



ORIGINAL ARTICLE

Hepatitis B and C: Neglected Infectious Diseases among Syrian Refugees in Lebanon

Loyal Al Mahmasani¹, Zeina Bayram^{2*}, Umayya Musharrafieh^{3,4} and Abdul Rahman Bizri³



¹Division of Hematology and Oncology, Department of Internal Medicine, American University of Beirut Medical Center, Beirut, Lebanon

²American University of Beirut, Beirut, Lebanon

³Division of Infectious Diseases, Department of Internal Medicine, American University of Beirut Medical Center, Beirut, Lebanon

⁴Department of Family Medicine, American University of Beirut Medical Center, Beirut, Lebanon

*Corresponding author: Zeina Bayram, American University of Beirut, Beirut 1107 2021, Lebanon

Abstract

Background: Hepatitis B and C are life-threatening infections that can result in liver-associated complications. Lebanon is a country experiencing its worst economic and political crises to date and is considered to be of low endemicity for hepatitis B virus (HBV) and hepatitis C virus (HCV).

Aim: This study aims to assess the prevalence of HBV and HCV infections among the Lebanese and the Syrian refugees residing in Lebanon, to describe the actual situation beyond statistical scrutiny, and to identify the risks and long-term consequences associated with neglecting these infections.

Methods: Data on the prevalence of HBV and HCV among the Lebanese population and Syrian refugees residing in Lebanon was obtained and sorted based on age and gender. The prevalence of HBV and HCV among these groups was compared to the prevalence among the Syrians remaining in Syria. The expected number of HBV and HCV cases in Lebanon was then calculated based on the total number of registered Syrian refugees in Lebanon. An extensive literature review was conducted using Medline, Google Scholar, and PubMed.

Results: The prevalence of HBV and HCV in Lebanon was 1.74% and 0.21%, respectively. 13% of HBV cases and 6% of HCV cases were associated with Syrian refugees and the average prevalence of HBV and HCV solely among Syrian refugees was 0.003% and 0.0007%, respectively. HBV and HCV were more prevalent among men than women for both the Lebanese population and the Syrian refugees. The age

group ranging from 20 to 39 represented 40% of the HBV and 30% of the HCV cases corresponding to the total population. For the Syrian refugees subgroup, 57% of HBV cases and 28% of HCV cases were reported among individuals aging between 20 and 39. The prevalence of HBV and HCV among the total Syrian population in Syria is 5.6% and 2.8% and is significantly higher than the prevalence among the Syrian refugees in Lebanon for both HBV (0.003%) and HCV (0.0007%). The number of HBV and HCV cases actually recorded among the Syrian refugees in Lebanon was significantly lower than the expected number of HBV and HCV cases.

Conclusion: HBV and HCV are neglected diseases among the Syrian refugee population in Lebanon. Continued neglect can increase the risk of chronic viral hepatitis complications and mortality, further increasing the health and economic burden in Lebanon. Urgent action is needed by the host country and by the international community to achieve better surveillance, detection and linkage to medical care in order to manage and prevent unexpected consequences.

Keywords

Lebanon, HBV, HCV, Viral hepatitis, Syrian refugees, Neglected diseases

Background

Hepatitis B virus (HBV) and hepatitis C virus (HCV) are major health problems and common causes of liver-associated morbidities [1]. According to World Health

Organization (WHO), it was estimated that 257 million people are living with HBV worldwide [2] and that 71 million people are infected with HCV [3]. HBV and HCV can cause acute and chronic infections. Chronic infections can develop severely at later stages and result in liver cirrhosis or liver cancer and eventually death. In 2015, HBV and HCV infections resulted in 887,000 deaths and 399,000 deaths, respectively. Most of these deaths were related to either cirrhosis or hepatocellular carcinoma (HCC) [4].

Viral hepatitis is one of the leading causes of mortality and disability worldwide [5]. Those affected will be at risk of severe complications and lower quality of life that may negatively affect their productivity. There is an established indirect burden of the illness described as it is associated with lower productivity, increased absenteeism, and higher healthcare benefit costs [6].

Oral antiviral agents are available to treat both chronic HBV and HCV, but the outcome and goals of treatment differ. For HBV, treatment aims to control the progression of the disease, prevent its complications, and achieve functional cure. The duration of treatment of HBV remains to be debatable especially when it comes to its cessation. For HCV, progress in antiviral therapy has allowed to achieve sustained viral response (SVR). Novel genotypic drugs can achieve virologic cure in more than 90% of cases. However, patients who receive treatment and achieve SVR will still need to be followed up routinely for liver disease progression especially those who started treatment at an advanced stage of liver illness [7].

