



HEPATITIS B AND C REGISTRATION IN NINEVEH, IRAQ BEFORE AND AFTER ISIL INVASION

*¹Dr. Ahmed Zuhair Thanoon, ²Dr. Ahmed Wael Hazim and ³Dr. Omar Mowaffaq Jabir Mohammed Allayla

¹M.B.Ch.B-HD(Field Epidemiology), Public Health Department.

²M.B.Ch.B-HD (Family Medicine)/ Right Discrete for the Primary Health Care.

³M.B.Ch.B-HD (Family Medicine)/ Right Discrete for the Primary Health.

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*Corresponding Author: Dr. Ahmed Zuhair Thanoon

M.B.Ch.B-HD(Field Epidemiology), Public Health Department.

ABSTRACT

Background: Viral hepatitis, a global health issue, affects 400 million people and causes 1.4 million deaths annually. In Iraq, prevalence varies among governorates, with cirrhosis being the most prevalent. The Ministry of Health prioritizes surveillance, medicines, diagnostic services, and immunization. **Methodology:** The study aims to investigate the prevalence of Hepatitis B and C in Nineveh, Iraq, a region with a population of 4,030,006 in 2021. The research will involve a cross-sectional study design, focusing on patients at primary health care centers, hospitals, laboratories, blood banks, and hemodialysis centers. It will be conducted from September to November 2022, analyzing data from aggregated forms, reports, annual statistical reports, and population estimation. The data will be analyzed using SPSS version 26, with categorical data described in proportions and p-values <0.05 considered significant. **Results:** The number of patients with Hepatitis B virus decreased after ISIL, with the most frequent age group (15-45) being male. The male gender was predominant in 2012 and 2014, but its proportion declined in 2014. Hepatitis B patients increased after ISIL's liberation, with the most frequent age group (15-45). The registration rate of Hepatitis C virus decreased from 2012 to 2014, then slightly increased from 2019-2021, but at lower levels. The registration rate of Hepatitis C virus showed different and lower levels than that of Hepatitis B virus. **Conclusion:** During ISIL, healthcare access, utilization, and services, along with lack of diagnostic devices, led to a slowdown in regenerated cases for HBV and HCV.

KEYWORDS: Hepatitis B, Hepatitis C, ISIL.

INTRODUCTION

Viral hepatitis is a foremost global health problem caused by five different types of viruses, including hepatitis virus type A, type B, type C, type D, as well as, type E, these viruses assault the liver and result in both acute and chronic hepatitis infection. Both the hepatitis B virus (HBV) and hepatitis C virus (HCV) can cause chronic hepatitis.^[1-2] Viral hepatitis affects approximately 400 million people globally and is responsible for about 1.4 million deaths each year, most (95%) of which are caused by hepatitis B and hepatitis C.^[3-4]

Hepatitis B is the most widespread viral hepatitis, with approximately 57 million people infected with HBV worldwide.^[5] Its prevalence was found higher in the Middle East than in Europe and the United States. Its prevalence ranges from 0.6% in Iraq to >8% in Sudan.^[6]

The number of HBV-infected persons in the Eastern Mediterranean region is >21 million (3.3% of the population). Hepatitis C influenced about 3% of the whole world's population; however, it has a high prevalence of approximately 10% in developing countries.^[7]

In Iraq, there is a prevalence of viral hepatitis unevenly among the governorates, for example, a viral hepatitis infection obtained in Basra- Iraq that indicated hepatitis prevalence was 0.12%^[8-9], and a similar study conducted in Babylon governorate reported that the prevalence was 0.7%^[10], another study showed the prevalence was 0.66% in Najaf governorate and 3.5% in Karbala.^[11]

Concerning HBV and HCV, Iraq is regarded as a low-endemic state compared to its neighbors. HBV and HCV

have a higher prevalence than other types of hepatitis in developed countries. People who suffer from either HBV or HCV may develop hepatitis cirrhosis because of chronicity that results from infection by type B or type C. Approximately, 7% of the total world population is a chronic carrier of HBV, although HCV infection is found in 160 million individuals, which represent 3% of the total world population.^[11] The prevalence rates (PRs) of HBV and HCV in Iraq were 1.6% and 0.4% in 2006, respectively.^[9]

The routine surveillance system of hepatitis in Iraq was a priority of the Ministry of Health, to build the capacity of health personnel to cope with patients. Providing medicines, diagnostic services, and the availability of immunization were the sole parts of the surveillance system.^[12]

