after the review by two senior consultants. Ethical approval (Serial No. 348) was secured from the IRB/Ethical Committee. Informed consent was required before enrolment in the study and was obtained from the parents of all participants after a thorough counseling of them about the nature, methodology, and importance of the study. Forty-nine children aged 4-14 years with liver cirrhosis were recruited in this study via consecutive sampling. Patients < 4 years and >14 years were excluded from the study. Patients with any comorbidities, liver failure, hepatic encephalopathy, vitally unstable, on the transplant list, or those unwilling to give consent were excluded. Patients were admitted according to hospital policy. After detailed history taking and clinical examination, patients underwent routine laboratory investigations, including liver function tests and abdominopelvic ultrasonography. Liver cirrhosis was confirmed via liver biopsy and/or fibro scan/elastography. According to the Child-Pugh Turcotte class system, all patients were classified into Class A, B, or C by considering the laboratory and clinical parameters (Table. 1). All of the patients also underwent upper gastrointestinal endoscopy after obtaining written informed consent. Patients having varices were graded as:

Grade I: flattened by insufflation

Grade II: not flattened by insufflation

Grade III: not flattened by insufflation and confluent around the circumference of the esophagus.

The collected data was entered into SPSS version 20 for analysis. Continuous variables were expressed as mean (±SD) and categorical variables as numbers and percentage. Chi square test was used to document the association of esophageal variceal grade with Child-Pugh Turcotte class in pediatric cirrhotic patients. A p-value less than 0.05 was considered significant.

Results

Forty-nine children with cirrhosis were enrolled in this study. As it is one of the rare diseases in childhood, and CMH Rawalpindi is a tertiary-level hospital where patients from all over Pakistan are referred and treated, we included the maximum number of patients avail-

able in that duration. The mean age of children was 7.3±3.0 years. Among 49 patients, 27(55%) were male and 22(45%) were female.

A high proportion of patients presented with high bilirubin, i.e. 46.9%, whereas serum albumin was normal in 36.7% of the patients. Prothrombin time was normal in 41% of patients. In more than half of the patients (55%), there were no ascites. Around 65% of the patients had no signs of encephalopathy. According to these variables, the majority of the patients fell into Class-C of the Child-Pugh class system (51%), whereas 24.5% were Class-A and 24.5% were Class-B (Table. 2). Etiology of liver cirrhosis is displayed in Figure 1.

Out of 49 patients, 29% presented with hematemesis, whereas the majority (47%) underwent screening (Figure 2).

The results of UGI endoscopy showed that 77.6% of the children had varices. Most of the patients i.e. 30.6% (n=15) had Grade-I varices followed by patients with Grade-III varices (26.5%).

Table 3 shows a significant association among the patients with an indication of endoscopy and esophageal variceal grade. Among those who presented with hematemesis (n=14), many had Grade-III varices (57%) followed by Grade-II varices (29%). Among patients who underwent screening (n=23), only 13% had Grade-III varices. Similarly, among patients with Malena, 33% of the children had Grade-III varies. Half of the patients who presented with pain in the abdomen had evidence of only Grade-I varices, and none had Grade-III varices (p=0.03).

Among patients falling into Class-A of Child-Pugh-Turcotte class, 42%(n=5) had no evidence of varices whereas 25%(n=3) had Grade-III varices. Of those among Class-B, 50%(n=6) had Grade-I varices on upper GI endoscopy, and none had Grade-III varices. Similarly, among those in Class-C, 40%(n=10) had Grade-III varices. However, this result was not significant (p=0.08).

Table 1. Child-Pugh Turcotte Class

Parameter	Points		
	1 Point	2 Points	3 Points
Serum Bilirubin (mg/dl)	<2.0	2.0-3.0	>3.0
Serum Albumin (g/dl)	>3.5	3.0-3.5	<3.0
Prothrombin time (seconds prolonged)	<4	4.0-6.0	>6.0
Ascites	None	Easily Controlled	Poorly Controlled
Encephalopathy	None	Minimal	Advanced

