Published in final edited form as:

Expert Rev Gastroenterol Hepatol. 2020 October ; 14(10): 1007–1011.

doi:10.1080/17474124.2020.1802246.

Single center analysis of therapy and outcomes of Hepatocellular carcinoma in Sub-Saharan Africa: an Ethiopian Experience

Amir Sultan Seid^{1,*}, Chimaobi M. Anugwom^{2,*}, Zerihun Wondifraw¹, Grace A. Braimoh³, Abate Bane^{1,3}, Jose D. Debes^{2,3,4,*}

¹Addis Ababa University, College of Health Sciences, Ethiopia

²Division of Gastroenterology, Hepatology and Nutrition, University of Minnesota, Minneapolis, Minnesota, United States

³Hennepin Healthcare, Minneapolis, Minnesota, United States

⁴Division of Infectious Diseases, Department of Medicine, University of Minnesota, Minneapolis, Minnesota, United States

Abstract

Purpose: To evaluate the characteristics and response to therapy for HCC in sub-Saharan Africa.

Patients and methods: We retrospectively evaluated demographic, clinical and outcome variables of individuals diagnosed with HCC in a referral clinic in Ethiopia from 2016 to 2018. Survival assessment was performed using the Mann-Whitney test. Associations between categorical variables was assessed using Pearson Chi-square test. A P-value 0.05 determined statistical significance.

Results: Forty-six HCC cases were reported, with a median age of 54 years (IQR 45 – 62) and half of them being female. Viral hepatitis was the most common underlying etiology of liver disease, with 41% of subjects infected with hepatitis B virus (HBV) and 45% with hepatitis C. The median MELD was 12 (IQR 8–17) and we found no association between survival and a MELD score $\leq$ 15, regardless of underlying disease (pr=0.61, p>0.05). Thirty-one percent of individuals underwent supportive treatment with a median survival of 27 days (IQR 19–181), 18% used Sorafenib (median survival of 94 days, IQR 24–121), and trans-arterial chemoembolization (TACE) with curative intent was utilized in 16% (median survival of 352 days, IQR 30–436). In those treated with sorafenib, a neutrophil-to-lymphocyte ratio (NLR) of <2.5 correlated with better survival (109 vs 68 days for NLR >2.5 , p=0.01). HBV cases were diagnosed younger (31% before

*Corresponding Author: Jose D. Debes, Address: University of Minnesota, 420 Delaware Street, S.E; MMC 810, Minneapolis, MN 55455, debes003@umn.edu Phone: 612 625 6353.

Author contribution statement:

A Seid was responsible for the conception of study, data collection, revising paper critically for intellectual content. C Anugwom: Interpretation of data, drafting and writing paper, Revising it critically for intellectual content, final approval. Z Wondifraw: Revising paper critically for intellectual content. G Braimoh: Revising paper critically for intellectual content. A Bane: Revising paper critically for intellectual content. J Debes: Supervisor, conception of study, data analysis, revising paper critically for intellectual content; and the final approval.

Reviewer Disclosures

Peer reviewers on this manuscript have no relevant financial or other relationships to disclose.

the age of 40) and those on Tenofovir had a longer median survival than those off Tenofovir (121 vs 34 days).

Conclusion: Our study found that antiviral treatment of HBV infection was associated with longer survival in HCC. Furthermore, Sorafenib was beneficial in patients that used this modality of treatment and the NLR was a good prognostic factor in those patients.

