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Original Article

Seroprevalence of Hepatitis B, Hepatitis C, and HIV Among Libyan Citizens and Migrant Workers in the Nalut Region

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Abstract
Hepatitis B (HBV), Hepatitis C (HCV), and Human Immunodeficiency Virus (HIV) represent significant global health challenges, particularly in transit regions where migration patterns may influence disease dynamics. Libya, as a destination and transit point for migrants, faces unique epidemiological pressures. Objectives: This study aimed to determine the seroprevalence of HBsAg, HCV antibodies, and HIV among Libyan citizens and foreign migrant workers in the Nalut region. A retrospective cross-sectional analysis was conducted using mandatory health examination records from the healthcare laboratory in Nalut between March and August 2025. A total of 894 participants (561 Libyans and 333 foreign workers) were screened using rapid diagnostic tests, with positive results confirmed via Enzyme-Linked Immunosorbent Assay (ELISA). Among Libyan citizens, the seroprevalence rates were 1.6% (n=9) for HBsAg, 0.71% (n=4) for HCV, and 0.17% (n=1) for HIV. Among foreign workers, the rates were 0.9% (n=3) for HBsAg and 1.5% (n=5) for HCV, with no HIV cases recorded. Statistical analysis indicated no significant differences in prevalence between the two groups ($p > 0.05$). Notably, the highest prevalence was observed in the 21–30 age group. Conclusion: The findings indicate a low to moderate prevalence of viral infections in the Nalut region, with similar rates between local and migrant populations. Continued surveillance and expanded screening programs are recommended to manage public health risks effectively.
Keywords. Seroprevalence, Hepatitis B, Hepatitis C, HIV, Migrant Workers, Libya.

Introduction

Viral hepatitis, mainly caused by hepatitis B and C viruses, can range from acute to chronic infections, potentially leading to cirrhosis and liver cancer [1]. In 2019, approximately 296 million and 58 million people were affected by hepatitis B and C, respectively, resulting in about 1.11 million deaths globally [2]. Pregnancy increases the risk of infection, which can affect both the mother and fetus [3]. Hepatitis is widespread, with an estimated 350 million infections, and 190 million people at risk of severe outcomes [4,5]. A study from 2014 reported approximately 107,848 cases of hepatitis B and 68,275 cases of hepatitis C in Libya [6]. Transmission typically occurs via blood contact, childbirth, or sexual intercourse, with hepatitis C being less commonly transmitted sexually [7,8]. Hepatitis remains a serious public health challenge, particularly in Africa and the Western Pacific [9].

Globally, HIV poses a significant health issue, characterized by an immune system deficiency.[10] By the end of 2023, UNAIDS reported about 39 million people living with HIV, with a prevalence rate of 0.2%. The primary mode of transmission includes intravenous drug use, alongside sexual contact and mother-to-child transmission during pregnancy and breastfeeding [11,12,13].

Libya, a Mediterranean country rich in resources but bordered by nations with high rates of hepatitis and HIV, faces increased transmission risks. The presence of many migrants also contributes to the spread of these diseases, with numerous studies highlighting their prevalence among migrant populations [14]. Previous national surveys in Libya estimated significant burdens of HBV and HCV [6]. However, regional data, particularly from border or transit areas like Nalut, are essential for localized health planning. This study assesses the current prevalence of these infections in Nalut to inform public health interventions.

Methods

Study setting and population

This study was conducted at the Health Center in the city of Nalut, in the Western Mountain region, in the far west of the mountain, approximately 270 kilometers from the city of Tripoli. The study included samples from 561 Libyans and 333 expatriates of various nationalities. The data was collected from March to May 2025 from the medical records of patients at the Health Center in Nalut city. Using a questionnaire to verify accuracy. The questionnaire contained identification data (age, distributed across several age groups, in addition to gender and nationality with regard to foreign workers and the medical examinations performed on them).

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Study sampling
Blood tests for hepatitis B, C, and HIV are important routine tests for healthcare workers, patients, and visitors in general. The test is performed using a blood sample from the patient. The test is initially performed using the rapid screening test (Rapid). If the result is positive, the test is repeated using the enzyme-linked immunosorbent assay (ELISA) test [13].

