RETROSPECTIVE COHORT STUDY

Overall Survival and the Impact of Albumin-bilirubin Grade in Patients with Advanced Hepatocellular Carcinoma: Data from a Tertiary Care Hospital in a Lower-middle-income Country

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Abstract

Background and aim: Hepatocellular carcinoma (HCC) is a leading cause of cancer-related deaths worldwide. Most patients are diagnosed at an advanced stage, limiting their treatment options. The traditional assessment of liver function using the Child–Pugh score has limitations due to its subjectivity. The albumin-bilirubin (ALBI) grade delivers a more precise evaluation of liver function. This study examines overall survival (OS) in advanced HCC patients treated with first-line systemic therapy and the impact of ALBI grading on these outcomes.

Materials and methods: A total of 104 patients with advanced HCC treated between January 2017 and December 2023 with one of the three first-line therapy options: Sorafenib, lenvatinib or atezolizumab/bevacizumab were retrospectively analyzed. The Kaplan–Meier method was utilized to examine the survival results, and the log-rank test was employed to evaluate the variations in survival among ALBI grades and therapy types. Cox proportional hazards regression examined the impact of ALBI grading and other covariates on OS, with a significance threshold of $p < 0.05$ for the multivariable model.

Results: The median age of HCC patients was 58.5 years, with 70% males, and a primary etiology of hepatitis C (43%). The median OS and time to progression (TTP) in this cohort were 9 months and 3.25 months. In ALBI grade I patients, the OS was 21 months, while in grade II or III patients, it was just 5 months. Treatment-related side effects necessitated dose reductions in over 84% of patients. Albumin-bilirubin grade, Child–Pugh class, and treatment modifications due to adverse effects were significant predictors of survival.

Conclusion: Lenvatinib appears to have better survival outcomes compared to other options. The albumin-bilirubin grading is a useful method for evaluating liver function and forecasting survival rates for individuals with HCC.

Clinical significance: Our findings support the use of ALBI grading in clinical decision-making for advanced HCC.

Keywords: Albumin-bilirubin grade, Child–Pugh score, First-line systemic therapy, Hepatocellular carcinoma, Overall-survival.

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Introduction

Hepatocellular carcinoma (HCC), the second most common cause of cancer-related death worldwide after lung cancer, is responsible for about 80–90% of primary liver cancer cases.[1,2] Southeast and East Asia have the highest rates of HCC. This area has a high prevalence of chronic hepatitis B infection, and more than half of all cases of HCC worldwide are recorded from this region.[3] Hepatocellular carcinoma has a 5-year overall survival (OS) rate of over 18%, whereas it is only 2% for metastatic disease.[4] According to GLOBOCAN, 6,121 new cases of HCC were diagnosed and 5,885 deaths reported in Pakistan in 2022, contributing to 5% of deaths related to cancer in the country.[2,5] Furthermore, in Pakistan, 60% of HCC deaths are attributable to hepatitis C virus, in contrast to other Asia-Pacific countries where hepatitis B is the most commonly reported cause.[6] Despite this, due to the lack of a national cancer surgery, sophisticated screening programs and limited treatment facilities, HCC cases in Pakistan are underestimated, the actual situation is expected to be far worse.[7]

Treatment options for early-stage HCC include ablation, transplantation, and surgical resection. Despite this, 70% of patients still experience disease recurrence within 5 years, and many only qualify for systemic therapy owing to progressive disease at diagnosis.[8] Until lenvatinib's approval in 2018, For 10 years, sorafenib was the only available first-line treatment option, offering some improvement in OS.[9,10] In the REFLECT trial, lenvatinib showed non-inferiority to sorafenib and had a better side effect profile.[11] Combination therapies, such as atezolizumab with bevacizumab and tremelimumab plus durvalumab, were made possible by

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recent advancements in therapy, which have also shown improved survival compared to first-line sorafenib and are preferred choices for appropriate candidates over single-agent tyrosine kinase inhibitors (TKIs).[12,13]

