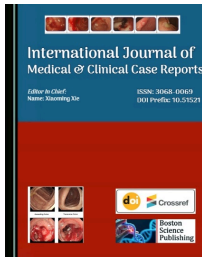
ISSN:3068-0069 International Journal of Medical and Clinical Case Reports DOI: https://dx.doi.org/10.51521/IJMCCR.2026.e5-1-117

Contents lists available at bostonsciencepublishing.com

International Journal of Medical and Clinical Case Reports



# Magnitude of Variceal Bleeding Among Patients with Cirrhosis: A Systematic Review and Meta-Analysis 2026

**Author:** Rahma Abdulkadir Awol[1**], Redeit Teferi Afework[2**]

**Co-Author:** Mulualem Dawit Bekele[3], Nathnael Cherinet Mammo[*4], Bekalu Zewde Fetena[5], Akiya Turi Goshe[*6], Rahel Yazie Tibebu[*7], Zelalem Tegegn Fantaw[*8], Yanit Tamirat Taddesse[4], Dawit Asmamaw Kifle[*8], Jessica Zerihun Yilma[*8], Adonay Hadgu Haile[9], Tewodros Kassahun Tarekegn[1]

[1]*Department of Medicine, Jimma University, School of Medicine, Jimma, Oromia, Ethiopia.*
[2]*Department of Medicine, Arba Minch University, College of Medicine and Health Sciences, Ethiopia.*
[3]*Department of Medicine, Haramaya University, College of Health and Medical Sciences, Ethiopia.*
[4]*Department of Medicine, Myungsung Medical College, Addis Ababa, Ethiopia.*
[5]*Department of Medicine, Hawassa University, College of Medicine and Health Sciences, Hawassa, Ethiopia.*
[6]*Department of Medicine, St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.*
[7]*Department of Medicine, GAMBY Medical and Business College, Ethiopia.*
[8]*Department of Medicine, Addis Ababa University, College of Health Sciences, School of Medicine, Addis Ababa, Ethiopia.*
[9]*Department of Medicine, Mekelle University, College of Health and Medical Science, Mekelle, Ethiopia*

ARTICLE INFO

*Article history:*

Received XX November 2026
Revised XX November 2026
Accepted XX November 2026
Published XX November 2026

**KEYWORDS:**

Magnitude,
Cirrhosis,
Variceal Bleeding,
Upper GI Bleeding,
Meta-Analysis,
Global

**To cite this article:**

Rahma Abdulkadir Awol[1**], Redeit Teferi Afework[2**], Mulualem Dawit Bekele[3], Nathnael Cherinet Mammo[*4], Bekalu Zewde Fetena[5], Akiya Turi Goshe[*6], Rahel Yazie Tibebu[*7], Zelalem Tegegn Fantaw[*8], Yanit Tamirat Taddesse[4], Dawit Asmamaw Kifle[*8], Jessica Zerihun Yilma[*8], Adonay Hadgu Haile[9], Tewodros Kassahun Tarekegn[1] (2026) Magnitude of Variceal Bleeding Among Patients with Cirrhosis: A Systematic Review and Meta-Analysis 2026. Int J Med Clin Case Rep, 5(1), 1-7.

ABSTRACT

**Introduction:** Liver cirrhosis is a consequence of chronic liver damage and inflammation, characterized by diffuse hepatic fibrosis. Progressive hepatic fibrosis results in potentially life-threatening complications, such as gastroesophageal varices and variceal bleeding, which are associated with substantial morbidity, recurrent hospitalization, and high mortality rates. Therefore, this systematic review and meta-analysis aimed to estimate the pooled prevalence of variceal bleeding among patients with cirrhosis.

**Methods and materials:** - This systematic review and meta-analysis was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guideline. A literature search was conducted in PubMed, Scopus, Web of Science, Embase, Google Scholar, and the Cochrane Library from database inception until September 10. The methodological quality was assessed using the Joanna Briggs Institute critical appraisal tool. An inverse variance-weighted random-effects model meta-analysis was performed to estimate The $I^2$ test statistic and the Egger's regression statistical test was used to check between-study heterogeneity ad publication bias respectively. A p-value of less than 0.05 used to declare statistical significance.

**Results:** The twenty-one included studies were retrospective studies with 8998 participants and mostly conducted in the Asia region. The magnitude of variceal bleeding ranges from 11.7 - 91 %. The pooled global proportion of magnitude of variceal bleeding was found to be 56.0% (95% CI: 40.6-71.5). The highest magnitude of variceal bleeding is 66.1 % (95% CI: 46.9- 83.3) was seen in Africa region and the lowest is 26.7 % (95% CI: 9.6.-43.9) was seen in North America region.

**Conclusion:** According to this systematic review and meta-analysis variceal bleeding is a critical global health concern, which affects over half of the targeted population globally. The regional analysis showed significant geographic disparities ranging from 26.7% in North America to 66.1% in Africa. Therefore tailored public health strategies, enhanced access to prophylactic treatment and strengthened healthcare infrastructure is essential to decrease the burden of the disease.

*©2026, Rahma Abdulkadir Awol., et al., This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited*

## Introduction

Liver cirrhosis is a consequence of chronic liver damage and inflammation, and characterized by diffuse hepatic fibrosis [1]. Progressive hepatic fibrosis and architectural distortion lead to portal hypertension and impaired hepatic function, resulting in a range of potentially life-threatening complications; [2-4] such as gastroesophageal varices and variceal bleeding which are associated with substantial morbidity, recurrent hospitalization, and mortality [5-8].

Gastroesophageal varices develop in response to increased portal venous pressure and the formation of portosystemic collateral vessels. The risk of bleeding associated with gastroesophageal varices increases with the severity of portal hypertension, variceal size, age, drugs, and the presence of other endoscopic and clinical risk factors [9-12]. If once variceal bleeding occurs, pa-

* *Corresponding authors: Nathnael Cherinet Mammo, Akiya Turi Goshe, Rahel Yazie Tibebu, Zelalem Tegegn Fantaw, Dawit Asmamaw Kifle and Jessica Zerihun Yilma.*

tients may develop severe hemodynamic instability, acute kidney injury, hepatic encephalopathy, infection, and other complications [13,14]. Evidence shows that despite advances in vasoactive therapy, endoscopic interventions, antibiotic prophylaxis, and management of portal hypertension, acute variceal hemorrhage remains a major cause of death among patients with decompensated cirrhosis [15,16].