Estimating the total cost of illness induced by HBV and HCV infections is an essential health concern. In general, viral hepatitis is linked with high health and economic burden that affects policy decisions globally [7]. Treatment for both HBV and HCV is available in Lebanon and provided for free to all Lebanese citizens through the Lebanese Ministry of Public Health (LMoPH). However, the cost of comprehensive treatment is a limiting factor for its acquirement since management is associated with several expensive laboratory tests including but not limited to nucleic acid techniques, fibroscan, routine laboratory tests, and liver function tests among others [8]. The cost of treatment and the management of hepatic and extra-hepatic complications has been evaluated in several studies. Evidence has shown that HBV can impose a substantial economic burden on patients, families and communities [9]. Similarly, HCV has been associated with tremendously high costs and treatment expenditures [10]. A study done by Abou Rashid, et al. showed that as the HCV population ages and the costs of treatment increase, the economic burden of chronic HCV infection is expected to grow proportionally along with its clinical burden [11]. Another study looking at the cost-effectiveness of HCV treatment done by Nasser, et al. mentioned that

early treatment is cost-effective compared to delayed therapy. This emphasizes the need to reinforce early screening and linkage to care [12].

Despite the commitment of LMoPH to treat all Lebanese affected with HBV and HCV, access to care is not always available in the country due to several economic and political factors. The limited budget available to LMoPH forced them to obtain generics from neighboring countries that are not always WHO approved. The recent political crisis and the resulting socioeconomic collapse have even further diminished the ability of LMoPH to obtain the necessary medications for chronic illnesses including viral hepatitis. This has rendered many individuals at risk of forced interruption of the treatment courses and increased the risk of complications associated with chronic viral hepatitis [13].

The Syrian crisis has added further salt to the wound since large numbers of Syrians sought refuge in Lebanon in response to the eruption of the Syrian crisis following 2012. Lebanon is currently believed to be the country with highest number of refugees per capita in the world [14]. The influence of those refugees on the healthcare system is tremendous [15]. It has been well established that with such population mobility, a host country is expected to face a number of new diseases and medical conditions especially communicable diseases such as HBV and HCV [16]. With Lebanon currently experiencing devastating circumstances, it is essential to address the challenges associated with such neglected infectious diseases and seek rapid control measures.

Objectives

The primary objective of this study is to assess prevalence of HBV and HCV infections among the Lebanese and the Syrian refugees residing in Lebanon, analyze and elaborate in a comprehensive approach on the actual situation beyond statistical scrutiny. Other objectives include assessment of the risks associated with neglecting these infections among the refugee population and a futuristic analysis of possible long-term consequences. A final objective would be to suggest and explore possible interventions to address the arising resultant situation.

Methods

The study is an observational cross-sectional study that consisted of data collection from the LMoPH registry of communicable diseases. Data on the prevalence of HBV and HCV infections among the Lebanese population and Syrian refugees residing in Lebanon was obtained. The data was distributed based on age and gender and for the period extending from year 2013 till year 2018. The prevalence of HBV and HCV was then compared to prevalence of HBV and HCV among the Syrians residing and remaining in Syria.

Data has been sorted according to year, nationality, age, and gender and plotted into tables and graphs. An extensive literature review was conducted using Medline, Google scholar, and PubMed utilizing the following keywords: Refugees, Syrians, HCV, HBV, Lebanon. Data collected was analyzed using SPSS.

Results

Lebanon

The population residing in Lebanon comprises the Lebanese people, Syrian Refugees, Palestinian refugees, and other nationalities. [Table 1](#) represents the prevalence of HBV and HCV infections and their distribution among the total population in Lebanon and the Syrian refugees residing in Lebanon throughout the years 2013-2018.

From year 2013 until year 2018, the total number of HBV and HCV cases reported in Lebanon was 1,701 and 693 cases, respectively. The total number of incidents ranged from 141 to 390 cases for HBV and from 102 to 136 for HCV with a mean of 283 and 115, respectively. The prevalence of HBV and HCV in Lebanon is 1.74% and 0.21% respectively, ranking Lebanon amongst countries with low endemicity for both viruses [17].

Among the cumulative number of reported cases from 2013 till 2018, 220 HBV cases and 40 HCV cases were associated with the Syrian refugees residing in Lebanon. The number of cases ranged from 8 till 53 for HBV and from 4 till 10 for HCV. On average, throughout

the indicated study duration, a mean of 37 HBV incidents and 7 HCV incidents were estimated among the Syrian refugees in Lebanon. This translates to around 13% and 6% of all HBV and HCV infections diagnosed in Lebanon throughout the years 2013-2018, and indicates that the average prevalence of HBV and HCV infections solely among Syrian refugees is equivalent to 0.003% and 0.0007% respectively throughout years 2013-2018.

The number of reported cases increased from 2013 till year 2015 during which the highest number of cases was reported. After year 2015, there was a stabilization in number of HBV and HCV cases with a decreasing trend as shown in [Table 1](#). [Table 2](#) represents the distribution of the HBV and HCV cases of year 2018 among the total population and the Syrian refugees in Lebanon by age and gender.