Table 2. Patient outcomes regarding Child-Pugh Turcotte Class

Parameter		n(%)
Serum Bilirubin	<2	15(30.6)
	2-3	11(22.4)
	>3	23(46.9)
Serum Albumin	>3.5	18(36.7)
	3-3.5	18(36.7)
	<3	13(26.5)
Prothrombin Time	<4	20(40.8)
	4-6	11(22.4)
	>6	18(36.7)
Ascites	None	27(55.1)
	Easily controlled	12(24.5)
	Poorly controlled	10(20.4)
Encephalopathy	None	32(65.3)
	Minimal	9(18.4)
	Advanced	8(16.3)
Child-Pugh Turcotte Class	A	12(24.5)
	B	12(24.5)
	C	25(51)
Varices	None	11(22.5)
	Grade-1	15 (30.6)
	Grade-2	13 (26.5)
	Grade-3	10 (20.4)

Discussion

Variceal bleeding is a significant contributor to both mortality and morbidity in patients suffering from liver cirrhosis. This condition arises from the rupture of esophageal varices, which are engorged veins that develop due to increased pressure in the portal venous system—a common consequence of advanced liver disease. The severity of liver cirrhosis can be effectively predicted using the Child-Pugh score, a clinically established scoring system.[8] The Child-Pugh score evaluates the prognosis of cirrhotic patients by integrating both laboratory and clinical parameters. In clinical practice, the Child-Pugh score serves as a valuable tool for guiding therapeutic decisions, monitoring disease progression, and improving the overall management of patients with liver cirrhosis. Its ability to predict the severity of the disease underscores its critical role in

J Postgrad Med Inst 2024;38(3):234-39.
http://doi.org/10.54079/jpmi.38.3.3405

with Esophageal Variceal Grade.

Table 3. Association of indications of UGI endoscopy with Esophageal Variceal Grade.

No.	Indication	Varices					
		None n(%)	Grade-I n(%)	Grade-II n(%)	Grade-III n(%)	Total n(%)	p-value
1	Hematemesis	0 (0)	2(14)	4(29)	8(57)	14 (100)	0.03
2	Screening endoscopy for varices	8 35)	9(39)	3(13)	3(13)	23 (100)	
3	Malena	1(17)	117)	2(33)	2(33)	6 (100)	
4	Pain abdomen	2(33)	3(50)	1(17)	0(0)	6 (100)	

Table 4. Association of Child-Pugh-Turcotte Class with Esophageal variceal Grade.

Class	Varices					
	None n(%)	Grade-I n(%)	Grade-II n(%)	Grade-III n(%)	Total n (%)	p-value
A	n(%)	2(14)	4(29)	8(57)	14 (100)	0.08
B	5 (42)	3(25)	1(8)	3(25)	12(100)	
C	3(25)	6(50)	3(25)	0(0)	12(100)	
	3(12)	6(24)	6(24)	10(40)	25(100)	
	11(22)	15(31)	13(27)	10(20)	49(100)	

FIGURE 1. ETIOLOGY OF LIVER CIRRHOSIS

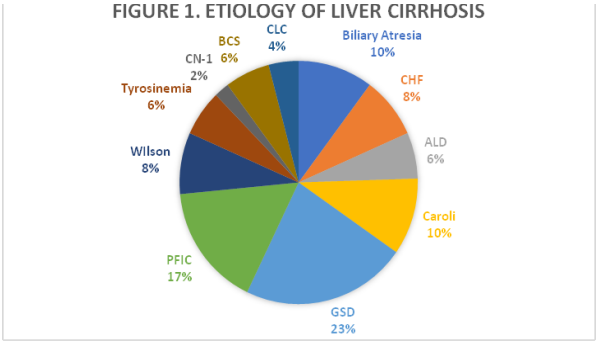
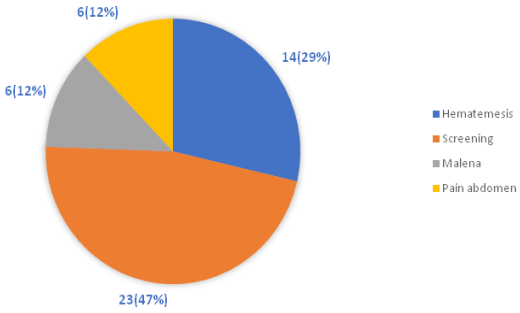