Bleeding from esophageal varices can be devastating and can causing morbidity and mortality [17]. To mitigate these outcomes, primary prophylaxis using non-selective beta-blockers or endoscopic band ligation is essential for high-risk patients, while prompt administration of vasoactive drugs combined with early endoscopic therapy remains critical for controlling acute hemorrhage [18-21]. However, because early rebleeding rates remain high despite initial endoscopic control, modern clinical approaches increasingly emphasize early transjugular intrahepatic portosystemic shunt (TIPS) placement in high-risk individuals to minimize recurrent bleeding and improve overall survival [22,23]. Understanding the magnitude of variceal bleeding is therefore important for estimating the clinical burden, planning appropriate diagnostic and therapeutic services, and identifying populations that may benefit from strengthened preventive strategies.

Even though several studies have assessed variceal bleeding among patients with cirrhosis, their findings have been conducted in different populations and healthcare settings and have reported varying estimates. Also, the available evidence has not been sufficiently synthesized to provide a comprehensive pooled estimate of the magnitude of variceal bleeding. So this study can address this gap by systematically identifying relevant studies, quantitatively synthesizing their findings, and exploring potential sources of heterogeneity.

## Objective of the study

- To estimate the pooled magnitude of variceal Bleeding among Patients with cirrhosis

## Methods and Materials

### Study Design and Reporting

This systematic review and meta-analysis was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guideline [24].

### Eligibility criteria

Population, Outcome, condition, and Context (POCC) framework was used to set eligibility of studies.

- **Population**: The studies conducted among adult patients diagnosed with liver cirrhosis, regardless of the underlying etiology, sex, disease severity, or clinical status.
- **Outcome**: The outcome was the prevalence of variceal bleeding among patients with cirrhosis.
- **Condition**: the condition is variceal bleeding which is bleeding attributed to esophageal, gastric, or other clinically relevant gastroesophageal varices, as defined by the individual study.
- **Context**: studies conducted globally.

### Inclusion criteria

Studies were included if they: were conducted among patients with clinically or radiologically diagnosed liver cirrhosis; reported magnitude of variceal bleeding, used an observational study design; whereas studies did not involve patients with cirrhosis, did not assess variceal bleeding, case reports, case series, editorials, letters, commentaries, conference abstracts without adequate data, narrative reviews, systematic reviews, meta-analyses, and clinical guidelines were excluded.

### Information sources and search strategy

A literature search was conducted in PubMed, Scopus, Web of Science, Embase, Google Scholar, and the Cochrane Library from database inception until September 10. Additional eligible studies were identified through manual screening of the reference lists of included studies and relevant systematic reviews. The main search terms were “liver cirrhosis,” “hepatic cirrhosis,” “cirrhosis,” “variceal bleeding,” “variceal hemorrhage,” “gastroesophageal varices,” “esophageal varices,” “oesophageal varices,” “gastric varices,” “upper gastrointestinal bleeding,” and “portal hypertension.” The search strategy was adapted to the indexing system and syntax of each database.

### Study selection

Retrieved articles were exported into endnote reference management software and duplicate were removed. All reviewers independently screened the titles and abstracts; then potentially related studies were retrieved in full text and assessed for eligibility. Any disagreement between the reviewers was resolved through discussion. When consensus could not be reached, a third reviewer was consulted.

### Data extraction

A standardized data extraction form was developed containing: first author and year of publication, country and study setting, study design, sample size, type of varices, and prevalence of variceal bleeding. Discrepancies between the reviewers were resolved by comparing the extracted information with the original article and through discussion with other reviewers.

### Outcome of the study

The primary outcome was the pooled magnitude of variceal bleeding among patients with cirrhosis. For each study, the prevalence was calculated as the number of cirrhotic patients who experienced variceal bleeding divided by the total number of cirrhotic patients assessed.

### Quality assessment of the studies

The methodological quality of the included studies was independently assessed by all reviewers using a standardized Joanna Briggs Institute (JBI) critical appraisal tool for observational studies [25]. Studies were categorized according to their overall methodological quality. Disagreements were resolved through consultation each other.

### Data synthesis and analysis

The extracted data were entered into Stata statistical software package version 14 for analysis. The magnitude of variceal bleeding reported by each study was transformed as appropriate and pooled to obtain an overall estimate with a 95% confidence interval (CI). Heterogeneity was assessed using Cochran's Q statistic and the $I^2$ statistic. $I^2$ values were interpreted as representing low, moderate, and high heterogeneity at approximately 25%, 50%, and 75%, respectively [26]. When substantial heterogeneity was observed, potential sources were explored using subgroup analyses and meta-regression. Sensitivity analyses, publication bias and small-study effects were assessed. Funnel plot asymmetry was assessed visually, and Egger's regression test was used objectively.

## Results

### Study selection and characteristics

Initially, 7981 studies were identified through database and manual searches. Of these, 2106 records were excluded due to duplication. The remaining records undertook title and abstract screening, resulting in the removal of 3563 articles. 2150 records were sought for retrieval, 159 not retrieved because of they are irrelevant. One thousand and nine hundred ninety-one publications were then assessed for eligibility, then 1970 Excluded due to eligibility criteria. Finally, 21 studies met the inclusion criteria and included in the analysis (Fig. 1).