The prevalence of HCV increased from 1.4 to 3.9 during the last decade. However, the HCV incidence is slightly higher in other neighboring countries compared to Iraq.^[11] For HBV, the prevalence decreased in 2008–2010 because of the effectiveness of a vaccination program that mandated all six-years-old to be vaccinated against HBV as a requirement for entering school.^[13] The prevalence of HBV is also lower than previously reported due to the effectiveness of the ongoing nationwide vaccination program, especially for HBV which shows a steadily decreasing incidence correlated with a remarkably positive effect on its annual incidence; the introduction of new and more effective healthcare facilities also acts an imperative role in this attainment.^[13-14] Since 2011, the HBV prevalence has increased continuously because of the high migration to Karbala due to the ISIL attack in some north-cities of Iraq, leading to the inability of the health sector to cover all people with vaccination.^[11]

Only HBV and HCV have been studied in Iraq, which is a middle-income country, due to their transmission. Other hepatitis types have been poorly described by Iraqi scholars, although they are highly prevalent amongst the Iraqi population. The current political situation in Iraq may contribute to the high incidence of such diseases. The insufficiency of confirmed data leads to diminished planning for the prevention and treatment strategies of the disease. Hence, there is a need for considerable epidemiological studies on community-based to obtain a more accurate incidence rate of HCV and HBV infection.^[15-17] This study was conducted in Ninawa governorate, in the north of Iraq which is the second main city in Iraq. Centers that register cases of HBV as, well as, HCV in Nineveh include one central bank, sixteen hospitals, and eleven districts; two inside Mosul city (which is the center of Nineveh) and nine outside it, in addition to two dialysis centers.

Since Mosul City was badly invaded by ISIL during 2014-2017 which lead to the destruction of the surveillance system including a defect in the vaccination

program and the sequel of this invasion on demographical changes. According to what was mentioned above this study was carried out. The present study aimed to calculate the registration rate of Hepatitis B and C in Nineveh in the north of Iraq and their relationship with other demographic data before and after the war to liberate the province from ISIL.

METHODS

A cross-sectional study design was chosen to conduct to achieve the aim of the present study. The present study was conducted by the director of health of the Nineveh Section of Statistics and the Department of Public Health. These sites were the main sites for the registration of the diseases under study. Nineveh governorate is located in the west north of Iraq with a population of 3,335,200 populations in 2012 up to 4,030,006 populations at 2021. It included eleven districts distributed as 2 in the center and 9 on the outside.

The records of all patients with HBV and HCV at primary health care centers in the districts, hospitals, laboratories, blood banks, and hemodialysis centers registered in the Department of public health were included. Data collection time will be 3 months from September to November 2022.

Inclusion criteria: any case of Hepatitis B and C recorded from 2012-2014 before ISIS and 2019–2021 after the liberation war was included. All other types of infection were excluded.

The information on all patients of HBV and HCV from the study sites by reviewing the aggregated data collecting forms, reports from the Department of Public Health, the Annual statistical reports, and population estimation from the section of Statistics. Every registered case of Hepatitis B and C in the period 2012-2014 and 2019-2021 was included in the study.

Data collection was done by reviewing the data collection forms and reports from the hepatitis unit in the communicable disease section of the Public Health Department, annual statistical reports, and population estimation from the section of Statistics that includes age, gender, occupation, residence, outcomes, and vaccination status. The collected data has been changed (hand copy and electronic copy) to an electronic data collection form that retrieves all the information available in the case investigation form.

Statistical analysis

The data analysis will be conducted by using Microsoft Excel (version 2013) and a statistical package for the social sciences (SPSS version 26). The categorical data will be described in proportions and will be calculated by the Chi-square test for independence and the Freeman Halton Exact test if there was any expected cell below 5. The p-value ≤ 0.05 is considered significant.

RESULTS

The number of patients with Hepatitis B virus decreased during the years proceeding ISIL from 303 in 2012 to 162 in 2014 as shown in Table (1). The age group (15-45) was the most frequent throughout these years representing 59.7%, 63.7%, and 64.2% respectively, the

association of the age groups with years was statistically significant ($p=0.000$). Although the male gender was predominant, its proportion was declined in 2014. Most of the patients lived in the left side of Mosul followed by the right side and the outsides at 2012 and 2013, while at 2014; the outside residents were the most frequent.

Table (1): HBV before ISIL.