FIGURE 2. INDICATION FOR UGI ENDOSCOPY



Out of 49 patients, 29% presented with hematemesis whereas the majority (47%) underwent screening (Figure.2).

the stratification and treatment planning for those at risk of life-threatening complications like variceal hemorrhage.[8,9]

The mean age in our study was 7.3 years, which is relatively younger than that of a study done in Iran (9.48%) and older than in Brazil (5.38%).[10,11] In our study, males were affected more by liver cirrhosis (55%), which is in concordance with other studies, i.e., 67% and 79%.[10,12]

In the present study, 29% of the cirrhotic patients suffered from bleeding from esophageal varices, i.e., presented with hematemesis. A study of Iranian pediatric patients with cirrhosis reported that 52% of their patients experienced esophageal bleeding.[13]

In the present report, glycogen storage disease (23%) followed by PFIC (17%) were among the most common etiologies of liver cirrhosis, and the least common being Criggler-Najjar type 1 (2%). Other studies report the most common etiology being Wilson's disease (50%) and biliary atresia (35%).[3,11,13]

Indication for UGI endoscopy in patients of liver cirrho-

sis was mostly screening (47%) in our study. Abdominal pain was reported to be the most common indication (45%) in the pediatric population of Jordan and variceal surveillance/eradication (19%) in India who underwent upper gastrointestinal endoscopy.[14,15]

The majority of the patients (31%) who presented with cirrhosis had Grade I, while 26% had Grade III varices. A report from a Brazilian hospital classified esophageal varices of medium and/or large size, having red spots, or those with gastric varices as high-risk varices and reported 19% of their patients falling into this category.[11] A study in Bangladesh followed Conn's classification and reported that 20.8% of patients had Grade I varices, 37% had Grade, 25% had Grade III, and 16.6% had Grade IV varices.[12]

Hematemesis was one of the most common presentations in the present study, and 57% of the patients presenting with hematemesis had Grade-III varices, which is a significant relationship. A report from Iran demonstrating risk factors of esophageal bleeding in cirrhotic patients stated that 86% who had esophageal bleeding had large size varices.[13] While demonstrating the relationship between Child-Pugh-Turcotte class and grade of varices, in this study, among patients falling into Class-A, 42% had no evidence of and only 25% had Grade-I varices. Of those among Class-B, 50% had Grade-I varices on upper GI endoscopy. Similarly, among those in Class C, 40% had Grade-III varices. Another study presented the findings that of patients who had high-risk varices, 56% of them belonged to Class-A, whereas 83% belonged to Class-A among patients with absent high-risk factors.[11] Similarly, in another study, 60% of those who had no evidence of varices belonged to class A, and 68% with varices belonged to class B or C.[16]

Limitations of the study

The limitations of this study include a small sample size, which restricts the generalizability of the results to a broader population. Additionally, to enhance the effectiveness and reduce potential biases, it is recommended that the Child-Pugh-Turcotte classification be combined with other parameters or scores, such as the platelet-spleen index, in future research.

Conclusion:

In conclusion, the Child-Pugh-Turcotte score demonstrates significant utility as a non-invasive tool for assessing morbidity and mortality in pediatric patients with liver cirrhosis. By effectively stratifying patients according to the presence and grade of esophageal varices, this scoring system provides critical insights that enhance clinical management and facilitate accurate outcome prediction. Routine implementation of the Child-Pugh-Turcotte score in clinical practice can markedly improve the accuracy of prognostic assessments and the precision of treatment planning. This, in turn, enables healthcare providers to deliver more targeted and effective interventions, ultimately improving patient care and outcomes for children afflicted with liver cirrhosis. The findings underscore the importance of integrating this score into regular clinical protocols to better manage and treat this vulnerable patient population.