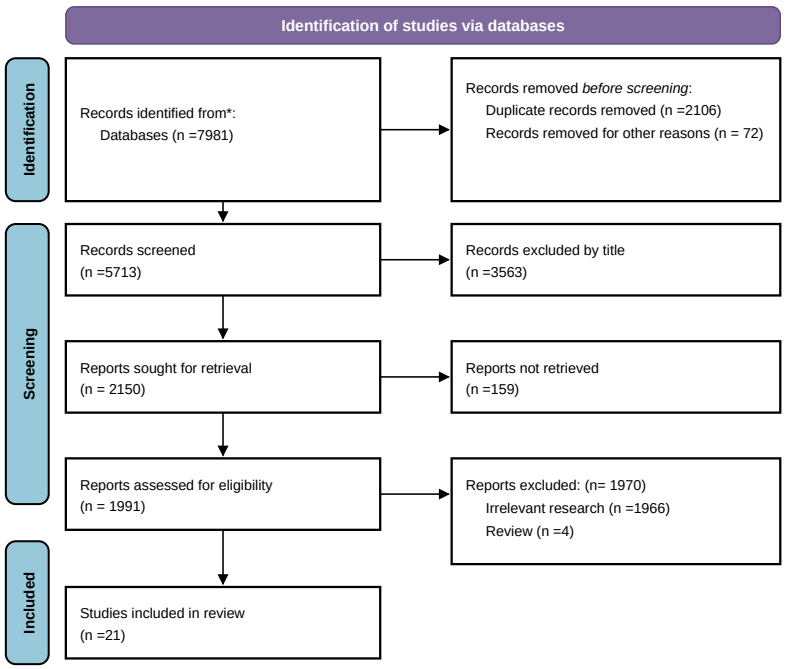



**Figure 1. PRISMA flow diagram of study selection for Pooled magnitude of variceal bleeding among Patients with cirrhosis**

The included studies were retrospective studies [27-47] with 8998 participants and mostly conducted in the Asia region. The sample size ranges from 34 [47] to 5775 [42] participants. Among included studies the magnitude of variceal bleeding ranges from 11.7 [42] - 91% [36]. All studies had good methodological quality (Table 1).

**Table 1. Characteristics of the study included in systematic review and meta-analysis**

| Authors Name | Publication Year | Study area | Type | Study design | Sample size | Prevalence with 95%CI |
|---|---|---|---|---|---|---|
| Gunda DW | 2019 | Tanzania | Esophagus | Cross-section | 223 | 39.5(33.0-45.9) |
| Duah A, | 2018 | Ghana | Esophagus | Cross-section | 149 | 90.6(85.9-95.2) |
| Prihartini J | 2005 | Indonesia | Esophagus | Cross-section | 47 | 76.6(64.4-88.7) |
| Gebregziabiher HT | 2023 | Ethiopia | Esophagus | Cross-section | 206 | 85.4(80.5-90.2) |
| Chalasani N | 1999 | USA | Esophagus | Retrospective | 346 | 20(15.7-24.2) |
| Thomopoulos KC | 2003 | Greece | Esophagus | Cross-section | 184 | 50(42.7-57.2) |
| Umar A, | 2015 | Kenya | Esophagus | Cross-section | 150 | 48(40.0-55.9) |
| Sharma SK | 2007 | India | Both | Cross-section | 101 | 88.1(81.7-94.4) |
| Mujahid N | 2024 | India | Esophagus | Prospective | 50 | 70(57.2-82.7) |
| Hossain E, | 2018 | Bangladesh | Esophagus | Cross-section | 100 | 91(85.3-96.6) |
| Cherian JV | 2011 | India | Esophagus | Prospective | 229 | 77.7(72.3-83.0) |
| Levy C, | 2007 | USA | Esophagus | Cross-section | 210 | 49.6(42.8-56.3) |
| Merli M | 2003 | Italy | Esophagus | Cross-section | 206 | 45.1(38.3-51.8) |
| Baye ML | 2023 | Ethiopia | Esophagus | Cross-section | 262 | 52(45.9-58.0) |
| Achinge IG | 2011 | Nigeria | Esophagus | Cross-section | 80 | 75(65.5-84.4) |
| Shukla R | 2016 | USA | Esophagus | Cohort | 5775 | 11.7(10.8-12.5) |
| Varghese J | 2008 | India | Esophagus | Prospective | 205 | 46.3(39.4-53.1) |
| Zakir MF | 2024 | Pakistan | Esophagus | Prospective | 135 | 13.3(7.5-19.0) |
| Azad T | 2025 | Pakistan | Esophagus | Cross-section | 186 | 18.3(12.7-23.8) |
| Bhattarai S, | 2017 | Nepal | Esophagus | Cross-section | 120 | 66.6(58.1-75.0) |
| Ebrahimi M | 2014 | Iran | Both | Cross-section | 34 | 64.7(48.6-80.7) |

## Magnitude of variceal bleeding

The pooled global proportion of magnitude of variceal bleeding was found to be 56.0% (95% CI: 40.6-71.5) with a heterogeneity index of 99.5%, with a P-value of less than 0.001 (Fig 2). The Eggers test yielded significant result (P ≤ 0.001). Therefore, Duval and Tweedie's trim-and-fill method was applied to assess the potential impact of publication bias. Because of there is no imputed study the adjusted pooled prevalence is similar, suggesting that publication bias.