Keywords

Hepatocellular carcinoma; Ethiopia; Sorafenib; Outcomes

1. Introduction

Hepatocellular carcinoma (HCC) remains one of the leading causes of cancer-related mortality in the world. In 2018 alone, it accounted for approximately 782 000 deaths worldwide, according to reports from the World Health Organization (WHO)[1]. Despite the advancements in technology that enable rapid and accurate diagnosis as well as development of multiple locoregional and systemic treatment strategies, it still accounts for increasing number of hospitalizations with rising inpatient charges and significant financial burden[2,3]. Hepatitis C (HCV) infection remains the most common etiological factor in the development of HCC in the United States and in most parts of Europe. In contrast, globally, Hepatitis B (HBV) infection is recognized as the most common risk factor for HCC. Prior studies have documented the significant healthcare burden associated with HCC in Sub-Saharan Africa[4]. Due to a variety of factors, including viral and environmental ones, HCC tends to affect younger populations in the continent[5]. Moreover, lack of support infrastructure and surveillance programs lead to late presentation of HCC with limited therapeutic options and a dismal prognosis. A recent report from the Africa Liver Cancer Consortium, across nine countries in the continent, showed that outside Egypt, less than 3% of individuals diagnosed with HCC received any form of treatment[4]. Overall, this increased mortality of HCC in Africa has been attributed primarily to lack of resources for early diagnosis and treatment, low rates of childhood immunization against HBV, presentation at late stage, and a more aggressive clinical behavior likely secondary to aflatoxin exposure[6]. Although prognosis and approach to management may differ among these regions, there is a paucity of knowledge on potential treatment approach and survival from these treatments in the African region. Moreover, most studies reporting treatment response originate from areas outside of Africa. In this study, we evaluated a single center in Ethiopia to describe clinical characteristics, survival and therapeutic response to HCC.

2. Methodology

2.1 Study design

We retrospectively evaluated the medical records of individuals that presented with a diagnosis of hepatocellular carcinoma (HCC) to a major referral clinic (Adera Clinic) located in Addis Ababa, Ethiopia from 2016 to 2018. The diagnosis of HCC was made via liver biopsy or radiological imaging criteria as established by the guidelines from the American Association for the Study of Liver Diseases (AASLD)[7].

2.2 Data collected

We collected basic demographic data on individuals, including that of the underlying etiology of liver disease (viral hepatitis testing, alcohol intake, other), presence of cirrhosis and jaundice, as well as other liver and tumor variables such as Model for End Stage Liver Disease (MELD) score, size of tumor at time of diagnosis, regular laboratories including complete blood count and basic metabolic panel as well as serum aminotransferases (AST & ALT), bilirubin and alkaline phosphatase levels and serum Alpha Feto-Protein (AFP). In those individuals with a positive result for viral hepatitis B or C, pertinent information about each virus was obtained (genotype of HCV and viral load when available; e antigen status for hepatitis B, HBV DNA when available) as well as treatment status.

2.3 Analysis

Median survival time was calculated from the date of last visit to the date of the initial diagnosis visit. Continuous variables were expressed as medians (Interquartile range Q1 to Q3), and categorical variables were expressed as proportions (%). Individuals with date of last visit to demise of less than seven days were excluded from the final survival analysis. Survival assessment was done using the Mann-Whitney test. Associations between categorical variables was assessed using Pearson Chi-square test. A P-value 0.05 was taken as the criterion for statistical significance

2.3 Ethical Considerations

This study was approved by the Ethics committee of Adera Clinic, Addis Ababa, Ethiopia.

3. Results

3.1 Individual and tumor characteristics.

The baseline characteristics of the individuals diagnosed with hepatocellular carcinoma (HCC) are represented in Table 1. A total of 46 cases of HCC were reported and collated with a median age of 54 years (IQR 45 – 62). Exactly half of these patients were female. The regions of origin of all the reported cases are depicted in Figure 1. Most cases were from the Addis-Ababa region (67%), whilst the Tigray and Harari regions were represented by 7% of the cases each. The most common presenting symptoms were abdominal pain in 96% of patients and weight loss in 76% of patients. Sixty-five percent of patients had evidence of ascites at time of presentation. Viral Hepatitis accounted for the underlying etiology of liver disease in 87% of cases; with the viral origin somewhat evenly divided between Hepatitis B virus (HBV) infection in 41.3% of cases and Hepatitis C virus (HCV) infection in 45.7% of cases. Thirteen percent of individuals had no specific diagnosis of etiology of liver disease, and there were no documented cases of alcohol-related cirrhosis or non-alcoholic fatty liver disease. We found no association between region of origin and etiology of liver disease ($p=0.126$, $p>0.05$). At time of diagnosis of HCC, 85% of the patients had cirrhosis with 17.4% of them presenting concomitant jaundice. Review of laboratory data revealed a median AST level of 91 U/L (IQR 67 – 113) and calculated median MELD was 12 (IQR 8 – 17). We found no association between survival and MELD score ≤ 15 regardless of underlying liver disease ($p=0.61$, $p>0.05$). The median tumor