References

1. *Gupte GL, Srivastava A. Chronic Liver Disease in Children: From Diagnosis to Liver Transplantation. Indian J Pediatr. 2024;91(3):260-1. DOI: 10.1007/s12098-024-05030-3.*
2. *Kehar M, Griffiths R, Flemming JA. Increasing incidence of cirrhosis over the past 2 decades among children in Ontario, Canada. Am J Gastroenterol. 2022;117(1):189-92. 10.14309/ajg.0000000000001564.*
3. *Herrmann J, Petit P, Grabhorn E, Lenz A, Jürgens J, Franchi-Albella S. Liver cirrhosis in children - the role of imaging in the diagnostic pathway. Pediatr Radiol. 2023;53(4):714-26. DOI: 10.1007/s00247-022-05480-x.*
4. *Mazumder MW, Benzamin M. Upper gastrointestinal bleeding in Bangladeshi children: Analysis of 100 cases. World J Gastrointest Endosc. 2024;16(1):44-50. DOI: 10.4253/wjge.v16.i1.44.*
5. *Borhani A, Luu H, Mohseni A, Xu Z, Shaghaghi M, Tolosa C. Screening for exclusion of high-risk bleeding features of esophageal varices in cirrhosis through CT and MRI. Clin Imaging. 2024;110:110168. DOI: 10.1016/j.clinimag.2024.110168.*
6. *Lesmana CRA, Raharjo M, Gani RA. Managing liver cirrhotic complications: Overview of esophageal and gastric varices. Clin Mol Hepatol. 2020;26(4):444-60. DOI: 10.3350/cmh.2020.0022.*
7. *Raj A, Pillai G, Divakar A, Shivam V, Nair A. Association of Thyroid Function and Severity of Illness in Liver Cirrhosis as Measured by Child-Pugh Score. Cureus. 2023;15(3):e36618. DOI: 10.7759/cureus.36618.*
8. *Tarar ZI, Farooq U, Gandhi M, Saleem S, Daglilar E. Safety of endoscopic retrograde cholangiopancreatography (ERCP) in cirrhosis compared to non-cirrhosis and effect of Child-Pugh score on post-ERCP complications: a systematic review and meta-analysis. Clin Endosc. 2023;56(5):578-89. DOI: 10.5946/ce.2023.027.*
9. *Girish A, Shrestha TM. Child Pugh Score as a Predictor of Large Oesophageal Varices in Chronic Liver Disease Patients. Nep Med J. 2020;3(1):37-41.*
10. *Rahmani P, Farahmand F, Heidari G, Sayarifard A. Non-invasive markers for esophageal varices in children with cirrhosis. Clin Exp Pediatr. 2021;64(1):31-6. DOI: 10.3345/cep.2019.01599.*
11. *Lopes JR, Ferreira AR, Liu PM, Queiroz TC, Fagundes ED, Pimenta JR, et al. Non-invasive predictors of esophageal varices with a high risk of bleeding in pediatric cirrhotic patients. J Pediatr Gastroenterol Nutr. 2021;72:802–6.*
12. *Roy U, Mondal A, Rukunuzzaman M. Assessment of Chronic Liver Disease (CLD) Based on Esophageal Varices in Children. Asian J Pediatr Res. 2023;13(4):90-8. DOI: 10.9734/ajpr/2023/v13i4295.*

13. Dehghani SM, Rashidinia Z, Shahramian I, Bazi A, Saeed A, Shorafa E. Risk Factors of Esophageal Bleeding in Children with Various Etiologies of Liver Cirrhosis–A Single-Center Report from Iran. Serb J Exp Clin Res.2019;23(2):135-40. DOI: 10.2478/sjecr-2019-0049.

14. Altamimi E, Odeh Y, Al-Quraan T, Mohamed E, Rawabdeh N. Diagnostic yield and appropriate indication of upper endoscopy in Jordanian children. BMC Pediatr. 2021;21(1):10. DOI: 10.1186/s12887-020-02470-6.

15. Wani MA, Zargar SA, Yatoo GN, Haq I, Shah A, Sodhi JS, Gul, et al. Endoscopic Yield, Appropriateness, and Complications of Pediatric Upper Gastrointestinal Endoscopy in an Adult Suite: A Retrospective Study of 822 Children. Clin Endosc. 2020;53(4):436-42. DOI: 10.5946/ce.2019.118.

16. Fagundes ED, Ferreira AR, Roquete ML, Penna FJ, Goulart EM, Figueiredo Filho PP, et al. Clinical and laboratory predictors of esophageal varices in children and adolescents with portal hypertension syndrome. J Pediatr Gastroenterol Nutr. 2008;46(2):178-83. DOI: 10.1097/MPG.0b013e318156ff07.