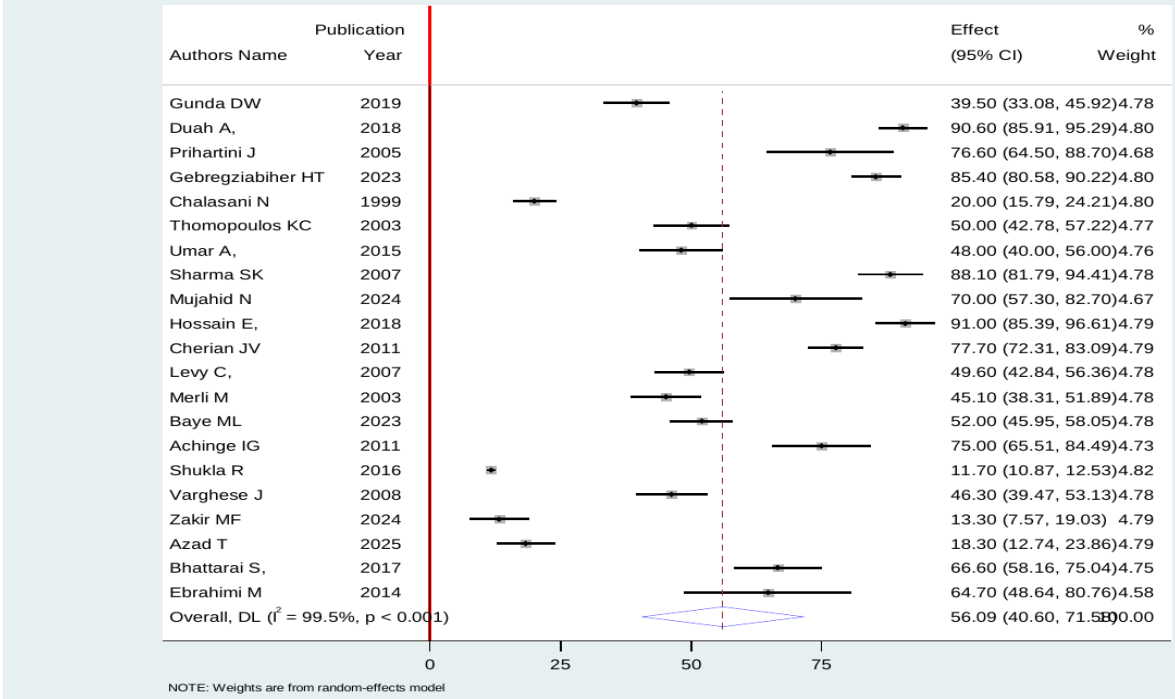



**Figure 2. Forest plot showing the pooled magnitude of variceal bleeding among Patients with cirrhosis**

## Sub-group analysis

The subgroup analysis was conducted based on region of the studies conducted. The highest magnitude of variceal bleeding is 66.1 % (95% CI: 46.9-83.3, $I^2$ = 98.1%) was seen in Africa region and the lowest is 26.7 % (95% CI: 9.6.-43.9, $I^2$ = 98.5%) was seen in North America region (Fig. 3).

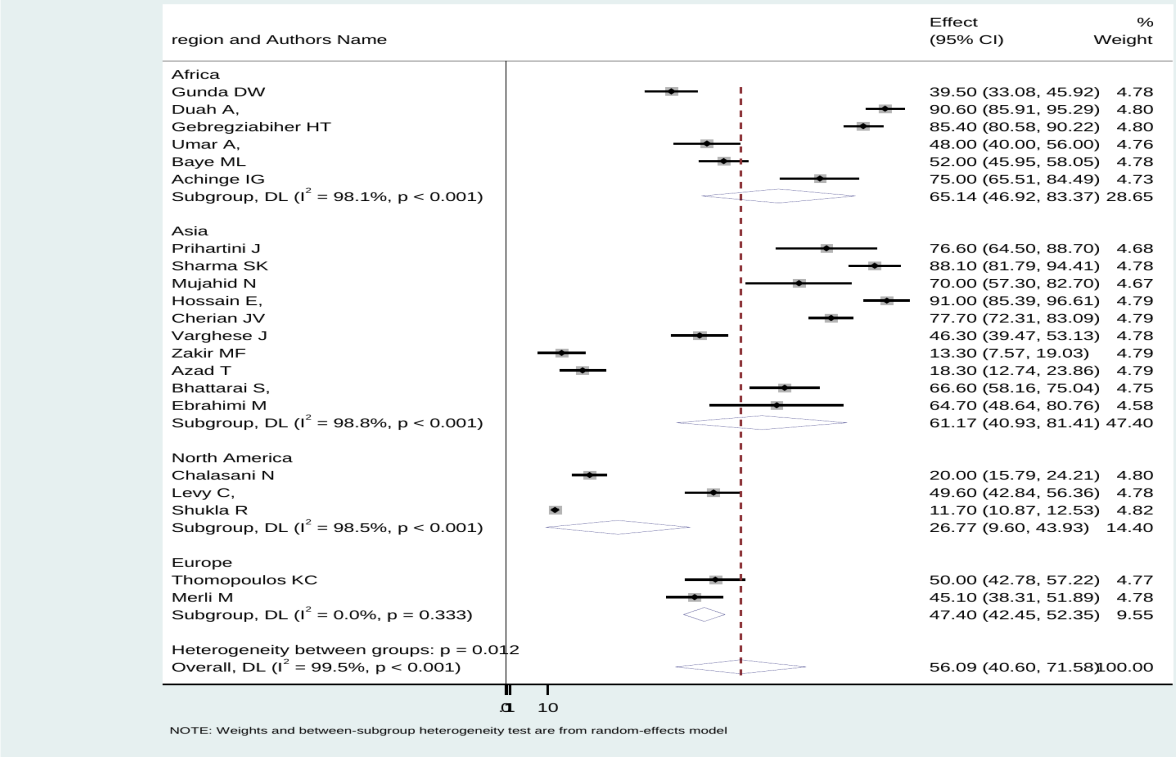



**Figure 3. Subgroup analysis of pooled magnitude of variceal bleeding among Patients with cirrhosis**

## Meta-regression and publication bias

Meta-regression was conducted using year of publication and sample size as a covariates to identify source of heterogeneity. The analysis showed that publication year and sample size didn't have a significant effect on heterogeneity between studies, with a P- value of 0.435 and 0.227 respectively (Table 2). Publication bias was assessed using visual inspection of the funnel plot and Egger's regression test. Evidence of publication bias was identified,

as the funnel plot showed asymmetry and Egger's regression test was statistically significant (P < 0.001) (Fig. 4). Therefore, the trim-and-fill analysis was conducted and the adjusted funnel plot appeared symmetrical.