An estimation of the incidence rates (%) of HBV and HCV reported among Syrians in Syria was then applied to the Syrian refugees residing in Lebanon in an attempt to better approximate the true incidence among the Syrian refugees. The number of both HBV and HCV infections was significantly higher among the youth than the rest of the age groups for both populations. The age group ranging from 20 to 39 represented 40% of the HBV and 30% of the HCV cases corresponding to the total population. For the Syrian refugees subgroup, 57% of HBV cases and 28% of HCV cases were reported among individuals aging between 20 and 39. Adolescents and the pediatric population displayed the lowest prevalence for both HBV and HCV for the two populations. Only 2%

Table 1: Prevalence of HBV and HCV infections among the total population in Lebanon and the Syrian refugees residing in Lebanon between years 2013 and 2018.

Year	HBV		HCV	
	Total	Syrian refugees	Total	Syrian refugees
2013	141	8	105	4
2014	229	31	104	5
2015	390	53	136	6
2016	367	48	116	8
2017	321	52	130	10
2018	253	28	102	7

Table 2: Prevalence of HBV and HCV infections in year 2018 among all residents in Lebanon and Syrian refugees sorted by age and gender.

		HBV		HCV	
		Total	Syrian refugees	Total	Syrian refugees
Age groups	Less than 19	6	0	5	0
	20-39	103	16	40	2
	40-59	64	6	25	2
	60+	20	0	9	1
	Unknown age	60	6	24	2
Gender	Male	152	22	78	3
	Female	98	6	25	4
	Unknown sex	3	0	0	0

of the total HBV cases and 5% of the total HCV cases among the total population in Lebanon were observed among individuals aging below 19 years, while no neither HBV no HCV cases were recorded among the Syrian refugees below 19 years of age.

HBV and HCV were more prevalent among men than women for both the Lebanese population and the Syrian refugees. In year 2018, 60% of HBV cases and 76% of the HCV cases were reported among the men of the total population residing in Lebanon. Similarly, for the Syrian refugees, 75% of HBV cases corresponded to Syrian males. The same trend was noted throughout all other years from 2013 to 2018. The number of reported cases of HCV among female Syrian refugees was slightly higher than that reported among male Syrian refugees in year 2018.

Syria

In Syria results showed that the prevalence of HBV and HCV among the total Syrian population in Syria is 5.6% and 2.8%, respectively, which is significantly higher than the prevalence among the Syrian refugees in Lebanon for both HBV (0.003%) and HCV (0.0007%). The comparison between the incidence rates of HBV and HCV among the Syrians in Syria and Syrians residing in Lebanon are displayed in [Figure 1](#).

An estimation of the incidence rates (%) of HBV and HCV reported among Syrians in Syria was then applied

to the Syrian refugees residing in Lebanon in an attempt to better approximate the true incidence among the Syrian refugees in Lebanon.

The expected number of HBV and HCV cases was calculated based on the total number of registered Syrian refugees in Lebanon (948,849 refugees). The number of HBV and HCV cases actually recorded among the Syrian refugees in Lebanon was significantly lower than the expected number of HBV and HCV cases, which were calculated to be 53,135 and 26,567 cases, respectively ([Table 3](#)).

Discussion

Viral hepatitis is a global health threat and a worldwide development priority [18]. The global burden of HBV and HCV is a growing issue and is most challenging in areas of conflict. War, displacement, and political crises are often associated with the outbreak of infectious diseases, and it has been exhibited that asylum seekers are at a higher risk of transmissible infections [19]. It is well known that refugees constitute a special social group in a geographical area. They often live under conditions that facilitate the spread of infectious diseases. Moreover, the prevalence of chronic infections among them depends on the endemicity of these diseases in the country of origin [20].

The Syrian conflict, which started in 2012, resulted in the disruption of many Syrian lives. Given that Lebanon