size in these cases was noted to be 6.5 cm (IQR 4.5 – 6.9), and serum AFP was found to be > 400 ng/ml in about half of the reported cases. About a third of patients had evidence of vessel invasion and 37% of patients were Barcelona Clinic Liver Cancer Stage C or D.

3.2 Treatment and survival

Treatment strategies varied widely (Table 2). About a third of the individuals underwent supportive treatment (32.6%), and median survival in these cases was 27 days (IQR 19 – 181). Sorafenib was used in 19.6% of patients, whereas locoregional therapy with trans-arterial chemoembolization (TACE) with curative intent using Doxorubicin, Cisplatin and Lipiodol, was utilized in 8 patients (17.4%). There was a trend towards improved survival in the first 6 months among patients treated with TACE, but this was not statistically significant ($p = 0.55$). Among the patients treated with Sorafenib 55% had advanced HCC with an estimated Barcelona Clinic Liver Cancer (BCLC) stage C to D. Two patients (22%) had BCLC stage C and one patient each (11%) had BCLC stage A and stage B. Overall, Sorafenib was well tolerated as a medication and only one patient (11%) stopped the treatment, reporting significant nausea and vomiting. The median survival in patients treated with Sorafenib or TACE was 94 days (IQR 24 – 121) and 352 days (IQR 30 – 436) respectively. A lower neutrophil-to-lymphocyte ratio (NLR) of <2.5 was found to correlate with better survival (109 days vs 68 days for those with NLR >2.5, $p = 0.01$). From a total of 9 individuals treated with Sorafenib, 5 were infected with HBV and all of these patients had an AFP level >400ng/ml (Table 3). Although proper evaluation of survival was not possible due to low numbers (2 cases of HBV-Sorafenib had less than 7-day follow up visit), the median survival in the remaining 3 was comparable to that of non-HBV HCCs treated with Sorafenib (122 vs 94 days). In the HBV subgroup of nineteen (41%) patients, the median age of diagnosis was 48 years, (IQR 19 – 38), with 31.6% of patients diagnosed before the age of 40. Serum AFP was higher than 400 ng/ml in 57.9% of these HBV infected patients and the median survival was 83 days (IQR 18 – 381). Among those on Tenofovir, the median survival was 121 days, whereas it was 34 days in patients who were off antiviral therapy despite having larger tumor-size (median 7.3cm vs 6cm).

4. Discussion

The burden of HCC cannot be overemphasized as it is associated with significant morbidity, mortality and financial repercussions world-wide [1,8]. In Africa, the incidence rates of HCC range from 20 – 40 cases per 100,000 population, but the true incidence of HCC in this region is underestimated, mostly due to paucity of records, absence of cancer registries in some countries and unclear diagnosis[9,10]. Viral hepatitis remain the predominant risk factors for development of HCC, with HBV sustaining a major burden in Sub-Saharan Africa[4]. Although HCC can occur in patients with chronic HBV infection, cirrhosis has been established as a very important risk factor for the development of HCC with studies estimating about 90% of patients having a diagnosis of cirrhosis at the time of HCC diagnosis [11–13]. We found that 85% of the cases of HCC had a diagnosis of cirrhosis irrespective of etiology of liver disease. Hence, routine HCC surveillance of these high-risk groups will promote the detection of early stage HCC and hence increase the chances of curative therapy[11,14]. In our cohort, only a minority of individuals received any attempt at

HCC cure. It should be noted, that in the region, the characterization of “palliative approach” mainly applies to “best supportive therapy”. Under the strict definition of non-curative approach, over 80% of individuals in our study received palliative care, with only 19.6% of them receiving a potentially curative therapy.