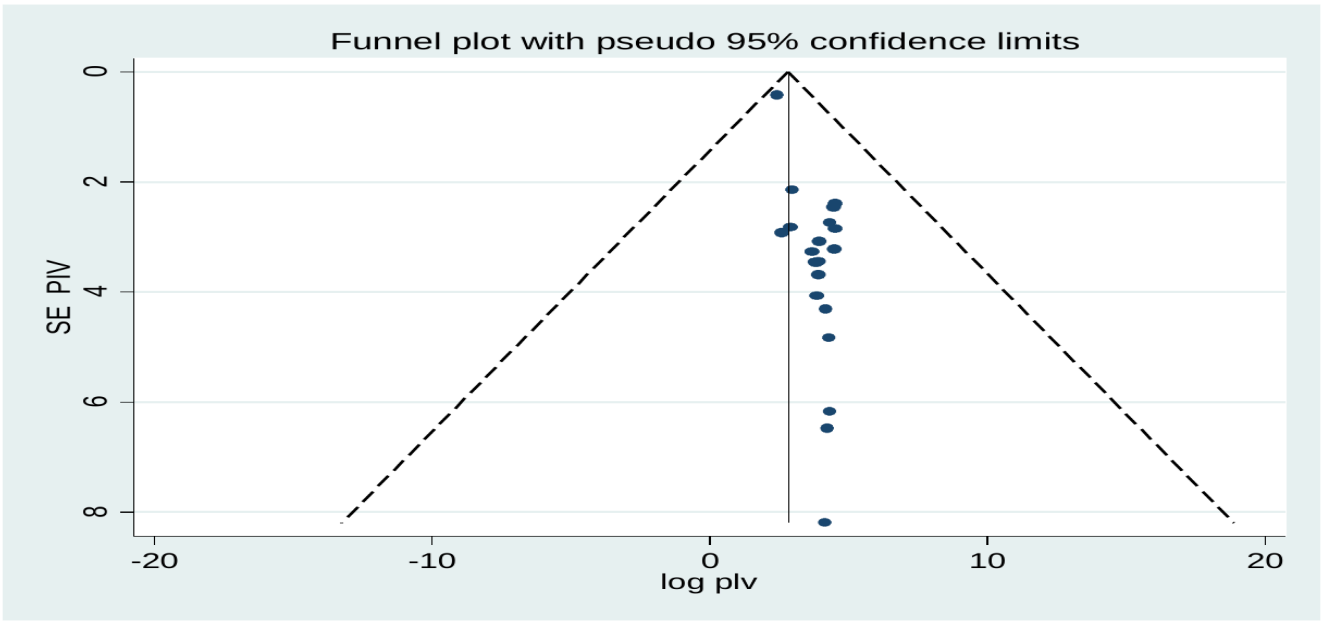



**Figure 4. Funnel plot to test publication bias in 21 studies with 95% confidence limits**

**Table 2. Meta-regression analysis of factors affecting between-study heterogeneity**

| Prevalence | Coefficient | Std error | T | P>\|t\| | [95% Conf. Interval] |
|---|---|---|---|---|---|
| Sample size | -.0031687 | .0025306 | -1.25 | 0.227 | -.0084853 - .002148 |
| Publication year | -.6290461 | .7875379 | -0.80 | 0.435 | -2.283602 - 1.02551 |
| Constant | 1297.928 | 1588.432 | 0.82 | 0.425 | -2039.243-4635.1 |

### Sensitivity analysis

Sensitivity analysis was performed to determine how various sources of uncertainty contribute to the overall uncertainty among the studies, but the results indicated that uncertainty has an insignificant influence on pooled prevalence (Fig. 5).

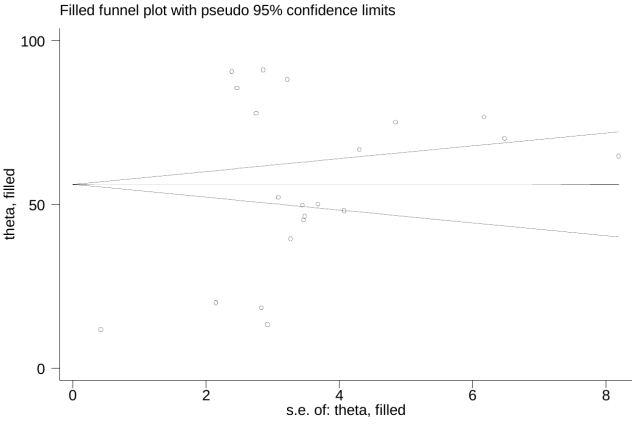



**Figure 5. Funnel plot to test publication bias in 21 studies with 95% confidence limits trim and fill-analysis**

## Discussion

Variceal bleeding represents one of the most severe and life-threatening decompensating events in patients with liver cirrhosis, reducing directly from the progressive elevation of portal venous pressure and the subsequent formation of fragile portosystemic collateral vessels [48, 49]. The clinical trajectory following a variceal bleed is frequently complicated by hemodynamic instability, recurrent hemorrhage, hepatic encephalopathy, and secondary systemic infections, all of which contribute significantly to the global burden of liver-related morbidity and mortality [50, 51].

On this systematic review and meta-analysis the pooled global proportion of magnitude of variceal bleeding was found to be 56.0% (95% CI: 40.6-71.5). This finding is higher than a similar study conducted in Sub-Saharan Africa 46.1% [52]. This discrepancy is might be associated with of healthcare infrastructure limitations, clinical variations, study methodologies; differences in the underlying etiology and baseline care of portal hypertension.

The subgroup analysis based on geographic region revealed substantial variability in the pooled prevalence of variceal bleeding among target populations, ranging from 26.7% in North America to 66.1% in Africa. This marked disparity highlights the critical role that regional healthcare infrastructure, underlying disease etiology, and access to prophylactic interventions play in influencing gastrointestinal complications.

The high magnitude of variceal bleeding observed in the African region (66.1%; 95% CI: 46.9%–83.3%) aligns with broader epidemiological trends regarding chronic liver disease across the continent. In many sub-Saharan African nations, endemic infectious etiologies specifically chronic hepatitis B and C virus infections, alongside schistosomiasis drive a disproportionately high burden of liver cirrhosis and non-cirrhotic portal hypertension [53-55]. Furthermore, limited access to timely diagnostic endoscopy, delayed presentation of liver disease, and restricted availability of primary prophylactic measures [56]. In contrast, the lower prevalence observed in North America (26.7%; 95% CI: 9.6%–43.9%) might be due to advanced clinical screening pathways, widespread access to early interventions and adherence to clinical guidelines [57-59].

## Limitation of the study

This systematic review and meta-analysis has several limitations. High statistical heterogeneity across the included primary studies restricts the generalizability of the overall pooled estimate. Additionally, the geographic distribution of eligible studies was uneven, leading to underrepresentation of certain regions and potential geographic bias. Lastly, potential publication must be acknowledged.

## Conclusion

According to this systematic review and meta-analysis variceal bleeding is a critical global health concern, which affects over half of the targeted popu-

lation globally. The region based analysis showed significant geographic disparities ranging from 26.7% in North America to 66.1% in Africa. Therefore tailored public health strategies, enhanced access to prophylactic treatment and strengthened healthcare infrastructure is essential to decrease the burden of the disease.

## Disclosure:

**Ethical Considerations.** Ethical approval was not required because this study did not involve direct interaction with human participants.

**Consent for publication.** Not applicable

**Availability of data and materials.** The data analyzed during the current systematic review and meta-analysis is available with reasonable request from corresponding author.