Blood test by rapid test Method
In this method, 3 ml of the patient's blood were taken into a test tube and placed in a centrifuge to separate the serum. Then, 50 microliters (µL) of serum were transferred to the test strip and left for 10 to 20 minutes. A red line appears in the positive case on the test strip. When a red line does not appear, the result is negative.

Enzyme linked immunosorbent assay (ELISA)
A total of 3 ml of the patient's blood was taken and placed in a test tube, then placed in a centrifuge to obtain the serum. Then, Then, 50 microliters (µL) of serum and 50 microliters (µL) of conjugate enzyme were added. The sample was placed in the incubator at 37 degrees Celsius for 30 minutes. After that, the sample was washed with a virus-specific solution and then 50 50 microliters (µL) of substrate It was placed in the incubator for 10 minutes, then 50 mu L of stop solution. In order to stop the reaction after reading the results, a blue color appears for a positive result and a transparent color for a negative result.

Statistical Analysis
Statistical analysis was conducted using SPSS version 21 from IBM, Somers, New York, USA. A two-group comparison test was used, with $P < 0.05$ considered statistically significant.

Ethical Approval
Permission was obtained from the College of Medical Technology, Rayayna, to conduct this study. The reference center in Nalut was then contacted to authorize data collection for the study.

Results

Demographic Characteristics
The study included a sample of 894 individuals, both Libyan and foreign residents, the majority of whom were male (76%), while only about 213 out of the 894 (24%) were female. The ages of the participants ranged from 10 to 80 years, and the sample was divided into seven age groups: 10-20, 21-30, 31-40, 41-50, 51-60, 61-70, and 71-80. Most of the sample fell within the first three age groups, as shown in (Table 1).
The total number of participants is 894; however, some cases did not indicate their age. The results from (Table 1) revealed that most of the participants (76%) are males, whereas females constitute 24% of the total sample.

Table 1. Demographic Characteristics of Participants (N=894)

Characteristic	Category	Frequency	Percentage
Gender	Male	681	76%
	Female	213	24%
Age Group	10–20 years	146	17%
	21–30 years	277	32%
	31–40 years	271	30%
	41–50 years	85	10%
	51–60 years	68	8%
	61–70 years	21	2%
	71–80 years	5	1%

As for their age, the greatest percentage (32%) was for the participants aged between 21 and 30 years old, followed by the participants aged between 31 and 40 years old (30%). The participants who were aged 10-20 years old were presented by 17%, while the participants between 41 and 50 years presented 10%. The participants aged between 50 and 60 years old constitute 8%, and the participants aged 61-70 years old present 2%. The smallest percentage (1%) was found for the oldest age group, from 71 to 80 years old. The results are summarized in (Figure 2).
Based on Figure 2, the majority of the cases are between 21 and 30 years, followed by the 31-40 age group.

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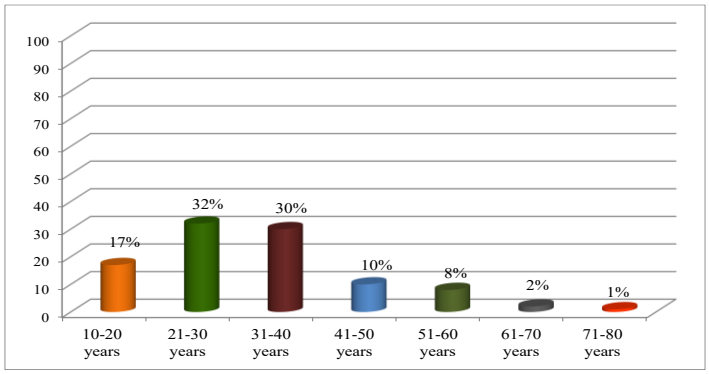

Figure 2. Distribution of participants according to their age

Overall Prevalence

The overall seroprevalence for the entire cohort was 1.3% for HBV, 1.0% for HCV, and 0.11% for HIV (Table 2).

