

Hepatocellular Carcinoma in Kosovo: A Retrospective Cohort Study, 2012–2022

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Abstract

Background: Hepatocellular carcinoma (HCC) is a leading cause of cancer mortality worldwide, yet comprehensive epidemiologic data from Kosovo are lacking. We aimed to characterize trends, demographic distributions, and risk factors of HCC in Kosovo from 2012 to 2022.

Methods and Results: In this retrospective, population-based cohort study, we analyzed 103 HCC cases diagnosed at the University Clinical Center of Kosovo. Demographic and clinical data were extracted from hospital registries and supplemented with national population figures. Over the study period, 77.7% of cases were male, and the highest incidence (36.9%) occurred in patients aged 60–69 years. Major risk factors included current smoking (57.3%) and regular alcohol consumption (20.4%), while only 6.8% had documented hepatitis B or C (HBV/HCV) infection, suggesting underdiagnosis. A transient decline in case detection in 2020 coincided with COVID-19-related healthcare disruptions.

Conclusion: HCC incidence in Kosovo rose gradually over the past decade, with a pronounced male and older-age predominance. Strengthening viral-hepatitis screening and promoting tobacco- and alcohol-cessation programs are critical to curbing the HCC burden and improving outcomes. (International Journal of Biomedicine. 2025;15(3):495-499.)

Keywords: hepatocellular carcinoma • epidemiology • smoking • alcohol consumption

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Introduction

Hepatocellular carcinoma (HCC) is the primary malignant tumor that most often attacks the liver. In terms of prevalence, it is the seventh most common cancer in the world and the second most common cause of cancer mortality.¹ HCC is an epithelial tumor originating from parenchymal cells. Many cases of HCC are preceded by HBV OR HCV. The highest incidence rates are found in Asia and Africa.² Mongolia has the highest incidence rate at 93.7 per 100,000, while China has the highest number of cases, due to the world's largest population (1.4 billion people).¹ Globally, HCC is the dominant type of liver cancer, accounting for about 75% of cases.² Incidence rates of HCC have declined in some high-incidence areas,³ but have

increased in most low-incidence regions. Between 1978 and 2012, the incidence of HCC declined in some Asian countries and Italy, but increased in India, the Americas, Oceania, and most European countries.³ However, in recent years, the increase in some countries, such as the United States, has slowed, as rates in some groups have stabilized or declined.^{4,5} The prognosis of HCC is poor in all regions of the world.⁶ As a result, the incidence and mortality rates are roughly the same. In 2018, the estimated global incidence rate of liver cancer per 100,000 population was 9.3, while the corresponding mortality rate was 8.5.^{1,7}

In addition to the well-established risk factors such as chronic viral hepatitis, alcohol intake, and tobacco use, recent research has emphasized the growing role of metabolic conditions in the development of HCC. Non-

alcoholic fatty liver disease (NAFLD), which ranges from simple hepatic steatosis to non-alcoholic steatohepatitis, is increasingly recognized as a major driver of liver cancer, even in the absence of cirrhosis. Type 2 diabetes and obesity, both strongly linked to NAFLD, are on the rise in many low- and middle-income countries, including Kosovo. Moreover, unhealthy dietary habits and sedentary lifestyles contribute to this metabolic shift, yet they are often overlooked in national health prevention strategies.

The incidence rate of HCC is directly related to age up to about 75 years, but the average age of diagnosis is younger.² In the United States, for example, the average age of diagnosis in men is 60–64 years and in women, 65–69 years.⁸ In Africa, the average age of diagnosis is lower in countries such as Egypt (58 years) than in other countries (≈ 46 years).^{9,10}

Men have incidence rates 2 to 4 times higher than women.² In the United States, the incidence rate in men in 2016 was 10.4 per 100,000 population, compared with 2.9 in women. Gender differences are greater in Europe, but in some countries, such as Uganda and Colombia, rates between men and women are similar.^{2,11}

The purpose of this paper is to provide a summary of the latest findings regarding the prevalence and risk factors of HCC and the diagnosis of patients at the University Clinical Center of Kosovo. The paper focuses on analyzing the increase in the number of patients diagnosed with HCC, examining age, gender, and risk factors.

Materials and Methods

This retrospective study included data from the period 2012–2022 of patients diagnosed and treated with HCC in Kosovo, at the University Clinical Center of Kosovo.

A total of 103 patients diagnosed with and treated for HCC were included in this study. The variables analyzed were gender, age, residence, and habits/factors associated with HCC. Statistical data were provided by the Oncology Clinic at the University Clinical Center of Kosovo and the Kosovo Agency of Statistics.

Results

Among 103 HCC patients, 77.67% were male and 22.33% were female (Figure 1). When analyzing the number of cases diagnosed with liver carcinoma over the years, a trend towards an increase in new cases was noted. At the same time, a decrease was reported in 2020; however, it is worth noting that this occurred during the pandemic, when patients were either unable or unwilling to undergo diagnostic procedures (Figure 2).