**Competing interests.** All the authors declare that they have no competing interests

**Funding.** The authors received no specific funding for this work

**Acknowledgment.** We would like to thank all authors of studies included in this systematic review and meta-analysis.

## References

1. Liu YB, Chen MK. Epidemiology of liver cirrhosis and associated complications: Current knowledge and future directions. *World Journal of Gastroenterology*. 2022 Nov 7;28(41):5910–5930. https://doi.org/10.3748/wjg.v28.i41.5910
2. Berumen J, Baglieri J, Kisseleva T, Mekeel K. Liver fibrosis: Pathophysiology and clinical implications. *WIREs Mechanisms of Disease*. 2021 Jan;13(1):e1499. https://doi.org/10.1002/wsbm.1499
3. van der Meer AJ, Feld JJ, Hofer H, Almasio PL, Calvaruso V, Fernández-Rodríguez CM, Aleman S, Ganne-Carrié N, D'Ambrosio R, Pol S, Trapero-Marugan M. Risk of cirrhosis-related complications in patients with advanced fibrosis following hepatitis C virus eradication. *Journal of Hepatology*. 2017 Mar 1;66(3):485–493. https://doi.org/10.1016/j.jhep.2016.10.017
4. Sharma A, Nagalli S. Chronic liver disease. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jul 3. https://www.ncbi.nlm.nih.gov/books/NBK554597/
5. Mannion R, Fitzpatrick E. Systemic complications secondary to chronic liver disease. *Indian Journal of Pediatrics*. 2024 Mar;91(3):286–293. https://doi.org/10.1007/s12098-023-04694-7
6. Gralnek IM, Garcia-Pagan JC, Hernández-Gea V. Challenges in the management of esophagogastric varices and variceal hemorrhage in cirrhosis – A narrative review. *The American Journal of Medicine*. 2024 Mar 1;137(3):210–217. https://doi.org/10.1016/j.amjmed.2023.12.001
7. Raţiu I, Lupuşoru R, Popescu A, Sporea I, Goldiş A, Dănilă M, Miuţescu B, Moga T, Barbulescu A, Şirli R. Acute gastrointestinal bleeding: A comparison between variceal and nonvariceal gastrointestinal bleeding. *Medicine*. 2022 Nov 11;101(45):e31543. https://doi.org/10.1097/MD.0000000000031543
8. Cho H, Nagata N, Shimbo T, Sakurai T, Sekine K, Okubo H, Imbe K, Watanabe K, Mikami S, Yokoi C, Kobayakawa M. Recurrence and prognosis of patients emergently hospitalized for acute esophageal variceal bleeding: A long-term cohort study. *Hepatology Research*. 2016 Dec;46(13):1338–1346. https://doi.org/10.1111/hepr.12692
9. Alqahtani SA, Jang S. Pathophysiology and management of variceal bleeding: SA Alqahtani. *Drugs*. 2021 Apr;81(6):647–667. https://doi.org/10.1007/s40265-021-01493-2
10. Yaru H, Mei Z, Kaixin L, Ruyue C, Mingshu L. Predictive factors for re-bleeding of esophageal varices in hospitalized patients. *Cellular and Molecular Biology*. 2022 Feb 28;68(2):183–188. https://doi.org/10.14715/cmb/2022.68.2.26
11. Meseeha M, Tian C, Attia M. Esophageal varices. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 Mar 9.
12. Costa D, Ielapi N, Minici R, Peluso A, Bracale UM, Andreucci M, Serra R. Risk factors for bleeding varicose veins in patients with chronic venous disease. *Medicina*. 2023 May 27;59(6):1034. https://doi.org/10.3390/medicina59061034
13. Carneiro de Moura M, Chen S, Kamath BM, Ng VL, Ling SC. Acute variceal bleeding causes significant morbidity. *Journal of Pediatric Gastroenterology and Nutrition*. 2018 Sep;67(3):371–376. https://doi.org/10.1097/MPG.0000000000002039
14. Kim JH, Im CB, Lee SS, Jeon H, Choi JW, Kim HJ, Cha RR, Cho HC, Lee JM, Ha CY, Kim HJ. Impact of acute kidney injury on mortality in patients with acute variceal bleeding. *BMC Gastroenterology*. 2021 Jul 13;21(1):290. https://doi.org/10.1186/s12876-021-01862-x
15. Haq I, Tripathi D. Recent advances in the management of variceal bleeding. *Gastroenterology Report*. 2017 May 1;5(2):113–126. https://doi.org/10.1093/gastro/gox007
16. Mohanty A, Garcia-Tsao G. Management of acute variceal bleeding. *Clinical Liver Disease*. 2024 Jun 28;23(1):e0176. https://doi.org/10.1097/CLD.0000000000000176
17. Boregowda U, Umapathy C, Halim N, Desai M, Nanjappa A, Arekapudi S, Theethira T, Wong H, Roytman M, Saligram S. Update on the management of gastrointestinal varices. *World Journal of Gastrointestinal Pharmacology and Therapeutics*. 2019 Jan 21;10(1):1–21. https://doi.org/10.4292/wjgpt.v10.i1.1
18. Sharma M, Singh S, Desai V, Shah VH, Kamath PS, Murad MH, Simonetto DA. Comparison of therapies for primary prevention of esophageal variceal bleeding: A systematic review and network meta-analysis. *Hepatology*. 2019 Apr;69(4):1657–1675. https://doi.org/10.1002/hep.30220
19. Singh S, Chandan S, Vinayek R, Aswath G, Facciorusso A, Maida M. Comprehensive approach to esophageal variceal bleeding: From prevention to treatment. *World Journal of Gastroenterology*. 2024 Nov 21;30(43):4602. https://doi.org/10.3748/wjg.v30.i43.4602
20. Krige J, Jonas E, Kotze U, Kloppers C, Gandhi K, Allam H, Bernon M, Burmeister S, Setshedi M. Defining the advantages and exposing the limitations of endoscopic variceal ligation in controlling acute bleeding and achieving complete variceal eradication. *World Journal of Gastrointestinal Endoscopy*. 2020 Oct 16;12(10):365–380. https://doi.org/10.4253/wjge.v12.i10.365
21. Battle A, Mudd J, Ahlenstiel G, Kalo E. Liver cirrhosis: Evolving definitions, and recent advances in diagnosis, prevention and management. *Livers*. 2025 Jun 25;5(3):28. https://doi.org/10.3390/livers5030028
22. Lv Y, Yang Z, Liu L, Li K, He C, Wang Z, Bai W, Guo W, Yu T, Yuan X, Zhang H. Early TIPS with covered stents versus standard treatment for acute variceal bleeding in patients with advanced cirrhosis: A randomised controlled trial. *The Lancet Gastroenterology & Hepatology*. 2019 Aug 1;4(8):587–598. https://doi.org/10.1016/S2468-1253(19)30090-1
23. Daðadóttir SM, Ingason AB, Hreinsson JP, Björnsson ES. Comparison of gastrointestinal bleeding in patients with and without liver cirrhosis. *Scandinavian Journal of Gastroenterology*. 2024 Sep 1;59(9):1081–1086. https://doi.org/10.1080/00365521.2024.2386451
24. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*. 2021 Mar 29;372:n71. https://doi.org/10.1136/bmj.n71
25. Munn Z, Moola S, Lisy K, Riitano D, Tufanaru C. Systematic reviews of prevalence and incidence. In: Joanna Briggs Institute Reviewer's Manual. Adelaide, South Australia: The Joanna Briggs Institute; 2017:5.1–5.
26. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analysis. *BMJ*. 2003;327(7414):557–560. https://doi.org/10.1136/bmj.327.7414.557
27. Gunda DW, Kilonzo SB, Mamballah Z, Manyiri PM, Majinge DC, Jaka H, Kidenya BR, Mazigo HD. The magnitude and correlates of esophageal varices among newly diagnosed cirrhotic patients undergoing screening fibre optic endoscope before incident bleeding in North-Western Tanzania: A cross-sectional study. *BMC Gastroenterology*. 2019 Nov 29;19(1):203. https://doi.org/10.1186/s12876-019-1123-9
28. Duah A, Nkrumah KN, Tachi K. Oesophageal varices in patients with liver cirrhosis attending a major tertiary hospital in Ghana. *Pan African Medical Journal*. 2018 Dec 13;31(1). https://doi.org/10.11604/pamj.2018.31.230.16657
29. Prihartini J, Lesmana LA, Manan C, Gani RA. Detection of esophageal varices in liver cirrhosis using non-invasive parameters. *Indonesian Journal of Internal Medicine*. 2005 Jul;37(3).
30. Gebregziabiher HT, Hailu W, Abay Z, Bizuneh S, Meshesha MD. Accuracy of non-invasive diagnosis of esophageal varices among cirrhotic patients in a low-income setting. *Heliyon*. 2023 Dec 1;9(12):e23229. https://doi.org/10.1016/j.heliyon.2023.e23229
31. Chalasani N, Imperiale TF, Ismail A, Sood G, Carey M, Wilcox CM, Madichetty H, Kwo PY, Boyer TD. Predictors of large esophageal varices in patients with cirrhosis. *The American Journal of Gastroenterology*. 1999 Nov 1;94(11):3285–3291. https://doi.org/10.1111/j.1572-0241.1999.1539_a.x
32. Thomopoulos KC, Labropoulou-Karatza C, Mimidis KP, Katsakoulis EC, Iconomou G, Nikolopoulou VN. Non-invasive predictors of the presence of large oesophageal varices in patients with cirrhosis. *Digestive and Liver Disease*. 2003 Jul 1;35(7):473–478. https://doi.org/10.1016/S1590-8658(03)00219-6
33. Umar A, Qazi F, Sattar RA, Umar B. Non-invasive parameters for the detection of variceal bleed in patients of liver cirrhosis, an experience of a tertiary care hospital in Pakistan. *Asian Journal of Medical Sciences*. 2015;6(1):61.
34. Sharma SK, Aggarwal R. Prediction of large esophageal varices in patients with cirrhosis of the liver using clinical, laboratory and imaging parameters. *Journal of Gastroenterology and Hepatology*. 2007 Nov;22(11):1909–1915. https://doi.org/10.1111/j.1440-1746.2006.04501.x
35. Mujahid N, Aithal K. A study of non-invasive predictors of esophageal varices in patients with cirrhosis of liver – A cross-sectional study. *Asian Journal of Medical Sciences*. 2024 Aug 3;15(8):73–78. https://doi.org/10.71152/ajms.v15i8.3731