Table 2. Prevalence of HBV, HCV, and HIV by Gender (N=894)

Virus	Male (n=681)	Female (n=213)	Total (%)
HBV	6 (0.67%)	6 (0.67%)	12 (1.3%)
HCV	7 (0.78%)	2 (0.22%)	9 (1.0%)
HIV	0 (0.00%)	1 (0.11%)	1 (0.11%)

Prevalence Among Libyan Citizens

Among the 561 Libyan participants, females showed slightly higher rates of HBV infection (0.89%) compared to males (0.71%). The only HIV case in the study was a Libyan female (Table 3).

Table 3. Infection Rates Among Libyans by Gender (n=561)

Virus	Male (n=367)	Female (n=194)	Total (%)
HBV	4 (0.71%)	5 (0.89%)	9 (1.6%)
HCV	2 (0.35%)	2 (0.35%)	4 (0.71%)
HIV	0 (0.00%)	1 (0.18%)	1 (0.17%)

The total number of Libyan cases is 561 participants. (Table 3) reveals that most Libyan cases (65%) are males, whereas females constitute 35% of the total cases. It is also shown that there are 4 males (0.71%) who are infected by HBV, 2 males (0.35%) are infected by HCV, while none of the males are infected by HIV. As for females, there are 5 cases (0.89%) who are infected by HBV, 2 cases (0.35%) are infected by HCV, and one case is infected by HIV. (Figure 3) presents this result.

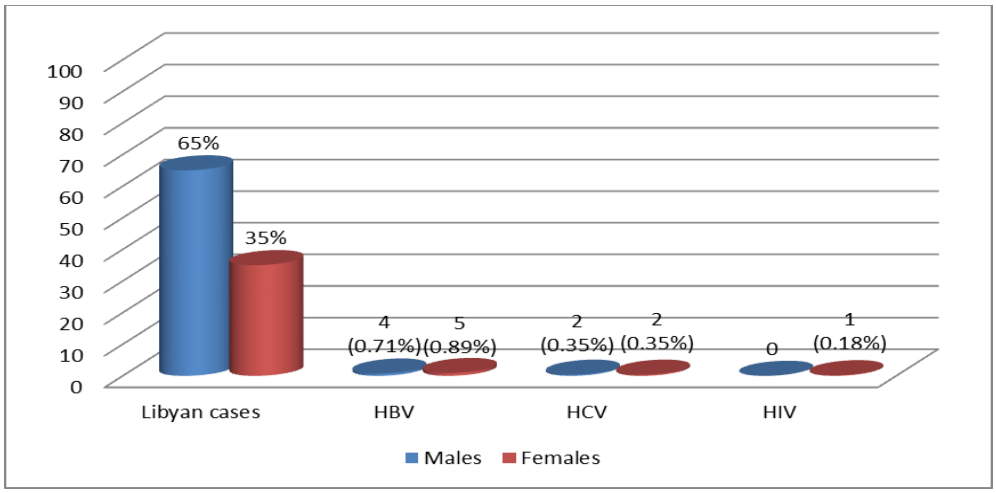

Figure 3. Prevalence of HBV, HCV, and HIV among Libyan citizens by gender.

Prevalence Among Foreign Workers

The foreign cohort (n=333) included individuals from 21 nationalities, primarily from Egypt (n=110), Sudan (n=63), and Nigeria (n=26). The prevalence of HCV (1.5%) was higher than HBV (0.9%) in this group (Table 4).

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Table 4. Infection Rates Among Foreign Workers by Nationality (n=333)

Nationality	HBV	HCV	HIV
Egyptian	0	3	0
Sudanese	1	0	0
Nigerian	2	1	0
Pakistani	0	1	0
Others	0	0	0
Total	3 (0.9%)	5 (1.5%)	0 (0.0%)

Comparative Analysis

Statistical comparison using independent sample t-tests revealed no significant differences between Libyans and foreign workers for any of the three viruses (Table 5).

Table 5. Statistical Comparison of Infection Rates (Libyan vs. Foreign)

Virus	Libyan Mean (SD)	Foreign Mean (SD)	t-value	p-value
HBV	1.99 (0.119)	1.99 (0.095)	-0.688	0.492
HCV	1.99 (0.084)	1.98 (0.122)	1.140	0.254
HIV	2.00 (0.042)	2.00 (0.000)	-0.770	0.441

Discussion

This study aimed to assess the prevalence of hepatitis B, hepatitis C, and HIV infection in the Western Mountain region of Nalut and its surrounding areas. Data was collected from the records of the reference center in Nalut and included both Libyan and foreign patients of various nationalities.