Treatment using TACE had a trend towards improved 6-month survival, though this was not statistically significant (Figure 2). In these patients, the median survival was 351 days. However, only a small number of patients (17.4%) were treated with this modality. In addition, most of the patients treated with sorafenib (55%) had advanced stage HCC, underscoring the prevalence of late diagnosis of HCC in the region. Due to the study’s retrospective nature, the Barcelona Clinic Liver Cancer (BCLC) staging of HCC was estimated in a limited number of patients, and performance status estimation was deemed inaccurate with the available information. Nevertheless, using the Child-Turcotte-Pugh (CTP) score, size and number of tumors and evidence of portal invasion, we estimated the HCC stage in these patients.

Late diagnosis of HCC, probably from paucity of resources, poor access to healthcare as well as late presentation of patients, is likely responsible for our findings. These factors stymie adequate healthcare in many regions of Sub-Saharan Africa, so effective health policies and early testing for viral hepatitis will help improve survival in these high-risk group of individuals[6,15]. In this region, vaccination rates among healthcare workers were low, and range from 4 – 28.7%, while vaccine coverage among children was as high as 85.1%[16–18]. Improved education of people at high risk of infection, such as HCW, as well improving childhood vaccination programs, will also be beneficial.

Our results show an increase in median survival in patients with HBV who were on antivirals (121 days) compared to those who were not (34 days). Active HBV DNA replication and integration in hepatocytes induces genetic damage, predating the formation of abnormal cells and development of HCC[19]. It is therefore not inconceivable that suppression of viral replication will be beneficial to the survival of patients with HBV-related HCC, and this has been echoed in multiple studies[20–22]. Though these findings have been clearly described in resource-rich settings, the information from HBV-endemic areas with low resources is not readily available. In regions of Sub-Saharan Africa where access to locoregional or systemic therapy is limited, consideration should be given to starting antiviral therapy for HBV, when available, in individuals with HBV-HCC as this could impact their survival.

Finally, our study found a better-than-expected survival in those individuals treated with Sorafenib. The use of Sorafenib for HCC as not been described before in Africa. Moreover, previous studies have shown a preferential response to Sorafenib in individuals infected with HCV[23]. Our results, albeit from a very small number of patients, suggest that even in the setting of HBV infection, Sorafenib could have a role in prolonging survival of HCC-affected patients. Furthermore, Sorafenib was well tolerated in these patients. This is significant, because, in areas with derisory infrastructure required to establish advanced loco-regional therapy, the administration of oral medications is, at times, the only available therapy. Furthermore, cell-mediated inflammatory response is increasingly being recognized

as having an important role in tumorigenesis and a the Neutrophil-to-lymphocyte ratio (NLR) has been reported to be a prognostic factor in many solid tumors with high levels suggesting a worse overall survival[24,25]. In patients with HCC treated with Sorafenib, high NLR values have been associated with worse outcomes[26]. We found a worse median survival in those with NLR >2.5. As technology yielding automated cell counts is becoming increasingly popular, NLR values could be implemented as a tool to further stratify the cost-benefit of treating individuals with Sorafenib.

We aimed to assess the characteristics, prognosis and management of HCC in a large center in Ethiopia to give an insight to the burden of disease in Sub-Saharan Africa. Despite the uniqueness of our study, it has several limitations. Firstly, we reported a limited number of cases with HCC and this may not be entirely representative of the population in Sub-Saharan Africa, however representative it might be from Ethiopia as patients presented from different regions of the country. Secondly, the retrospective nature of the study limits our collated variables to those available in the patients' medical records. As such, it is difficult to evaluate the effect of additional patient variables on median survival. Finally, the assessment of Barcelona Clinic Liver Cancer (BCLC) score, was not assessed at the time.