Regarding the age of diagnosis, the largest number of diagnosed patients belonged to the age group of 60–69 years (36.89%, 38 cases: 29 men and 9 women). The age of the youngest patient diagnosed with HCC was 33 years, while the oldest was 84 (Figure 3).

Of the 103 patients diagnosed with HCC, 98 were diagnosed with primary HCC, while 5 cases, after radiological

and histopathological examinations, were found to be metastatic (Figure 4).

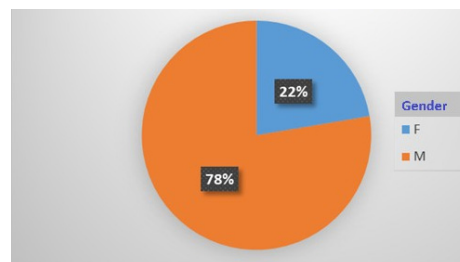


Fig. 1. Distribution of patients diagnosed with HCC by gender.

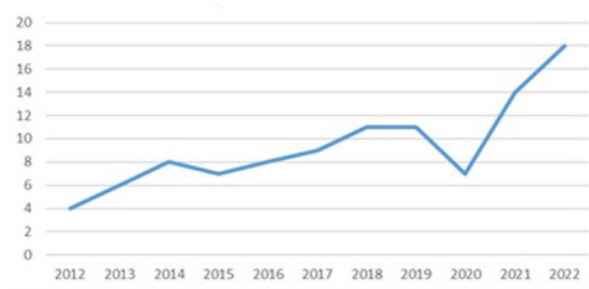


Fig. 2. Distribution of patients diagnosed with HCC according to the year of diagnosis.

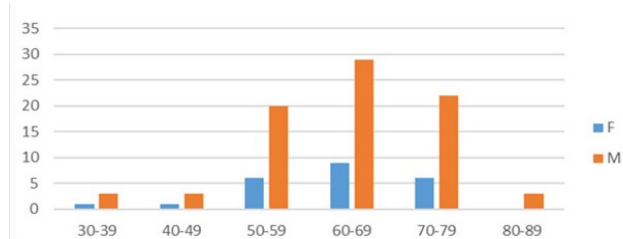


Fig. 3. Distribution of patients diagnosed with HCC according to age groups and gender.

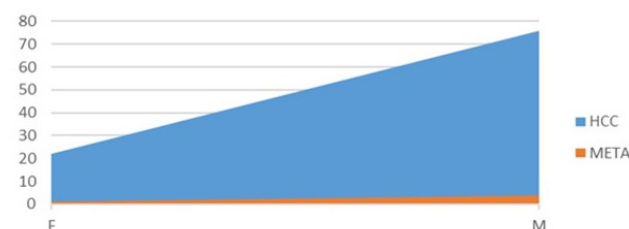


Fig. 4. Distribution of patients diagnosed with liver cancer according to the origin of the tumor.

Infection with the hepatitis B or C virus is considered an important factor that influences the appearance of liver cancer; from the analysis of diagnosed patients, 7 were diagnosed with this infection (Figure 5).

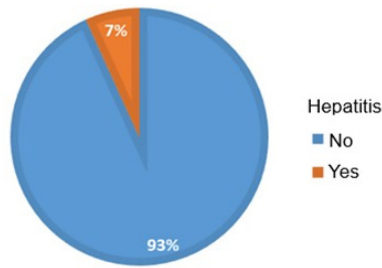


Fig. 5. Ratio of HCC patients previously diagnosed with Hepatitis B or C virus infection to those who were not infected.

In addition to HBV and HCV infection, additional factors contributing to the occurrence of HCC are smoking and alcohol consumption (Figures 6 and 7). In our study, 57.28% of diagnosed patients were smokers, 20.39% were alcohol consumers, while 15.53% were consumers of both.

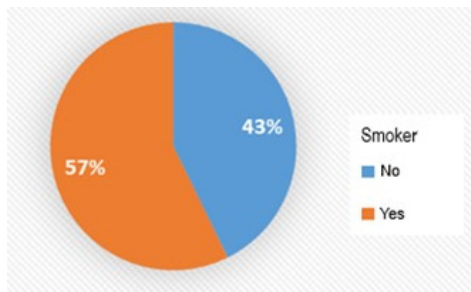


Fig. 6. Ratio of patients diagnosed with HCC who claim to be smokers to those who are not.

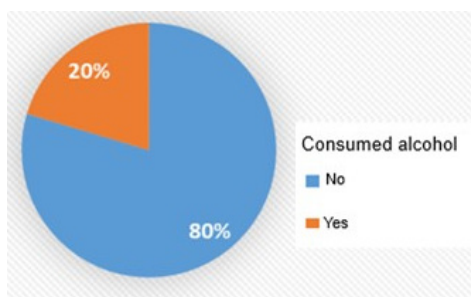


Fig. 7. Ratio of patients diagnosed with HCC who claim to be alcohol consumers to those who are not.

Regarding the residence of diagnosed patients, Prishtina had the highest representation among cities at 15.53% (Figure 8). This high frequency correlates with both the high number of residents in the capital and the quality of the air.