Prior to the initiation of systemic therapy for newly diagnosed HCC patients, liver function assessment, and Child–Pugh Score are routinely performed to evaluate the severity of liver disease, guide treatment decisions, and predict patient prognosis. The Child–Pugh score is measured using liver function tests and clinical signs of encephalopathy and ascites, which pose challenges of subjective assessment and inter-observer variability.[14] Therefore, before beginning therapy, it is essential to evaluate liver function in such individuals using a more straightforward and objective method. The albumin-bilirubin (ALBI) score, which is determined by applying the formula ALBI = (log10 bilirubin × 0.66) + (albumin × −0.085), divides patients into three classes: grade I (≤ −2.60), grade II (−2.60 to < −1.39), and grade III (> −1.39). This model, which has undergone thorough testing in a global context, offers a straightforward, objective, and evidence-based approach for evaluating liver function in HCC. It removes the necessity of subjective factors like encephalopathy and ascites, which are required for the conventional Child–Pugh classification.[15] Patients with chronic liver disease (CLD) have shown the prognostic value of the ALBI grade, which is comparable to the Child–Pugh score in terms of forecasting in-hospital mortality. Additionally, ALBI has demonstrated potential for forecasting the results of treatment for patients with HCC undergoing trans-arterial chemoembolization and surgical resection.[16]

To the best of our knowledge, Pakistan has not published any data on the results of patients with HCC receiving first-line systemic therapy. Our objectives in this study with advanced HCC undergoing first-line systemic treatments are to determine the impact of baseline ALBI grade on patient OS.

Materials and Methods

We conducted a retrospective, descriptive observational study at the Aga Khan University Hospital (AKUH) in Karachi, Pakistan, from January 2017 to June 2024. Waiver of exemption was obtained from the hospital's ethical review committee (approved number 2023-8577-24468, April 10, 2023). Participants with a radiologically or pathologically confirmed diagnosis of HCC that was unresectable due to significant bilobar involvement, inadequate reserve for hepatic function, extrahepatic dissemination or tumor invasion of main vessels, an Eastern Cooperative Oncology Group (ECOG) performance status score of 2 or below, Child–Pugh class A or B, and at least one untreated target lesion quantifiable according to RECIST were included. Patients who had previously undergone systemic therapy for HCC or had a second concomitant tumor were excluded from the study. Patients had received one of three treatment options: sorafenib (400–800 mg daily), lenvatinib (4–8 mg daily), or a combination of atezolizumab (15 mg/kg every 3 weeks) and bevacizumab (1200 mg every 3 weeks), with doses adjusted based on the patient's performance status and liver function. Treatment continued until disease progression, hepatic deterioration to Child–Pugh class C, unacceptable adverse events, or death. The response to treatment was assessed both clinically and through CT imaging every eight weeks, or according to the primary physician's discretion. Concurrent antiviral systemic therapy was permitted. The common terminology criteria for adverse occurrences (CTCAE) version 5 was used to record adverse occurrences.

Data was collated in Excel using a preset pro forma to ensure uniform data entry and retrieval from patient-health records. After collection, the data was checked for consistency and completeness. The original data was stored in password protected files, while a separate coded and de-identified data file was created for analysis. Stata version 15.1 was used for the statistical analyses. The median and interquartile range (IQR) was computed to report quantitative variables (e.g., age) whereas categorical variables were reported using frequencies and percentages (e.g., sex, ECOG). To address data sparsity, possible, categories including ALBI grades II and III, were merged. Survival analysis was conducted using the Kaplan–Meier method, and differences in survivor function across ALBI grades and treatment modalities were tested using the log-rank test ($p < 0.05$). Cox proportional hazards regression was used to examine the impact of ALBI grading and other covariates on OS, with a criterion of $p < 0.25$ set for inclusion in the multivariable model. Multicollinearity was assessed between covariates, followed by multivariable analysis with a significance level of $p < 0.05$. The proportional hazards assumption for the cox model was tested, and no violations were reported.

Results

We initially retrieved data for 172 patients from hospital health records. After applying the inclusion criteria, 68 patients were excluded from the analysis, resulting in a final sample size of 104 patients. The demographic and clinical data for these 104 patients are summarized in Table 1. The median age was 58.5 years, ranging

Table 1: Descriptive characteristics of patients with HCC

Variables	*Total N = 104 (%)*
Clinical characteristics	
Age (years)	58.5 (20–78)*
<60	56 (53.85)
≥60	48 (46.15)
Sex	
Male	73 (70.19)
Female	31 (29.81)
ECOG	
0	4 (3.85)
1	45 (43.27)
2	55 (52.88)
HCC etiology	
HBV	20 (19.23)
HCV	48 (46.15)
Non-viral	36 (34.62)
Comorbidities	
None	17 (16.35)
CLD only	30 (28.85)
CLD and Others	40 (38.46)
Other comorbidities	17 (16.35)
Ascites	
None	59 (56.73)
Mild-Moderate	45 (43.27)
Encephalopathy	
None	86 (82.69)
Mild-Moderate	18 (17.31)

(Contd...)