Nonetheless, our report provides important insight on HCC outcomes in a single center in Sub-Saharan Africa. Our study found that antiviral treatment of HBV infection was associated with higher median survival in our cohort of cases with HCC; the use of sorafenib was beneficial in the limited number of patients that used this modality of treatment, and the Neutrophil-to-lymphocyte ratio showed to be a good prognostic factor in those patients. Larger prospective studies are needed to evaluate its specific role in the management of HCC in the region.

5.0 Conclusion

Our study describes the prognosis of individuals with HCC in a country in Sub Saharan Africa. The majority of HCC had viral hepatitis as underlying liver disease. The study shows that treatment of viral hepatitis B prolonged survival in those with HCC. Moreover, NLR ratio proved useful in predicting survival. These findings suggest that tools available in resource-limited settings can be used to help manage HCC.

Funding

This paper was funded in part by the University of Minnesota Center for Global Health and Social Responsibility Global Health Seed Award and NIH-NCI R21 CA215883-01A1.

Declaration of Interests

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

References

Papers of special note have been highlighted as either of interest (*) or of considerable interest (**) to readers.

1. World Health Organisation Nr, fact sheets, cancer. (Accessed June 2020)
2. Jinjuvadia R, Salami A, Lenhart A, et al. Hepatocellular Carcinoma: A Decade of Hospitalizations and Financial Burden in the United States. *The American journal of the medical sciences*, 354(4), 362–369 (2017). [PubMed: 29078840]
3. Mishra A, Otgonsuren M, Venkatesan C, et al. The inpatient economic and mortality impact of hepatocellular carcinoma from 2005 to 2009: analysis of the US nationwide inpatient sample. *Liver international : official journal of the International Association for the Study of the Liver*, 33(8), 1281–1286 (2013). [PubMed: 23710596]
4. Yang JD, Mohamed EA, Aziz AO et al. Characteristics, management, and outcomes of patients with hepatocellular carcinoma in Africa: a multicountry observational study from the Africa Liver Cancer Consortium. *The lancet. Gastroenterology & hepatology*, 2(2), 103–111 (2017). [PubMed: 28403980]
5. Yang JD, Gyedu A, Afihene MY et al. Hepatocellular Carcinoma Occurs at an Earlier Age in Africans, Particularly in Association With Chronic Hepatitis B. *The American journal of gastroenterology*, 110(11), 1629–1631 (2015). [PubMed: 26618430] ** This is a brief report of an interim analysis supporting prior discussions that HCC occurs at a much younger age in Africa than in other parts of the World. The authors found that approximately 40% of individuals developing HBV-induced HCC in Africa develop HCC before the age of 40.
6. Ladep NG, Lesi OA, Mark P et al. Problem of hepatocellular carcinoma in West Africa. *World journal of hepatology*, 6(11), 783–792 (2014). [PubMed: 25429316] * The authors discuss the prevalence of HCC in Africa, risk factors, and the reasons for the specific disease pattern of HCC in West Africa. They highlight the obstacles to effective diagnosis and treatment of HCC and proffer solutions to these factors.
7. Marrero JA, Kulik LM, Sirlin CB et al. Diagnosis, Staging, and Management of Hepatocellular Carcinoma: 2018 Practice Guidance by the American Association for the Study of Liver Diseases. *Hepatology (Baltimore, Md.)*, 68(2), 723–750 (2018).
8. Choo SP, Tan WL, Goh BKP, et al. Comparison of hepatocellular carcinoma in Eastern versus Western populations. *Cancer*, 122(22), 3430–3446 (2016). [PubMed: 27622302]
9. Kew MC. Epidemiology of hepatocellular carcinoma in sub-Saharan Africa. *Annals of hepatology*, 12(2), 173–182 (2013). [PubMed: 23396727]
10. Tang A, Hallouch O, Chernyak V, et al. Epidemiology of hepatocellular carcinoma: target population for surveillance and diagnosis. *Abdominal radiology (New York)*, 43(1), 13–25 (2018). [PubMed: 28647765]
11. Fattovich G, Stroffolini T, Zagni I, Donato F. Hepatocellular carcinoma in cirrhosis: incidence and risk factors. *Gastroenterology*, 127(5 Suppl 1), S35–50 (2004). [PubMed: 15508101]
12. Bruix J, Sherman M. Management of hepatocellular carcinoma: an update. *Hepatology (Baltimore, Md.)*, 53(3), 1020–1022 (2011).
13. Leung C, Yeoh SW, Patrick D et al. Characteristics of hepatocellular carcinoma in cirrhotic and non-cirrhotic non-alcoholic fatty liver disease. *World journal of gastroenterology*, 21(4), 1189–1196 (2015). [PubMed: 25632192]
14. Singal AG, Pillai A, Tiro J. Early detection, curative treatment, and survival rates for hepatocellular carcinoma surveillance in patients with cirrhosis: a meta-analysis. *PLoS medicine*, 11(4), e1001624 (2014). [PubMed: 24691105]
15. Stierle F, Kaddar M, Tchicaya A, Schmidt-Ehry B. Indigence and access to health care in sub-Saharan Africa. *The International journal of health planning and management*, 14(2), 81–105 (1999). [PubMed: 10538937] * A well-done report that reviews the multiple factors that stymie the access and availability of healthcare in Africa. These issues affect care of patients with chronic diseases to a very large extent
16. Biset Ayalew M, Adugna Horsa B. Hepatitis B Vaccination Status among Health Care Workers in a Tertiary Hospital in Ethiopia. *Hepatitis Research and Treatment*, 2017, 6470658 (2017). [PubMed: 28751988]
17. Abebaw TA, Aderaw Z, Gebremichael B. Hepatitis B virus vaccination status and associated factors among health care workers in Shashemene Zonal Town, Shashemene, Ethiopia: a cross sectional study. *BMC research notes*, 10(1), 260 (2017). [PubMed: 28683822]