36. Hossain E, Ahammed F, Saha SK, Foez SA, Rahim MA, Noor-e-Alam SM, Abdullah AS. Screening of esophageal varices by noninvasive means in chronic liver disease. *Euroasian Journal of Hepato-Gastroenterology*. 2018 May 1;8(1):18–22. https://doi.org/10.5005/jp-journals-10018-1252

37. Cherian JV, Deepak N, Ponnusamy RP, Somasundaram A, Jayanthi V. Non-invasive predictors of esophageal varices. *Saudi Journal of Gastroenterology*. 2011 Jan;17(1):64–68. https://doi.org/10.4103/1319-3767.74470

38. Levy C, Zein CO, Gomez J, Soldevila-Pico C, Firpi R, Morelli G, Nelson D. Prevalence and predictors of esophageal varices in patients with primary biliary cirrhosis. *Clinical Gastroenterology and Hepatology*. 2007 Jul 1;5(7):803–808. https://doi.org/10.1016/j.cgh.2007.02.031

39. Merli M, Nicolini G, Angeloni S, Rinaldi V, De Santis A, Merkel C, Attili AF, Riggio O. Incidence and natural history of small esophageal varices in cirrhotic patients. *Journal of Hepatology*. 2003 Mar 1;38(3):266–272. https://doi.org/10.1016/S0168-8278(02)00420-8

40. Baye ML, Abay Z, Tesfaye T, Ahmed E, Arage G, Zewude EA, Anley DT. Gastroesophageal variceal hemorrhage in patients with chronic liver diseases attending University of Gondar Specialized Comprehensive Hospital in Ethiopia: Institutional-based cross-sectional study. *Heliyon*. 2023 Apr 1;9(4):e15133. https://doi.org/10.1016/j.heliyon.2023.e15133

41. Achinge IG, Malu AO, Okeke EN, Agaba EI, Misauno MA. Prevalence of oesophageal varices in newly diagnosed chronic liver disease patients at the Jos University Teaching Hospital, Jos. *Nigerian Medical Journal*. 2011 Apr;52(2):128–132.