Table 1: *(Contd...)*

Variables	*Total N = 104 (%)*
Diagnosis of HCC	
Radiological	83 (79.81)
Histopathological	21 (20.19)
Macrovascular invasion	
Absent	18 (17.31)
Present	86 (82.69)
Extrahepatic metastasis	
Absent	38 (36.54)
Present	66 (63.46)
Previous treatment history	
TACE	38 (36.54)
TARE	2 (1.92)
RFA	6 (5.77)
Hepatic resection	7 (6.73)
Systemic treatment	
Sorafenib	56 (53.85)
Lenvatinib	31 (29.81)
Atezolizumab/Bevacizumab	17 (16.35)
Grade III-IV adverse events	69 (66.35)
Dose reductions	88 (84.62)
Treatment held due to adverse events	50 (48.08)

CLD, chronic liver disease; ECOG, eastern cooperative oncology group performance status; HCC, hepatocellular carcinoma; TACE, trans arterial chemoembolization; TARE, trans arterial radio-embolization; RFA, radiofrequency ablation; Atezolizumab-bevacizumab (Atezo/bev), International Units per Liter (IU/L) *Median and interquartile range

from 20 to 78 years. Among them, 70% were males. Hepatitis C virus was the most common cause of cancer, affecting 48 patients, followed by hepatitis B in 20 patients. Evaluation of ECOG performance status showed that 53% of patients belonged to ECOG 2, i.e., they were ambulatory and able to do self-care but were unable to carry out work-related activities. On clinical evaluation, 43% had mild to moderate ascites, 17% had mild-moderate encephalopathy and a majority of the patients had both macrovascular invasion (86 patients, 82.69%) and extrahepatic metastasis (66 patients, 63.64%). The cohort exhibited diverse comorbidities, with only CLD in 30 patients (28.85%) and CLD with other comorbidities in 40 patients (38.46%). About 56 patients (53.85%) underwent first-line therapy with Sorafenib, 31 (29.81%) with Lenvatinib and 17 (16.35%) with the atezolizumab/bevacizumab combination. Due to any grade of adverse events, 88 (84.62%) patients required dose reductions and interruptions, while 69 (66.35%) reported treatment-related side effects of grade 2 or higher.

The median OS of patients with HCC was 9 months (95% CI: 5–13) (Fig. 1), whereas the median time-to-progression (TTP) was 3.25 (IQR, 0.5–31) months. Out of 104, 25 patients (24%) were classified as ALBI grade I and 79 (76%) belonged to ALBI Grade II and III (only 4 patients belonged to grade III). In comparison, 75 patients (72.12%) were Child–Pugh class A, while 29 (27.88%) were Child–Pugh class B. All patients belonging to ALBI grade I were also Child–Pugh class A. However, 50 patients (63.29%) identified as ALBI grade II and III were Child–Pugh class A, while the remaining 29 (36.71%) were Child–Pugh class B as described in Table 2. The median OS for ALBI grade I patients was 21 (95% CI: 11–54) months, and for ALBI grade II and III patients, it was 5 (95% CI: 4–9) months, with a highly significant