18. Teshome S, Biazin H, Zeleke T, et al. Antibody level against HBV after hepatitis B vaccination and sero-prevalence of HBV in children in Addis Ababa, Ethiopia. *Clinica Chimica Acta*, 493, S555–S556 (2019).
19. Levrero M, Zucman-Rossi J. Mechanisms of HBV-induced hepatocellular carcinoma. *Journal of hepatology*, 64(1 Suppl), S84–s101 (2016). [PubMed: 27084040]
20. Pazgan-Simon M, Simon KA, Jarowicz E, et al. Hepatitis B virus treatment in hepatocellular carcinoma patients prolongs survival and reduces the risk of cancer recurrence. *Clinical and experimental hepatology*, 4(3), 210–216 (2018). [PubMed: 30324148]
21. Hann HW, Coben R, Brown D et al. A long-term study of the effects of antiviral therapy on survival of patients with HBV-associated hepatocellular carcinoma (HCC) following local tumor ablation. *Cancer medicine*, 3(2), 390–396 (2014). [PubMed: 24519810]
22. He L, Liu X, Zhao Y et al. Efficacy of Nucleot(s)ide Analogs Therapy in Patients with Unresectable HBV-Related Hepatocellular Carcinoma: A Systematic Review and Meta-Analysis. *Disease markers*, 2017, 7075935 (2017). [PubMed: 28396612]
23. Bruix J, Cheng AL, Meinhardt G, et al. Prognostic factors and predictors of sorafenib benefit in patients with hepatocellular carcinoma: Analysis of two phase III studies. *Journal of hepatology*, 67(5), 999–1008 (2017). [PubMed: 28687477]
24. Templeton AJ, McNamara MG, Seruga B et al. Prognostic role of neutrophil-to-lymphocyte ratio in solid tumors: a systematic review and meta-analysis. *Journal of the National Cancer Institute*, 106(6), dju124 (2014).** The authors carried out a comprehensive systematic review and meta-analysis of 100 studies comprising 40559 patients, noting that a high NLR is associated with an adverse OS in many solid tumors. These findings, and the availability as well as the inexpensive nature of the NLR, may suggest its importance in prognostication for clinical decision making in these patients.
25. Omichi K, Cloyd JM, Yamashita S et al. Neutrophil-to-lymphocyte ratio predicts prognosis after neoadjuvant chemotherapy and resection of intrahepatic cholangiocarcinoma. *Surgery*, 162(4), 752–765 (2017). [PubMed: 28688518]
26. Lue A, Serrano MT, Bustamante FJ et al. Neutrophil-to-lymphocyte ratio predicts survival in European patients with hepatocellular carcinoma administered sorafenib. *Oncotarget*, 8(61), 103077–103086 (2017). [PubMed: 29262546]