Hepatitis B		2012 n=303		2013 n=300		2014 n=162		p-value
Study parameters		No.	%	No.	%	No.	%	
Age groups	< 5	4	1.3	6	2.0	2	1.2	0.000*
	5-14	12	4.0	12	4.0	11	6.8	
	15-45	181	59.7	191	63.7	104	64.2	
	>45	106	35.0	91	30.3	45	27.8	
Gender	Males	183	60.4	190	63.3	94	58.0	0.513**
	Females	120	39.6	110	36.7	68	42.0	
Residence	Mosul /left	119	39.3	109	36.3	63	38.9	0.254**
	Mosul/right	88	29.0	84	28.0	34	21.0	
	Outsides	96	31.7	107	35.7	65	40.1	

*Freeman-Halton Exact test, **Chi square test

The number of patients with Hepatitis B virus was raised in the years 2019, 2020, and 2021 after liberation from ISIL from 98, 110, and 266 respectively as shown in Table (2). Still, the association of the age groups with years was statistically significant ($p=0.000$) and the age group (15-45), the most frequent constitute 65.3%,

64.6%, and 61.3% respectively. The male gender was predominant. There was shifting in the residence from the left side of Mosul in 2019 followed by the outsides in 2020 and 2021 with a statistically significant association ($p=0.000$).

Table (2): HBV after ISIL.

Hepatitis B		2019 n=98		2020 n=110		2021 n=279		p-value
Study parameters		No.	%	No.	%	No.	%	
Age groups	< 5	0	0.0	2	1.8	3	1.1	0.000*
	5-14	4	4.1	4	3.6	11	3.9	
	15-45	82	83.7	68	61.8	159	57.0	
	>45	12	12.2	36	32.8	106	38.0	
Gender	Males	55	56.1	69	62.7	171	61.3	0.581**
	Females	43	43.9	41	37.3	108	38.7	
Residence	Mosul /left	59	60.2	39	35.5	83	29.8	0.000**
	Mosul/right	5	6.1	30	27.2	55	19.7	
	Outsides	34	34.7	41	37.3	141	50.5	

*Freeman-Halton Exact test, **Chi square test

The comparison of the study parameters before and after ISIL was shown in Table (3) and revealed insignificant statistical differences regarding age groups and gender.

The difference concerning the residence was statistically significant ($p=0.000$).

Table (3): HBV before and after ISIL.

Hepatitis B		Before n= 765		After n= 487		p-value*
Study parameters		No.	%	No.	%	
Age groups	< 5	12	1.6	5	1.0	0.794
	5-14	35	4.6	19	3.9	
	15-45	476	62.2	309	63.4	
	>45	242	31.6	154	31.6	
Gender	Males	467	61.0	295	60.6	0.868
	Females	298	39.0	192	39.4	
Residence	Mosul /left	291	38.0	181	37.2	0.000

	Mosul/right	206	26.9	90	18.5	
	Outsides	268	35.1	216	44.3	
*Chi-square test						

The numbers of patients with Hepatitis C virus before ISIL were 36, 58, and 28 in 2012, 2013, and 2014 in that order as shown in Table (4). Still, the age group (>45), was the most frequent that constitute 44.4%, 46.2%, and 28.6% respectively with a statistically significant

association over the period ($p=0.000$). The male gender was predominant in 2012 and 2014. Most of the patients 52.8% in 2012 and 42.9% in 2014 lived outside while in 2013, 42.3% lived on the right side of Mosul.

Table (4): HCV before ISIL.

Hepatitis C		2012 n= 36		2013 n= 52		2014 n=28		p-value
Study parameters		No.	%	No.	%	No.	%	
Age groups	< 5	2	5.6	0	0.0	0	0.0	0.000*
	5-14	5	13.9	3	5.8	2	7.1	
	15-45	13	36.1	25	48.1	18	64.3	
	>45	16	44.4	24	46.2	8	28.6	
Gender	Males	19	52.8	25	48.1	15	53.6	0.862**
	Females	17	47.2	27	51.9	13	46.4	
Residence	Mosul /left	11	30.6	13	25.0	7	25.0	0.149**
	Mosul/right	6	16.7	22	42.3	9	32.1	
	Outsides	19	52.8	17	32.7	12	42.9	
*Freeman-Halton Exact test, **Chi square test								

The number of patients with Hepatitis B virus was raised in the years 2019, 2020, and 2021 after liberation from ISIL from 18, 21, and 58 respectively as shown in Table (5). The age group (15-45) was the most frequent in 2019 and 2021 representing 61.2% and 65.5% respectively, while in 2020, the age more than 45 years was the most frequent representing 61.9%, the association was

statistically significant ($p=0.006$). The male gender was predominant. The left side of Mosul was the main residence for the patients in 2019 and 2020 while the right side of Mosul was the most frequent residence in 2021 with a statistically significant association ($p=0.000$).