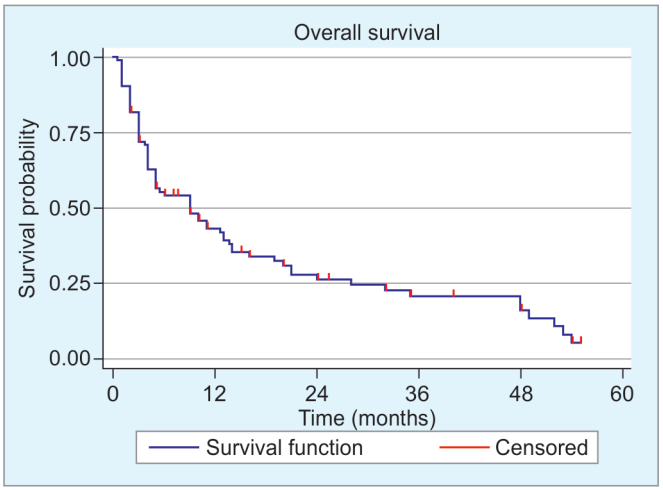

Fig. 1: Overall survival of HCC patients

Table 2: Crosstabulation of ALBI grade and Child–Pugh score

	Total n (%)	*ALBI grade I 25 (24.04)*	*ALBI grade II or III 79 (75.96)*
Child–Pugh			
A	75 (72.12)	25 (100)	50 (63.29)
B	29 (27.88)	–	29 (36.71)

ALBI, albumin-bilirubin grade. Only 4 patients met ALBI grade III criteria

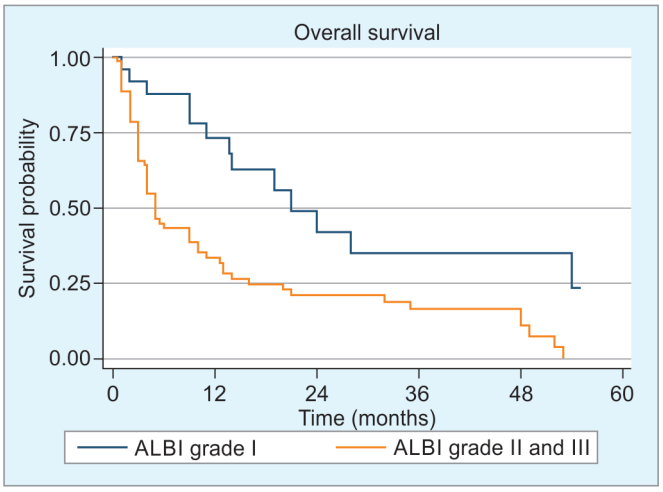

Fig. 2: Overall survival with respect to ALBI grade (Log rank $p = 0.0005$)

difference among groups ($p < 0.001$) (Fig. 2). In contrast, for Child Pugh class A it was 11 (95% CI: 5.5–20) months, and for Child Pugh class B patients, it was 5 (95% CI: 3–9) months. The median TTP for ALBI grade I was 8 (IQR 1–28) months, and for grade II and III was III (0.5–31) months, while for Child Pugh class A it was 4 (IQR 1– 31) months and for class B it was 3 (IQR 0.5–11) months**.** Moreover, the median OS time for patients undergoing treatment with Sorafenib was 9 (95% CI: 4–13) months, Lenvatinib was 16 (95% CI: 5–28) months and Atezo/Bev was 5.5 (95% CI: 2–NR) months (Fig. 3). Time to progression for patients receiving Sorafenib was 3 (IQR 1–31) months, Lenvatinib 4 (IQR, 0.5–25) months, 3 (IQR, 1–14) months.

Furthermore, ALBI grading was compared with the side effects experienced by the patient as shown in Table 3. In this study,