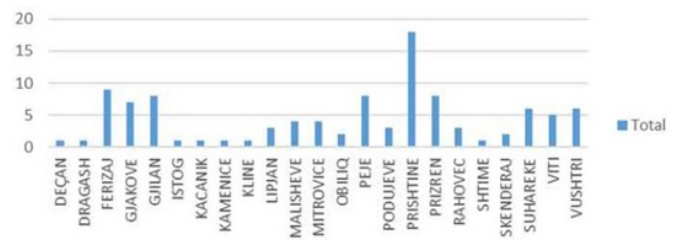


Fig. 8. Distribution of patients diagnosed with HCC by place of residence.

It is important to note that certain well-documented risk factors—such as obesity, type 2 diabetes, a family history of liver cancer, and exposure to aflatoxins—were not consistently recorded in the clinical datasets analyzed in this study. This limitation highlights a significant gap in data collection and underscores the need to strengthen medical documentation practices. Establishing standardized protocols for recording risk profiles in patients diagnosed with HCC would improve the reliability of future research and contribute to more accurate public-health assessments.

Discussion

Comparison with Neighboring Countries and European Regions

When compared with the large Albanian series of 648 HCC patients diagnosed between 2000 and 2014, our Kosovo cohort exhibits very similar demographic patterns but distinct etiologic and temporal trends. The Albanian study reported 77.1% male (M/F \approx 3.41) and a mean age of 60.4 years, whereas our data show 77.7% (M/F \approx 3.48) male with peak incidence in the 60–69 age group, underscoring near-identical gender and age distributions. However, Albania's age-standardized incidence (ASR) almost doubled during its study period (from 6.6 to 9.3 per 100,000 in successive five-year intervals), while Kosovo experienced a more gradual rise from 2012 to 2022 (exact ASR calculation pending).¹² In terms of risk factors, 50.9% of Albanian cases were linked to HBV infection and 21.8% to combined HBV and alcohol, compared to our cohort's lower documented rates of viral hepatitis but higher prevalences of smoking (57.3%) and regular alcohol use (20.4%). Finally, underlying cirrhosis was present in 89.3% of Albanian patients—a figure we could not systematically capture—highlighting the need in Kosovo for improved cirrhosis assessment as well as enhanced HBV/HCV screening alongside ongoing tobacco- and alcohol-control measures.

Montenegro's age-standardized liver cancer mortality remained essentially stable between 1990 and 2018, with an average annual percent change (AAPC) of +1.4% overall ($P=0.004$) and +1.9% in women ($P=0.002$), but no significant change in men; mortality was concentrated in those aged 65–74 (34.9%), 75–84 (26.6%), and 55–64 (25.8%).¹³ In contrast, our Kosovo study documents a slow

but steady increase in HCC incidence from 2012 to 2022, with marked male predominance and peak incidence in the 60–69 age group. Whereas Montenegro's sustained prevention and hepatitis-eradication efforts likely underpin its plateauing mortality, Kosovo's rising incidence—coupled with underdiagnosed HBV/HCV and high tobacco/alcohol exposure—highlights the urgent need for similar public-health strategies, including viral-hepatitis elimination and targeted screening in older men.

The pronounced male predominance in Kosovo (M/F \approx 3.48) closely mirrors the ratios seen in Southern and Western Europe (M/F \approx 3.3) yet exceeds those reported in Northern and Central-Eastern Europe (M/F:2.1–2.6). Like the broader European trend of rising HCC incidence with age and a peak in the 60–79-year bracket, our study identified the highest incidence specifically in the 60–69-year age group, underscoring its consistency with regional patterns. Southern Europe (6.7/100 000) has the highest ASR among European subregions, followed by Western Europe (5.4/100 000). Although we lack an exact Kosovo ASR, our observed increase approaches the level seen in Central-Eastern Europe (4.3/100 000).¹⁴

Regarding etiologic drivers, our Kosovo cohort exhibited notably high prevalences of tobacco and alcohol use—57% of patients were smokers and 20% consumed alcohol regularly—while chronic HBV/HCV infections appear underdiagnosed. By contrast, Northern and Central-Eastern Europe generally report lower rates of viral hepatitis but similarly recognize tobacco and alcohol as principal risk drivers, suggesting that bolstering viral-hepatitis screening in Kosovo could further mitigate the HCC burden alongside ongoing tobacco- and alcohol-control efforts.¹⁴

Conclusions

- HCC has an increased incidence in Kosovo, with a high concentration in the 60–69 age group and a clear male predominance.
- The main risk factors include smoking, alcohol consumption, and chronic hepatitis infections, although the latter remain underreported.
- The COVID-19 pandemic has negatively affected the early diagnosis of this disease, creating a gap in patient follow-up.

To improve the situation and reduce the incidence of liver carcinoma in Kosovo, it is necessary to take concrete actions: Systematic screening for hepatitis B and C, especially in at-risk age groups, raising awareness among the population about the adverse effects of tobacco and alcohol on liver health, improving health infrastructure to ensure early diagnosis and adequate treatment for patients.

Competing Interests

The authors declare that they have no competing interests. No author has received any honoraria, consulting

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