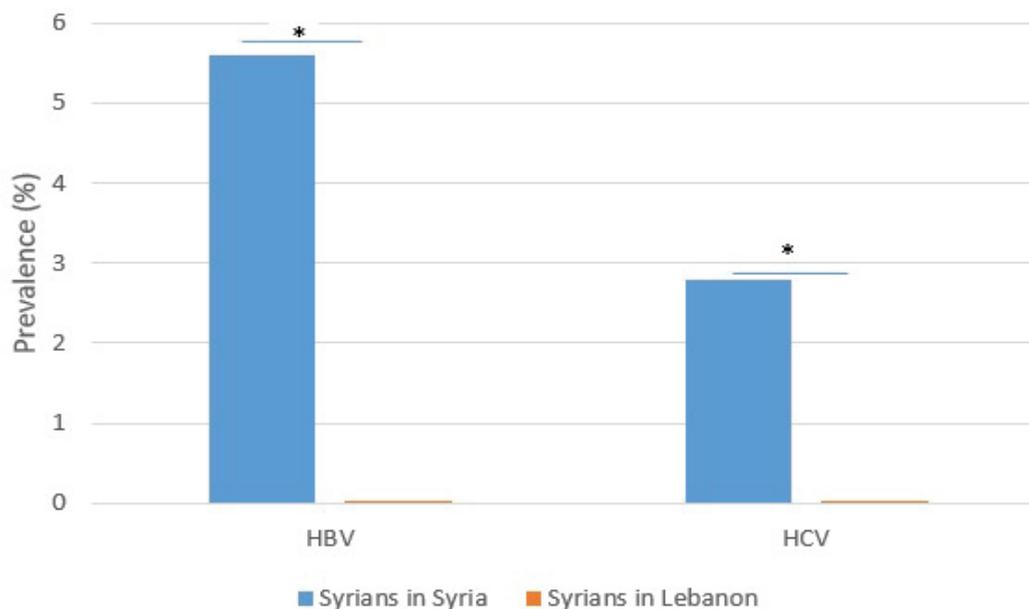


Figure 1: Comparison between the incidence rates of HBV and HCV among the Syrians in Syria and Syrians residing in Lebanon.

Table 3: Comparison between the number of HBV and HCV cases reported among Syrian refugees in Lebanon and the expected number of HBV and HCV cases when applying the incidence rates (%) in Syria to Syrian refugees in Lebanon.

HBV in Syria	HBV in Syrian refugees Calculated	HBV cases reported	HCV in Syria	HCV in Syrian refugees calculated	HCV cases reported
5.6%	53,135	220	2.8%	26,567	40

is in close proximity to Syria, Syrians sought refuge in Lebanon. Lebanon itself is a nation struggling with political, economic and social crises. The severity of its status was magnified by the influx of large numbers of Syrian refugees. Lebanon's infrastructure, economy and healthcare sector was excessively overburdened and limited resources were available to its fast-growing population [21].

In Lebanon, the prevalence of HBV has decreased after the implementation of several interventions including HBV vaccination of newborns since 1998, the implementation of mandatory premarital screening implemented since 1994, and the establishment of different awareness campaigns [17]. However, the high number of refugees and the catastrophic political and economic events taking place have forced the nation into detrimental public health consequences rendering the confinement of viral hepatitis infections at risk. In this study, the prevalence of HBV and HCV among the Syrian refugees in Lebanon with reference to the prevalence among the total population in Lebanon throughout the years 2013-2018 was assessed. According to the registry of communicable diseases of the LMoPH, 13% and 6% of the total HBV and HCV cases in the country respectively were reported among the Syrian refugees. The incidence rate of HBV and HCV among the Syrians in Lebanon was significantly lower than that among the Syrians remaining in Syria such that an average of 0.003% and 0.0007% incidence rates for HBV and HCV, respectively were reported for Syrian refugees in Lebanon as compared to 5.6% incidence rate for HBV and 2.8% incidence rate for HCV among the Syrians remaining in Syria. In order to better analyze the current findings, extrapolation of data was conducted.

Table 3 shows the expected numbers of HBV and HCV cases if the incidence rates (%) of HBV and HCV reported among Syrians in Syria applies to the Syrian refugees residing in Lebanon. The estimated number of cases of HBV and HCV among Syrian refugees calculated based on the % incidence among Syrian cases in Syria showed a marked discrepancy with the numbers reported to the LMoPH.

This implies that the actual number of Syrian refugees infected with HBV or HCV is much larger. These unmatched results raise several concerns regarding the status of HBV and HCV for Syrian refugees in Lebanon. The major difference in the prevalence of both infections may indicate that the HBV and HCV cases are being underreported or underdiagnosed. It may also indicate insufficient disease surveillance activity in Lebanon. This can be attributed to several factors to be discussed. It is worth noting that a huge number of Syrian refugees are not registered and that the estimated number of refugees mentioned above is expected to be far from the actual number of Syrian refugees residing in Lebanon. This renders the extrapolated prevalence much lower,

and thus, the issue of underreporting more heightened. The diagnosis and reporting of communicable diseases are important steps for evaluating and constructing disease control programs and are valuable for overall disease surveillance. Surveillance itself is an essential tool to identify new outbreaks and trends and to monitor the progression of a certain diseases [22]. The absence of either of these interlinked components can impair proper epidemiological assessments and derive detrimental health outcomes. For example, it is known that HCV surveillance has poor sensitivity [23] due to under-detection and under-reporting. Under-detection is mainly attributed to the slow and the silent onset of the disease [24]. Under-reporting has been shown to be the result of political turmoil, indifference, and poor infrastructures [25]. Due to the insensitivity of HCV surveillance, HCV attack-rates are systematically underestimated [26], especially if surveillance focuses only on acute infections which are rarely symptomatic. According to WHO, given that most patients will not realize they are infected, screening is recommended for the entire population in countries with high prevalence. However, this is rarely applied.