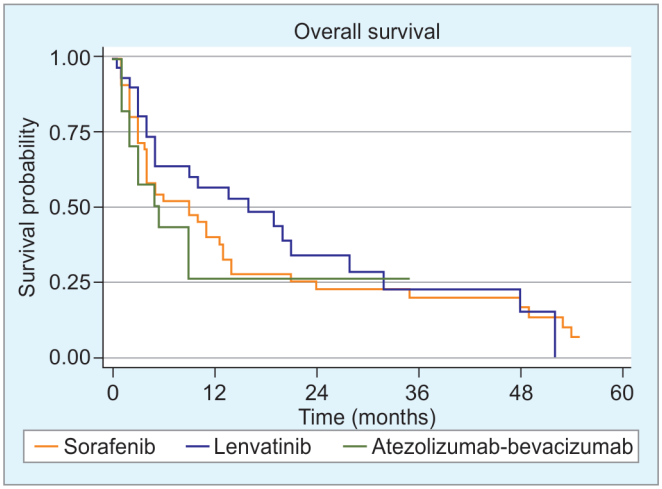

Fig. 3: Overall survival with regard to systemic treatment

Table 3: Adverse events in HCC patients as per ALBI grading

Adverse event	*Total n (%)*	*Grade I (n = 25)*	*Grade II or III (n = 79)*	*p-value**
Hypertension	14 (13.46)	5 (20)	9 (11.39)	0.31
Deranged LFTs	50 (48.08)	10 (40)	40 (50.63)	0.37
Mucositis	19 (18.27)	5 (20)	14 (17.72)	0.77
Hand-foot syndrome	18 (17.31)	4 (16)	14 (17.72)	1
Diarrhea	2 (1.92)	–	2 (2.53)	1
UGIB	5 (4.81)	2 (8)	3 (3.80)	0.59
Pancreatitis	1 (0.96)	1 (4)	–	0.24

ALBI, albumin-bilirubin grade; UGIB, upper gastrointestinal bleeding. *Computed with Fisher's exact test ($p < 0.05$)

50 patients, (48.08%) had deranged LFTs, 19 (18.27%) developed mucositis, 18 (17.31%) had hand-foot syndrome, 14 (13.46%) experienced hypertension, 5 (4.81%) had upper gastrointestinal bleed (UGIB), only 2 (1.92%) had diarrhea, and only 1 patient developed pancreatitis. The associations between higher grade ALBI and adverse events were not statistically significant. In addition, we compared side effects concerning treatment modality. The most commonly reported side effects by patients undergoing treatment with Sorafenib were deranged LFTs (51.79%), followed by hand-foot syndrome (28.57%) and mucositis (21.43%). Similarly, 45% of patients receiving lenvatinib reported deranged LFTs, while 22.58% reported mucositis. Only 17 patients received Atezo/Bev, and 7 (41.18%) had abnormal liver function tests, as shown in Table 4.

In univariate analysis, ALBI grade (HR 2.81, 95% CI: 1.49–5.25), Child–Pugh class (HR 1.98, 95% CI: 1.18–3.31), and presence of extra-hepatic metastasis affected OS (HR 2.12, 95% CI: 1.29–3.49). On multivariable analysis, we observed that patients classified as ALBI grades II and III have a significantly higher risk of death as compared to ALBI grade I patients 2.71 (HR 95% CI: 1.41–5.19) in the presence of extra-hepatic metastasis and if the treatment is withheld due to side-effects (Table 5).

Discussion

The objective of this retrospective study was to ascertain the OS of patients with advanced HCC in a population of Pakistanis who were

Table 4: Adverse events in patients undergoing first-line systemic treatment for HCC

Adverse event	*Total n (%)*	*Sorafenib (n = 56)*	*Lenvatinib (n = 31)*	*Atezo/Bev (n = 17)*
Hypertension	14 (13.46)	11 (19.64)	2 (6.45)	1 (5.88)
Deranged LFTs	50 (48.08)	29 (51.79)	14 (45.16)	7 (41.18)
Mucositis	19 (18.27)	12 (21.43)	7 (22.58)	–
Hand-food syndrome	18 (17.31)	16 (28.57)	1 (3.23)	1 (5.88)
Diarrhea	2 (1.92)	1 (1.79)	–	1 (5.88)
UGIB	5 (4.81)	1 (1.79)	2 (6.45)	2 (11.76)
Pancreatitis	1 (0.96)	1 (1.79)	–	–

LFTs, liver function tests, UGIB, upper gastrointestinal bleeding

Table 5: Univariate and multivariable analysis of covariates with overall survival in HCC patients

	Univariate		*Multivariable*	
Characteristics	*cHR*	*95% CI*	*aHR*	*95% CI*
ALBI grade				
Grade I	Ref	Ref		
Grade II and II	2.81	1.49–5.25	2.71	1.41–5.19
Age	0.99	0.97–1.02	–	–
Sex				
Female	Ref	Ref		
Male	0.91	0.56–1.47	–	–
ECOG				
0	Ref	Ref		
1	0.46	0.13–1.56		
2	0.72	0.22–2.36	–	–
HCC Etiology				
Non-viral	Ref	Ref		
HBV	1.01	0.52–1.91		
HCV	0.99	0.60–1.65	–	–
Comorbid				
None	Ref	Ref		
CLD only	0.95	0.47–1.92		
CLD and others	0.78	0.41–1.48		
Others	0.86	0.41–1.83	–	–
Child pugh score				
Class B	1.98	1.18–3.31	–	–
Extrahepatic metastasis				
Absent	Ref	Ref	Ref	Ref
Present	2.12	1.29–3.49	1.76	1.06–2.94
Macrovascular invasion				
Absent	Ref	Ref		
Present	1.30	0.72–2.33	–	–
Previous TACE				
No	Ref	Ref		
Yes	0.79	0.50–1.27	–	–
Previous TARE				
No	Ref	Ref		
Yes	0.73	1.02–5.33	–	–
Previous RFA				
No	Ref	Ref		
Yes	1.37	0.55–3.41	–	–

(Contd...)