Table (5): HCV after ISIL.

Hepatitis C		2019 n=18		2020 n=21		2021 n=58		p-value
Study parameters		No.	%	No.	%	No.	%	
Age groups	< 5	0	0.0	0	0.0	0	0.0	0.006*
	5-14	2	11.1	3	14.3	2	3.5	
	15-45	11	61.2	4	19.0	34	58.6	
	>45	5	27.7	14	66.7	22	37.9	
Gender	Males	12	66.7	13	61.9	38	65.5	0.943**
	Females	6	33.3	8	38.1	20	34.5	
Residence	Mosul /left	15	83.3	8	52.4	11	18.9	0.000*
	Mosul/right	1	5.6	13	14.3	35	60.3	
	Outsides	2	11.1	0	19.0	12	20.7	
*Freeman-Halton Exact test, **Chi square test								

Age groups, gender, and residence among the patients with HCV showed an insignificant difference before ISIL and after ISIL as shown in table (6).

Table (6): HCV before and after ISIL.

Hepatitis C		Before n= 116		After n= 97		p-value
Study parameters		No.	%	No.	%	
Age groups	< 5	2	1.7	0	0.0	0.749*
	5-14	10	8.6	7	7.2	
	15-45	56	48.3	49	50.5	
	>45	48	41.4	41	42.3	
Gender	Males	59	50.9	63	64.9	0.038**
	Females	57	49.1	34	35.1	
Residence	Mosul /left	31	26.7	34	35.1	0.749*
	Mosul/right	37	31.9	49	50.5	
	Outsides	48	41.4	14	14.4	

*Fissure Exact test, ** Chi square test

The registration rate of HBV was decreased from 2012 to 2014 from 0.091 to reach 0.046 and then raised slightly from 2019-2021 but at lower levels. The registration rate of HCV showed different and lower levels than that of

HBV; starting from 0.011 at 2012 and declining at 2013, 2014 reaching 0.008, and after ISIL liberation, the registration rate raised again to reach 0.014 in 2021 as demonstrated in the table (7) and figure (1).

Table (7): Registration rate for HBV and HCV.

Years		2012	2013	2014	2019	2020	2021
Population		3335200	3438194	3524348	3828197	3928215	4030006
HBV	N	303	300	162	98	110	279
	Registration rate	9.1	8.7	4.6	2.6	2.8	6.9
HCV	N	36	52	28	18	21	58
	Registration rate	1.1	1.5	0.8	0.4	0.5	1.4