The study sample consisted of 561 Libyans and 333 foreigners who visited the Health Center in Nalut, including those who presented for medical reasons during the period between March and May 2025. This study revealed that the percentage of positive cases for the hepatitis B virus was 1.3%, while the percentage of cases infected with the hepatitis C virus was 1%. Additionally, there was one case of HIV infection, representing 0.11% of the total cases among Libyans. These results show that they were close to the conclusions of the study [4], with a slight increase compared to the results of this study. The prevalence rate was higher for the hepatitis C virus and lower for HIV, as indicated in the study [15].

Furthermore, this study indicated that the distribution of cases among Libyans by gender was skewed towards men (65%), of whom 4 (0.71%) were carriers of hepatitis B virus, 2 (0.35%) of hepatitis C virus, and no HIV cases were recorded among men. The distribution of cases among women was 35%, including 5(0.89%) carriers of the hepatitis B virus, 2 (0.35%) of the hepatitis C virus, and 1 (0.18%) of HIV. The highest prevalence was recorded in the 21-30 age group. These rates are consistent with previous studies [15, 6].

The study showed that the prevalence of the hepatitis B virus among foreigners was 0.9% (3) out of 333 cases, while the prevalence of the hepatitis C virus was higher (1.5%) (5 cases). The cases were distributed across different age groups, with the 21-30, 41-50, and 51-60 age groups recording the highest prevalence. This percentage is considered low compared to a similar study that showed a higher prevalence of infections in the 18-28 age group [16].

The study also showed that the foreign participants, both male and female, were distributed across 21 African and Asian countries. The cases were distributed among four nationalities, with Egyptians comprising 0.3% (3) of the foreigners. The remaining cases were distributed among the other three nationalities. This result is considered low compared to a previous study, taking into account the difference in sample size [15]. Our study showed that there is a prevalence of viral infection (HBV, HCV, HIV) in the Libyan cases within the sample, compared to the cases of foreigners, which recorded a prevalence of two types of viruses under study. Table [5], which shows the differences in the prevalence of the viruses under study between Libyan and foreign cases, *indicates that the P=value in each of the three viral indicators shows no differences* between Libyan and foreign cases alike, which aligns with the findings of study [7].

Conclusion

This study confirms the presence of HBV, HCV, and HIV in both the local and migrant populations of Nalut, albeit at relatively low levels. The study indicated an overall prevalence of hepatitis B infection of 1.3%. It is distributed equally between males (0.67%) and females (0.67%). The overall prevalence of hepatitis C infection was 1% lower, with a moderate prevalence among males (0.78%) and a lower rate among females (0.22%). The HIV prevalence in the total sample was 0.11%, with one case reported among females. The study also showed a relatively high prevalence rate among Libyan patients compared to foreign workers, with a total sample size of 561 cases. The sample was distributed among Libyan individuals of both sexes, with males constituting the majority. (65%) 367 and (35%) 194 for women. The study showed that (0.71%) 4 males carry HBV infection, (0.35%) 2 males carry HCV infection, and no HIV

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infection was recorded among men. The spread of infection among women was higher, with (0.89%) 5 HBV (0.35%) 2 HCV, and (0.18%) 1 HIV. The distribution of foreign individuals in the study was represented by (37%) 333 cases. The prevalence of HBV infection was (0.9%)3 cases, two of Nigerian nationality and one of Sudanese nationality, while the prevalence of HCV infection was (1.5%)5 cases, three of which were Egyptian nationality and one each of Nigerian and Pakistani nationality. No HIV infections were recorded. Therefore, it is necessary to monitor the spread of infection among both Libyans and expatriates, and we recommend conducting similar studies that consider sample size and geographical location.

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Conflicts of Interest
The authors declare no conflicts of interest and received no funding for this study. The findings are presented objectively, without any relationships that could influence the research interpretation.

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