Table 5: *(Contd...)*

	Univariate		*Multivariable*	
Characteristics	*cHR*	*95% CI*	*aHR*	*95% CI*
Previous hepatic resection				
No	Ref	Ref		
Yes	0.57	0.21–1.58	–	–
Systemic treatment				
Atezo/Bev	Ref	Ref		
Sorafenib	0.76	0.39–1.51		
Lenvatinib	0.61	0.29–1.28	–	–
Side Eeffects				
No	Ref	Ref		
Yes	1.08	0.66–1.77	–	–
Dose reduction				
No	Ref	Ref		
Yes	0.97	0.49–1.90	–	–
Treatment withheld				
No	Ref	Ref	Ref	Ref
Yes	1.66	1.05–2.62	1.93	1.21–3.09

LR2 = 25.16, $p < 0.001$, log-likehood = −280.03516. cHR, crude hazard's ratio; aHR, adjusted hazard's ratio; ALBI, albumin-bilirubin grade; MELD-Na, model for end stage liver disease – sodium; Atezo/bev, atezolizumab-bevacizumab

treated with sorafenib, lenvatinib, or atezolizumab/bevacizumab as first-line systemic therapy. Additionally, we investigated the impact of ALBI grading, Child–Pugh Score, and other covariates on patients' OS to better understand the factors influencing treatment outcomes. Typically, HCC prognosis depends on disease spread and liver function.[17,18] In our cohort, most patients had a significant disease burden, with macrovascular invasion in 82.69% and extrahepatic metastasis in 63.64% of participants. This disease progression is consistent with other studies, including the SHARP trial, which reported macrovascular invasion in about 50% and extrahepatic metastasis in around 40% of patients, reflecting a comparable disease profile.[19] Multivariable analysis revealed that ALBI grades II and III, extrahepatic metastasis, and adverse events leading to dose reductions were significant predictors of poor OS.[20] This highlights the importance of considering liver function and disease progression when selecting systemic therapy.[8]

For the total cohort, our data showed a median OS of 9 months and a median TTP of 3.25 months. The INSIGHT study, which looked at actual data on the diagnosis, treatment, and management of HCC in the Asia-Pacific area, found that the median OS for patients with Barcelona Clinic Liver Cancer (BCLC) stage C who were undergoing systemic therapy was 5.6 months, which was comparable to our OS data.[21] Furthermore, patients with ALBI Grade II in our study had a significantly longer median OS of 21 months compared to 5 months for those with ALBI grades II and III, highlighting ALBI grading's role as a predictor of response and survival with systemic therapy. In contrast, the IMbrave150 study reported a median OS of 15.4 months with sorafenib vs not estimable (NE) with atezolizumab + bevacizumab for ALBI grade I patients, and 11.7 months vs 12.2 months for ALBI grade II patients, respectively.[22] These findings underscore the variability in outcomes based on ALBI grading and treatment regimen. Similarly, the Child–Pugh score was a significant predictor of survival, with a median OS of 11 months for class A patients and 5 months for class B patients, consistent with the established understanding that patients with Child–Pugh class A generally have better outcomes. These results are comparable to those reported by Aly et al.[23] who found similar survival patterns for class A and B patients in a community oncology setting.