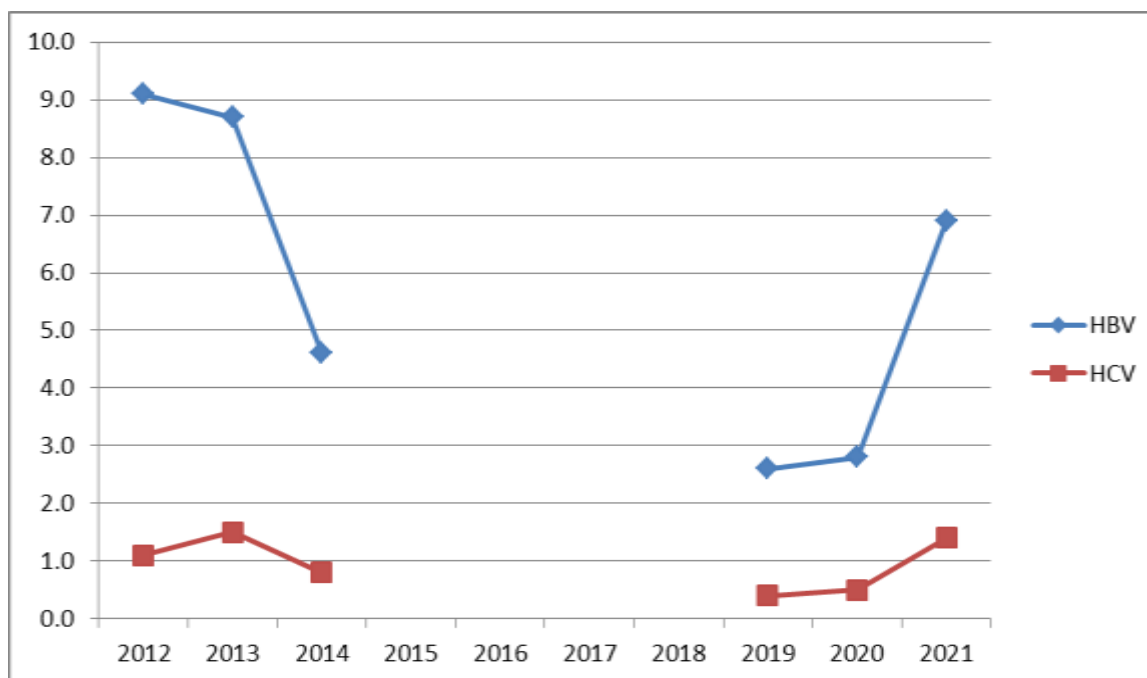


Figure (1): Time trends for the registration rate of HBV and HCV.

DISCUSSION

In the Middle East, the prevalence of HBV ranges from around 3% in Iraq, Iran, and Syria to about 7% in Yemen and some regions in Saudi Arabia.^[18-20]

Regarding Nineveh province, Iraq, there were no previous studies on the time trend of viral hepatitis, and

this study was conducted to find the time trend for HBV and HCV from the aggregated data throughout the period 2012-2014 before ISIL and 2019-2021 after ISIL and comparing the age, gender, and residence. No similar study was found despite thorough searching and reviewing of articles.

For the HBV, the patients' age groups among the study sample were significantly associated with the years before ISIL; the age groups (5-14) and (15-45) increased reaching 2014 while the age group more than 45 years was decreased. After liberation from ISIL, the statistically significant association between the age groups and time from 2019-2021 was still but the age groups showed a change in that those more than 45 years were increased till 2021 in addition to (5-14) age group and the age group (15-45) was decreased. This might be due to under-registration of the infection in this age group or the changing in their socio-economical levels, and difficult access to health services. By comparing the age groups before and after ISIL, the present study found a decline in the number of patients from 765 to 487; all the age groups were lower after ISIL than before but statistically, the difference was insignificant ($p=0.794$). The probable explanation for this was a reflection of many underlying etiology, such as the disruption of the health care providing system, improper surveillance of infectious disease, and disruption of prevention and control program notification. Alsamarai *et al.*, study^[21] who study the seroprevalence of HBsAg found a significant increase with time, which was 1.6%, 3.55%, and 4.74% for 2011, 2012, and 2013 respectively. This finding indicated a 2.96 times prevalence for 2013 as compared to 2011. This increase in HBV prevalence represents a public health problem that may be a reflection of an increase of vertical and horizontal transmission and/or disruption in the Expanded Program of Immunization (EPI). Whether before or after ISIS, the male gender was predominant with an insignificant statistical difference. Jamal *et al.*, study^[22] reported that among the participants tested positive for HBsAg, of whom 26(68.4%) were males and 12(31.6%) were females. Regarding residence, both living on the left side of the city or outside during 2012-2014 were higher than those living on the right side but the association was statistically insignificant after ISIL, from 2019 to 2021, there was shifting from the left and right sides of Mosul toward the outside residence with the statistically significant association. In addition, there was a significant drop in all residences after the ISIL than before.

The number of registered cases of HCV in Mosul was at a lower rate in comparison to that of HBV; the association of age groups concerning the time before ISIL and after ISIL was statistically significant at ($p=0.000$) and ($p=0.006$) respectively with an age group of (15-45) was the most frequent age group.

The predominant male gender was obvious throughout the periods of the study but with the significant statistical association.

There was an insignificant statistical association of residence before ISIL while after ISIL, the association was significant and there was decreasing in the number

of patient at the left side and outside of Mosul in comparison to the right side of the city.

The registration rate for HBV in Mosul in 2020 was 2.8/100,000, while in Baghdad, it was 0.58, in Basrah 0.95, Salah Al-Deen 5.06, Erbil 0.05, Duhok and Kirkuk was zero, and Al-Anbar 3.81. While HCV in Mosul was 0.5, in Baghdad, it was 0.13, in Basrah 0.18, and zero registration in Kirkuk, Duhok, and Erbil, Salah Al-Deen 0.10, Al-Anbar 0.03 according to the annual statistical report.

CONCLUSION

The slowdown in the number of regenerated cases for HBV and HCV during the period of ISIL was clearly due to regression in the means of healthcare access, utilization, and provision of healthcare services in addition to lack of diagnostic devices and their operating kits, all result in weakness in detection, diagnosis, and so on the registration and documentation.

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