Two hypotheses are proposed in view of the current HBV and HCV findings: linkage to care and the principle of neglected diseases. The principle of linkage to care is crucial for the fate of terminal infectious diseases including viral hepatitis. Patients who are linked to care once tested can achieve significant reductions in HBV-associated morbidity and mortality [27]. Lok, et al. mentioned that linking HBV-infected patients to care facilitates timely treatment for eligible persons and allows for the periodic surveillance of HCC and monitoring of disease progression [28]. Coyle, et al. indicated that linkage to care can enhance HCV care continuum and allows acquiring behavioral risk reduction counseling and the vaccination of susceptible contacts [29]. In Lebanon, several factors can influence linkage to care. Individuals may be of their infection or are not referred to a specialist despite their diagnosis [30]. Lack of effective screening policies, poor health literacy, and high cost of treatment and follow-up expenses may also prevent any attempts towards linkage to care [31]. Nonexistence of this care linkage can impose individual and national financial burdens and can make the eradication of the disease less feasible.

The second principle is related to neglected diseases. Neglected diseases are infections common among populations associated with lower income and socioeconomic status, and they offer negligible marketable and profitable issues. As such, they are often undermined and least attractive to the private sector when it comes to research and drug design [32]. Trapped in the vicious circle of underdevelopment-poverty-health inequity, these populations constitute exhausted "preys" for "predators" such as HIV/AIDS, malaria, tuberculosis and a multitude of the so-called

neglected diseases [33]. The great interest in the three big killers overshadows the sufferings that neglected diseases are causing to millions of people. Thus, neglected diseases are not considered a priority and are overlooked by the media and the government. This results in lack of awareness to the disease symptoms and complications, neglects the importance of screening, and prevents the implementation of reporting and surveillance strategies [34]. Lebanon is a country of low HBV and HCV endemicity and these infections are not considered as major priorities. It is assumed that HBV and HCV have become neglected diseases.

This implies that the Syrian refugees in Lebanon are subject to a cumulative risk of complications in the absence of proper screening and treatment. HBV and HCV progressions are often silent and many patients remain unaware of their infection until later stages of cirrhosis, liver decompensation or HCC [35,36]. Reports show that 55-85% of people with acute HBV develop chronic infection and about one third of these, if not treated, eventually develop liver cirrhosis or HCC [37]. As for HCV, it has been evident that the 5-year cumulative risk for HCC was 9.7% to 15.5% in cirrhotic patients [38]. Most patients infected with HCV have different degrees of liver damage that can worsen and lead to liver cirrhosis in 20% of the cases [39]. One third of patients with predominantly mild HCV showed significant fibrosis progression over a median period of 30 months [40]. However, individual variability is wide, and it is not yet possible to predict who will progress or in what period. The HCV disease paradigm varies by country based on historical and present risk factors, screening programs and treatment methods [41].

In developing countries, which are most prevalent with HBV and HCV, treatment capacity and financial resources are limited. Screening and treatment are prioritized for patients in more advanced stages of the disease [42]. This prevents the early identification of patients. The WHO mentions that early identification of individuals with HBV and HCV infections enables them to be linked to care and to prevent or delay progression of liver diseases. It also allows the reduction of transmission through counseling and vaccination [34]. Even though it is expected that with time the overall prevalence of viral hepatitis will decrease, the morbidity and mortality attributed to viral hepatitis are expected to increase as the presently infected population progresses to advanced stages of liver disease [43]. For instance, under the current treatment paradigm, the prevalence of chronic HCV is projected to fall slightly by 2030, with a 4% decrease, but cases of advanced stage liver disease are projected to increase by 18-30% [44]. A study by Sibley, et al. mentioned that the number of HCC cases attributable to HCV was projected to a 25% increase by 2030 from a base of 30 cases and that compensated cirrhosis and decompensated cirrhosis

were also projected to a 30% and 17% increase, respectively, from a base of 810 and 90 cases in 2014 [43]. This implies that the cumulative risk of chronic complications is being continuously elevated. Further neglecting such infections can impose severe burdens especially for struggling countries [45].

Lebanon is a struggling country itself. Financial and political instabilities caused deleterious consequences on its already deficient health sector. Lebanon is currently undergo in unique circumstances, holding a peculiar population structure, and experiencing failure in healthcare performance. Given the expected progression of these infections, thorough assessments and careful measures are needed in order to better control HBV and HCV and their long-term sequelae.

According to the data presented in Table 2, 60% of HBV cases and 76% of HCV cases in year 2018 were reported among the total population residing in Lebanon corresponding to the age group between 20 and 39. Several studies have shown that HBV and HCV disease progression is an age dependent process. Age at the time of infection has been shown to be a strong determinant of chronicity. The earlier the acquisition of infection, the higher probability of developing chronic infection [46]. In the National Health and Nutrition Examination Survey (NHANES) study on HCV infection, the chronicity rate was estimated at 30% in subjects below the age of 20 years, and 76% for those older than 20 years [47]. Also, a study by Pradat, et al. showed that most HCV patients, if untreated, are expected to develop cirrhosis at about 65 years, irrespective of the age at infection [48]. For Lebanon, this raises several concerns. The Syrian refugees population in Lebanon is a youthful population that is currently aging while still residing in Lebanon as the conflict in Syria is yet to be resolved. This implies that the burden of HBV and HCV chronicity will be more pronounced in the forthcoming future. Thus, it is important to highlight the cumulative risk assessment associated with viral hepatitis. Lack of patient identification protocols and efficient screening strategies prevent any opportunities for clinical interventions before the onset of severe liver complications. This further increases the burden. The burden of HBV and HCV is expected to be more elevated while the healthcare capacity in Lebanon continues to diminish. Efforts should be targeted towards enhancing the testing-linkage to care process in Lebanon.