In our study, patients treated with lenvatinib had a median OS of 16 months, compared to 9 months with sorafenib and 5.5 months with atezolizumab combined with bevacizumab. This suggests that lenvatinib may offer better survival benefits for our population. These findings align with the REFLECT trial, which also suggested that lenvatinib provides superior survival advantages. In contrast, Lee et al. reported a median OS of 9.36 months with lenvatinib and 8.36 months with sorafenib in a Taiwanese population, which is lower than our results.[24] The lower OS in the atezolizumab/bevacizumab group may be multifactorial. The patient's baseline health status may have confounded the results, making it difficult to draw definitive conclusions. Patients in this cohort were generally frailer at the start of systemic therapy and had more comorbidities compared to the other two groups (with 5 out of 17 patients having 4 comorbidities and 3 out of 17 having 3, with an average number of comorbidities of 2.4 compared to less than 2 in the other two groups). This imbalance, coupled with the small sample size of this group, contributed to the lower survival outcomes in our study, while patients with better performance status (Child–Pugh class A or ALBI grade I) showed the highest OS rates, emphasizing the impact of baseline health on treatment outcomes.

We also looked into the adverse events associated with first-line therapy, with 66.35% of patients experiencing treatment-related adverse events of grades II or higher. Dose reductions were frequent and observed in 84.62% of cases. The most frequent drug-related adverse events were deranged liver enzymes, hypertension, hand-foot syndrome and mucositis, with sorafenib contributing to over half of these adverse events. This is consistent with international data, showing a similar side effect profile. Atezolizumab and bevacizumab appear to be the safest combinations compared to the TKIs. Despite this high incidence of side effects and dose modifications, the efficacy of the treatments remained relatively consistent, suggesting that dose adjustments are a viable strategy to manage toxicity without significantly compromising treatment outcomes. The correlation between ALBI grade and side effect severity was an important discovery. Although not statistically significant, we also observed that patients with higher ALBI grades experienced drastic side effects, which could impact their overall tolerance for therapy and quality of life. This observation warrants further investigation to better understand the implications of liver function on treatment toxicity and efficacy, and take into the consideration type of therapy and dose adjustments. For example, Sorafenib is known to contribute most to the derangement of liver enzymes, a TKI-free regimen (e.g., atezolizumab/bevacizumab) may be a better option for such patients.

Our emphasis on using the ALBI score instead of the Child–Pugh score is due to the fact that the ALBI provides a more objective assessment of liver function. In this study, ALBI grade I included only 25 patients, who appeared to have the best liver functions compared to other Child–Pugh class A patients, many of whom were graded ALBI II or III. This distinction helps identify a small subset of Child–Pugh class A patients who have the best prognosis and respond most favorably to systemic therapy. This underscores the point that not all Child–Pugh class A patients are the same in terms of liver function and prognosis. In summary, our findings demonstrate that the ALBI grade is a valuable predictive tool in

assessing survival outcomes for HCC patients receiving any of the first-line systemic therapy.[15,25]

To the best of our knowledge, this is the first study conducted in Pakistan to assess the prognostic significance of ALBI grade in HCC patients receiving atezolizumab/bevacizumab, lenvatinib, and sorafenib. Despite its advantages, our study had a few drawbacks. First of all, because it was a retrospective analysis, biases pertaining to patient selection and data accuracy may have been introduced. Second, although prior research suggests that the predictive usefulness of the ALBI grade II subgroups (grades II A and B) is significant, we did not explore this further. Thirdly, the fact that only one institution's data was gathered may have constrained how broadly applicable our conclusions might be. Finally, the atezolizumab/bevacizumab group in our trial had a limited sample size, which might have impacted how robustly our comparisons held up. Therefore, further prospective, interventional and randomized studies are needed to comprehensively establish the prognostic value of the ALBI score and the comparative effectiveness of these treatments in patients with advanced HCC.

Conclusion

In our cohort, lenvatinib offers a survival benefit over sorafenib and atezolizumab/bevacizumab, especially in individuals whose liver function has been better preserved, as seen by both Child–Pugh classification and ALBI grading. These results indicate that ALBI grading should be regarded as an independent predictor of survival in patients receiving first-line systemic therapy for HCC, and support its use in clinical decision-making as an alternative to the conventional Child–Pugh classification. Further research with larger cohorts and prospective trials is required to validate these results and refine treatment strategies for advanced HCC in Pakistan.

Clinical Significance

Our results indicate that ALBI grading could be a better tool for identifying a subset of Child–Pugh class A patients who would benefit most from systemic therapy, and they support the use of ALBI grading in clinical decision-making for advanced HCC. By using ALBI grading, patients in Pakistan may be better selected for systemic therapy and may have higher survival rates.

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