Figure 1:
Distribution of HCC cases based on region of origin

Figure 2:
Kaplan-Meier survival curve showing survival for Sorafenib, TACE and Palliative care

TABLE 1:**BASELINE CHARACTERISTICS**

VARIABLES	
Demographics	
Age, in years (IQR)	54 (45 – 62)
Female sex (%)	50
Black Ethnicity, N (%)	46 (100%)
Underlying liver disease	
Hepatitis B infection, N (%)	19 (41.3)
Hepatitis C infection, N (%)	21 (45.7)
Alcoholic liver disease, N (%)	0 (0)
Non-alcoholic fatty liver disease, N (%)	0 (0)
Other etiology, N (%)	6 (13)
Tumor variables	
Evidence of cirrhosis, N (%)	39 (84.8)
Presence of jaundice, N (%)	8 (17.4)
Median MELD score (IQR)	12 (8 – 17)
Median serum AST, U/L (IQR)	91 (67 – 113)
Median Tumor size, cm (IQR)	6.5 (4.5 – 6.9)
Serum Alpha Feto-Protein >400 ng/ml, N (%)	24 (52.2)
Major vessel invasion, N (%)	15 (32.6%)
Child-Turcotte-Pugh B or C, N (%)	31 (67.4%)
Barcelona Clinic Liver Cancer Stage A/B, N (%)	22 (47.8%)
Barcelona Clinic Liver Cancer Stage C, N (%)	13 (28.3%)
Barcelona Clinic Liver Cancer Stage D, N (%)	4 (8.7%)

TABLE 2:**TREATMENT REGIMEN AND SURVIVAL**

VARIABLES	
Treatment Regimen, N (%)	
Surgery	1 (2.2)
Trans-arterial chemoembolization	8 (17.4)
Sorafenib	9 (19.6)
Palliative	15 (32.6)
Others (Lost to follow up, no access to therapy)	13 (28.3)
Survival, days (IQR)	
General median survival	68 (17 – 334)
Trans-arterial chemoembolization	351 (30 – 436)
Sorafenib	94 (24 – 121)
Palliative	27 (19 – 181)
Overall survival in HBV infected patients	83 (18 – 381)
HBV patients on anti-viral treatment	121 (19–387)
HBV patients not on anti-viral treatment	34 (15–294)

TABLE 3:

Characteristics of HCC-HEPATITIS B SUBGROUP

VARIABLES	
Number of patients, N (%)	19 (41)
Median age at diagnosis, years (IQR)	49 (19 – 38)
Diagnosis <40 years, N (%)	6 (31)
AFP >400 ng/ml, N (%)	11 (57)
Median survival on antiviral therapy	121 days
Median survival off antiviral therapy	34 days
NLR >2.5	68 days

TABLE 4:

Characteristics of individuals treated with SORAFENIB

VARIABLES	
Patients on Sorafenib, N (%)	9 (19)
Median survival, days (IQR)	94 (24 – 121)
Alpha Feto-Protein >400 ng/ml, N (%)	9 (100)
HBV infection, N (%)	5 (55)
Neutrophil-to-lymphocyte ratio (NLR) and survival	
NLR < 2.5	109 days
NLR > 2.5	68 days