Our results also displayed higher HBV and HCV prevalence among men than women in both studied populations. This is in accordance with previous literature indicating that the rate of chronicity for HBV and HCV infections appears to be lower in women, particularly younger women [49,50]. Such conclusions are essential for the prioritization and elimination strategies of viral hepatitis particularly in a limited resources setting such as Lebanon.

Despite being neglected disease, some efforts have focused on the elimination of HBV and HCV. The WHO has recently issued its first guidance for country validation of HBV and HCV elimination and provided recommendations for screening, care and treatment of persons with chronic infections [51]. Newly developed drugs have revolutionized treatment of HBV and HCV compared to traditional drugs and have exhibited great efficacy, high tolerance, and minimal side effects [52]. However, despite these advancements, the eradication of viral hepatitis remains to be unattainable in Lebanon [11]. Like many low-middle income countries, Lebanon faces lack of awareness among patients, high costs and shortages in medicines and care utilities [41]. Although the price of medicines effective against HBV infection have decreased sharply, a study done by Hutin, et al. in 2016 showed that there is significant underutilization of low-price, generic medicines effective against HBV [53].

Such challenges are underscored in the presence of the high number of refugees in Lebanon. Refugees are among the underprivileged populations. Refugees often experience transit or unstable living conditions and are expected to exhibit elevated rates of HBV and HCV, as described above [54]. United Nations High Commissioner for Refugees (UNHCR) provides certain medical services to the Syrian refugees in Lebanon. Services include few vaccines, medications for acute illnesses, two ultrasounds for pregnant women, and discounts varying from 10-15% on some other services. Treatments related to HBV or HCV infections are not included in any way other than vaccination against HBV as part of routine children vaccination program [55]. Findings show that Syrian refugees spend only 12% of their income on medical expenses [56]. The Syrian refugees, who are already struggling financially in their host country, are also burdened by the medical expenses. This makes them reluctant towards seeking diagnosis and linkage to care. This adds pressure on the overloaded Lebanese healthcare sector that is experiencing shortages in medical resources. This pressure results in disparities in the distribution of healthcare services and treatments. Consequently, ethical dilemmas arise regarding the prioritization of these treatments among the refugees and host population [57,58]. These issues should be addressed in order to decrease the social and economic burden awaiting the Lebanese government and its people.

Action is needed in order to prevent further neglecting HBV and HCV. Early steps towards eradication and decreasing the expected cumulative burden are crucial. This can be achieved through outreach campaigns to ensure community awareness and to promote a better understanding of HBV and HCV. Efficient proactive screening based on risk analysis is needed. The Lebanese government must establish a responsive, people-oriented healthcare system and ensure access to affordable diagnostics and treatments. Imaging

modalities required for early HCC such as MRI and CT scans should be provided with minimal costs. This will allow systematic surveillance and regular reporting and will enhance testing and linkage to care.

Limitations

There are certain limitations that ought to be addressed. The number of Syrian refugees described in this study is under-representative as the actual number of refugees is expected to be higher. This study included the number of confirmed HBV and HCV cases but did not mention the number of cases with severe liver complications.

Conclusion

HBV and HCV are neglected diseases in the Syrian refugee population. This continued neglect will render this vulnerable population at a higher risk of chronic viral hepatitis complications and mortality, further increasing the health and economic burden in a country already financially strained. Urgent action is needed by the host country and by the international community to apply better surveillance, detection and linkage to medical care. Given the limited resources available for the Lebanese government, international organizations involved in the health of Syrian refugees should prioritize the management and prevention of viral hepatitis B and C in Lebanon.

Ethical Approval

An approval from the Institutional Review Board (IRB) was not needed for conducting this study.

Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Data Availability

The data that support the findings of this study are available through the LMoPH database and the listed online references.

References

1. World Health Organization (2017) Global hepatitis report 2017.
2. World Health Organization (2021) Hepatitis B.
3. World Health Organization (2022) Hepatitis C.
4. CDC (2022) Viral Hepatitis.
5. Stanaway JD, Flaxman AD, Naghavi M, Fitzmaurice C, Vos T, et al. (2016) The global burden of viral hepatitis from 1990 to 2013: Findings from the Global Burden of Disease Study 2013. *The Lancet* 388: 1081-1088.
6. Su J, Brook RA, Kleinman NL, Corey-Lisle P (2010) The impact of hepatitis C virus infection on work absence, productivity, and healthcare benefit costs. *Hepatology* 52: 436-442.