42. Shukla R, Kramer J, Cao Y, Ying J, Tansel A, Walder A, Advani S, El-Serag HB, Kanwal F. Risk and predictors of variceal bleeding in cirrhosis patients receiving primary prophylaxis with non-selective beta-blockers. *Official Journal of the American College of Gastroenterology*. 2016 Dec 1;111(12):1778–1787. https://doi.org/10.1038/ajg.2016.440

43. Varghese J, Cherian JV, Solomon R, Jayanthi V. Predictors of variceal bleed among patients with liver cirrhosis in the era of sclerotherapy. *Singapore Medical Journal*. 2008 Mar 1;49(3):239.

44. Zakir MF, Afzal A, Kalwar HA, Mujtaba G, Karim S, Hussain M. Gastric variceal bleeding in patients of liver cirrhosis with portal hypertension. *Pakistan Armed Forces Medical Journal*. 2024 Jun 30;74(3):812. https://doi.org/10.51253/pafmj.v74i3.8524

45. Azad T, Umair M, Alam S, Ibrar A, Manan F. Prevalence of gastric varices in cirrhotic patients presenting with upper GI bleed at Shifa International Hospital: An insidious threat. *The Egyptian Journal of Internal Medicine*. 2025 Nov 26;37(1):180. https://doi.org/10.1186/s43162-025-00573-z

46. Bhattarai S, Dewan KR, Shrestha G, Patowary BS. Spectrum of upper gastrointestinal bleed in patients with cirrhosis of liver. *Journal of College of Medical Sciences-Nepal*. 2017 Oct 19;13(3):318–322. https://doi.org/10.3126/jcmsn.v13i3.17938

47. Ebrahimi M, Reihani H, Sheikhian M, Bolvardi E, Pashayi M, Pishbin E. Re-bleeding in patients with cirrhosis: Evaluation of esophageal and gastric variceal bleeding and their relationship with a model for the end-stage liver disease (MELD) score and Child-Pugh score. *Razavi Journal of Medicine*. 2014 Apr 1;2(2). https://doi.org/10.5812/rijm.16324

48. Abby Philips C, Sahney A. Oesophageal and gastric varices: Historical aspects, classification and grading: Everything in one place. *Gastroenterology Report*. 2016 Aug 1;4(3):186–195. https://doi.org/10.1093/gastro/gow018

49. Mantovani A, Tsochatzis EA. Epidemiology of varices and variceal bleeding in liver cirrhosis. In: Variceal Bleeding in Liver Cirrhosis. Singapore: Springer Singapore; 2020 Nov 3:1–11.

50. Yahaya JJ, Abraham ZS. Haemorrhagic shock leading to death due to ruptured esophageal varices: An autopsy-based case report. *Annals of Medicine and Surgery*. 2022 Jun 1;78:103932. https://doi.org/10.1016/j.amsu.2022.103932

51. Damink SO, Dejong CH, Deutz NE, Van Berlo CL, Soeters PB. Upper gastrointestinal bleeding: An ammoniagenic and catabolic event due to the total absence of isoleucine in the haemoglobin molecule. *Medical Hypotheses*. 1999 Jun 1;52(6):515–519. https://doi.org/10.1054/mehy.1998.0026

52. Taye B, Ayele YY, Achenef DN, Abeje G, Yirdaw AK. Burden and determinants of upper gastrointestinal bleeding in cirrhotic patients: Evidence from Sub-Saharan Africa, 2024. *BMC Gastroenterology*. 2025 Sep 29;25(1):679. https://doi.org/10.1186/s12876-025-04298-9

53. Al Ta'ani O, Aleyadeh W, Al-Ajlouni Y, Alnimer L, Ismail A, Natour B, Njei B. The burden of cirrhosis and other chronic liver disease in the Middle East and North Africa (MENA) region over three decades. *BMC Public Health*. 2024 Oct 28;24(1):2979. https://doi.org/10.1186/s12889-024-20445-5

54. Sticher JS, Csermak KR, Otsyula N, Turkson M, Aubrun E, Oshagbemi OA. Prevalence of viral hepatitis in sub-Saharan Africa among the general population: An umbrella review of systematic reviews and meta-analyses. *BMJ Open*. 2025 Sep;15(9):e101029. https://doi.org/10.1136/bmjopen-2025-101029

55. Buonfrate D, Ferrari TC, Adegnika AA, Stothard JR, Gobbi FG. Human schistosomiasis. *The Lancet*. 2025 Feb 22;405(10479):658–670. https://doi.org/10.1016/S0140-6736(24)02814-9

56. Opio CK, Rejani L, Kazibwe F, Ocama P. The diagnostic accuracy of routine clinical findings for detection of esophageal varices in rural sub-Saharan Africa where schistosomiasis is endemic. *African Health Sciences*. 2019 Dec;19(4):3225–3234. https://doi.org/10.4314/ahs.v19i4.46

57. Jakab SS, Garcia-Tsao G. Screening and surveillance of varices in patients with cirrhosis. *Clinical Gastroenterology and Hepatology*. 2019 Jan 1;17(1):26–29. https://doi.org/10.1016/j.cgh.2018.03.012

58. Garcia-Tsao G, Abraldes JG, Berzigotti A, Bosch J. Portal hypertensive bleeding in cirrhosis: Risk stratification, diagnosis, and management: 2016 practice guidance by the American Association for the Study of Liver Diseases. *Hepatology*. 2017 Jan 1;65(1):310–335. https://doi.org/10.1002/hep.28906

59. Liu YB, Chen MK. Epidemiology of liver cirrhosis and associated complications: Current knowledge and future directions. *World Journal of Gastroenterology*. 2022 Nov 7;28(41):5910–5930. https://doi.org/10.3748/wjg.v28.i41.5910

INTERNATIONAL STANDARD SERIAL NUMBER

Crossref

CC BY

**Submit your manuscript to Boston science publishing journal and benifit from:**

- Convenient online submission
- Rigorous peer review
- Immediate publication on acceptance
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

Submit your manuscript at
submission@bostonsciencepublishing.com