7. Khoury ACE, Wallace C, Klimack WK, Razavi H (2012) Economic burden of hepatitis C-associated diseases: Europe, Asia Pacific, and the Americas. *J Med Econ* 15: 887-896.
8. Scott DR, MT Levy (2010) Liver transient elastography (Fibroscan): A place in the management algorithms of chronic viral hepatitis. *Antivir Ther* 15: 1-11.
9. Lu J, Xu A, Wang J, Zhang L, Song L, et al. (2013) Direct economic burden of hepatitis B virus related diseases: Evidence from Shandong, China. *BMC Health Serv Res* 13: 37.
10. Mohammadzadeh M, Derafshi H, Ghari T (2018) The estimation of economic burden of hepatitis C virus infection in Iran. *Iran J Public Health* 47: 1575-1582.
11. Rached AA, Kheir SA, Saba J, Assaf S, Kassis G, et al. (2018) Hepatitis C in Lebanon: The burden of the disease and the value of comprehensive screening and treatment. *Hepat Med* 10: 73-85.
12. Nasser SC, Mansour H, Nader TA, Metni M (2018) Cost-effectiveness of novel treatment of hepatitis C virus in Lebanese patients. *Int J Clin Pharm* 40: 693-699.
13. Isma'eel H, Jamal NE, Dumit NY, Al-Chaer E (2020) Saving the suffering Lebanese healthcare sector: Immediate relief while planning reforms. *Initiative AR*.
14. Reliefweb (2021) UNHCR Lebanon: Fact sheet, September 2021.
15. Ammar W, Kdouh O, Hammoud R, Hamadeh R, Harb H, et al. (2016) Health system resilience: Lebanon and the Syrian refugee crisis. *J Glob Health* 6: 020704.
16. Hussein NR, Muhammed I, Younus OM, Saleh AM, Salim AA, et al. (2017) Prevalence of HBV, HCV and HIV infections among Syrian refugees in Kurdistan region, Iraq. *Int J Infect Dis* 4: e39420.
17. Rached AA, Kheir SA, Saba J, Ammar W (2016) Epidemiology of hepatitis B and hepatitis C in Lebanon. *Arab J Gastroenterol* 17: 29-33.
18. Ward JW, Hinman AR (2019) What is needed to eliminate hepatitis B virus and hepatitis C virus as global health threats. *Gastroenterology* 156: 297-310.
19. Sharara SL, Kanj SS (2014) War and infectious diseases: Challenges of the Syrian civil war. *PLoS Pathog* 10: e1004438.
20. Roussos A, Goritsas C, Pappas T, Spanaki M, Papadaki P, et al. (2003) Prevalence of hepatitis B and C markers among refugees in Athens. *World J Gastroenterol* 9: 993-995.
21. Brun C, Fakih A, Shuayb M, Hammoud M (2021) The Economic Impact of the Syrian Refugee Crisis in Lebanon.
22. World Health Organization Regional Office For The Eastern Mediterranean (2022) Importance of surveillance in preventing and controlling noncommunicable diseases.
23. Desenclos JC (2003) The challenge of hepatitis C surveillance in Europe. *Eurosurveillance* 8: 99-100.
24. Rantala M, van de Laar MJW (2008) Surveillance and epidemiology of hepatitis B and C in Europe—a review. *Euro Surveill* 13: 18880.
25. Arita I, Nakane M, Kojima K, Yoshihara N, Nakano T, et al. (2004) Role of a sentinel surveillance system in the context of global surveillance of infectious diseases. *Lancet Infect Dis* 4: 171-177.
26. Kim WR (2011) Global epidemiology and burden of hepatitis C. *Microbes Infect* 4: 1219-1225.
27. Cohen, C, Holmberg SD, McMahon BJ, Block JM, Brosgart CL (2011) Is chronic hepatitis B being undertreated in the United States? *J Viral Hepat* 18: 377-383.
28. Lok ASF, McMahon BJ (2007) Chronic hepatitis B. *Hepatology* 45: 507-539.
29. Coyle C, Moorman AC, Bartholomew T, Klein G, Kwakwa H, et al. (2019) The hepatitis C virus care continuum: Linkage to hepatitis C virus care and treatment among patients at an urban health network, Philadelphia, PA. *Hepatology* 70: 476-486.
30. Spradling PR, Xing J, Rupp LB, Moorman AC, Gordon SC, et al. (2016) Infrequent clinical assessment of chronic hepatitis B patients in United States general healthcare settings. *Clin Infect Dis* 63: 1205-1208.
31. Sanga ES, Mukumbang FC, Mushi AK, Lerebo W, Zarowsky C (2019) Understanding factors influencing linkage to HIV care in a rural setting, Mbeya, Tanzania: qualitative findings of a mixed methods study. *BMC Public Health* 19: 1-15.
32. Trouiller P, Olliaro P, Torreele E, Orbinski J, Laing R, et al. (2002) Drug development for neglected diseases: a deficient market and a public-health policy failure. *The Lancet* 35: 2188-2194.
33. Boutayeb A (2007) Developing countries and neglected diseases: Challenges and perspectives. *Int J Equity Health* 6: 20.
34. World Health Organization (2016) Guidelines on hepatitis B and C testing: Policy brief.
35. Bucci L, Garuti F, Lenzi B, Pecorelli A, Farinati F, et al. (2017) The evolutionary scenario of hepatocellular carcinoma in Italy: An update. *Liver Int* 37: 259-270.
36. Lavanchy D (2011) Evolving epidemiology of hepatitis C virus. *Clin Microbiol Infect* 17: 107-115.
37. World Health Organization (2021) Hepatitis C fact sheet.
38. Varbobitis I, Papatheodoridis GV (2016) The assessment of hepatocellular carcinoma risk in patients with chronic hepatitis B under antiviral therapy. *Clin Mol Hepatol* 22: 319-326.
39. Coltorti M, Romano M, Persico M, Morisco F, Tuccillo C, et al. (1995) Hepatitis C virus RNA in serum and liver histology in asymptomatic anti-HCV positive subjects. *Infection* 23: 33-36.
40. Ryder S, Irving WL, Jones DA, Neal KR, Underwood JC (2004) Progression of hepatic fibrosis in patients with hepatitis C: A prospective repeat liver biopsy study. *Gut* 53: 451-455.
41. Liakina V, Hamid S, Tanaka J, Olafsson S, Sharara AI, et al. (2015) Historical epidemiology of hepatitis C virus (HCV) in select countries—volume 3. *J Viral Hepat* 22: 4-20.
42. World Health Organization (2014) Guidelines for the screening, care and treatment of persons with hepatitis C infection.
43. Sibley A, Han KH, Abourached A, Lesmana LA, Makara M, et al. (2015) The present and future disease burden of hepatitis C virus infections with today's treatment paradigm—volume 3. *J Viral Hepat* 22: 21-41.
44. Alfaleh, F, Nugrahini N, Matičič M, Tolmane I, Alzaabi M (2015) Strategies to manage hepatitis C virus infection disease burden—volume 3. *J Viral Hepat* 22: 42-65.

45. Li J, Gordon SC, Rupp LB, Zhang T, Trudeau S (2017) Long-term progression of viral load and serum markers of fibrosis among treated and untreated patients with chronic hepatitis B. *Journal of gastroenterology and hepatology* 32: 1250-1257.
46. Pan CQ, Zhang JX (2005) Natural history and clinical consequences of hepatitis B virus infection. *International Journal of Medical Sciences* 2: 36.
47. Alter MJ, Kruszon-Moran D, Nainan OV, McQuillan GM, Gao F, et al. (1999) The prevalence of hepatitis C virus infection in the United States, 1988 through 1994. *New England Journal of Medicine* 341: 556-562.
48. Pradat P, Voirin NV, Tillmann HL, Chevallier M, Trépo C (2007) Progression to cirrhosis in hepatitis C patients: An age-dependent process. *Liver Int* 27: 335-339.
49. Chen SL, TR Morgan (2006) The natural history of hepatitis C virus (HCV) infection. *Int Journal of Medical Sciences* 3: 47.
50. CDC (2020) Prevalence and trends in Hepatitis B virus infection in the United States, 2015-2018.
51. World Health Organization (2021) WHO releases first-ever global guidance for country validation of viral hepatitis B and C elimination.
52. Lawitz E, Mangia A, Wyles D, Rodriguez-Torres M, Hassanein T, et al. (2013) Sofosbuvir for previously untreated chronic hepatitis C infection. *N Engl J Med* 368: 1878-1887.
53. Hutin Y, Nasrullah M, Easterbrook P, Nguimfack BD, Burrone E, et al. (2018) Access to treatment for hepatitis B virus infection-worldwide, 2016. *MMWR Morb Mortal Wkly Rep* 67: 773-777.
54. Angeletti S, Ceccarelli G, Vita S, Dicuonzo G, Lopalco M (2016) Unusual microorganisms and antimicrobial resistances in a group of Syrian migrants: Sentinel surveillance data from an asylum seekers centre in Italy. *Travel Med Infect Dis* 14: 115-122.
55. Ammar Z (2018) Health response strategy. Maintaining health security, preserving population health & saving children and women lives. A new approach 2016 & beyond. Ministry of Public Health Lebanon.
56. Inter-Agency Coordination (2015) Profiling of Syrian Refugees in Lebanon.
57. Puchner K, Karamagioli E, Pikouli A, Tsiamis C, Kalogeropoulos A, et al. (2018) A Time to rethink refugee and migrant health in Europe: Moving from emergency response to integrated and individualized health care provision for migrants and refugees. *Int J Environ Res Public Health* 15: 1100.
58. Biesen WV, Vanholder R, Hernandez T, Drewniak D, Luyckx V (2018) Caring for migrants and refugees with end-stage kidney disease in Europe. *Am J Kidney Dis* 71: 701-709.