



## THE PATTERN OF VIRAL HEPATITIS DISEASE IN THE UNITED ARAB EMIRATE, DUBAI: AN OBSERVATIONAL DESCRIPTIVE EPIDEMIOLOGICAL STUDY OF DATA FROM THE DUBAI STATISTICS CENTER 2008-2015

Ibrahim G. Alghamdi\*

University of Al-Baha, College of Applied Medical Sciences, Saudi Arabia

### ARTICLE INFO

#### Article History:

Received 20<sup>th</sup> March, 2017

Received in revised form 8<sup>th</sup> April, 2017

Accepted 24<sup>th</sup> May, 2017

Published online 28<sup>th</sup> June, 2017

#### Key words:

Hepatitis A virus; Hepatitis B virus;  
Hepatitis C virus; The United Arab Emirate;  
Dubai; Incidence rate; Notifiable diseases.

### ABSTRACT

**Background:** This study describes the pattern of hepatitis cases A, B, and C viruses diagnosed from 2008 to 2015 among citizens and Non-citizens in Dubai, the United Arab Emirate. It includes the frequency number of cases, the ratio of incidence rate, and the crude incidence rate (CIR) adjusted by year of diagnosis and nationality.

**Methods:** This is a retrospective descriptive epidemiological study of hepatitis A, B, and C viruses recorded in the Dubai Statistics Center, from 2008 to 2015. The statistical analyses were conducted using descriptive statistics and analysis of variance with the Statistical Package for the Social Sciences version 20 (SPSS).

**Results:** A total of 11,454 hepatitis cases were recorded in the Dubai Statistics Center between 2008 and 2015, with an estimated average 1,432 cases per year. The highest overall CIR of hepatitis cases were documented in Non-Emirati residents, from 2008 to 2015, with an estimated average (62.8) per 100,000 population. While, the lowest overall CIR were observed in Emirati residents in Dubai at (8.2) per 100,000 population. In addition, the overall CIR of hepatitis B virus (40 per 100,000) was higher than the overall CIR of hepatitis A and C virus (19.1, 3.7) among Non-Emirati residents in Dubai. Alternatively, the overall CIR of hepatitis C virus (5.5 per 100,000) was higher than the overall CIR of hepatitis B and A virus (2.3, 0.4) among Emirati residents in Dubai.

**Conclusion:** This study revealed that there was a notable decreased of the CIR of all hepatitis types in the Emirate of Dubai, during the years 2008 to 2015. The overall CIR of all hepatitis types was higher in Non-Emirati residents in Dubai, than Emirati population. However, further epidemiological studies should be conducted in the Emirate of Dubai to understand the reasons of a high CIR of hepatitis in Non-Emirati population living in Dubai.

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### INTRODUCTION

Viral hepatitis is an inflammation of the liver that can be caused by multiple different of viruses, such as hepatitis A virus (HAV), hepatitis B virus (HBV), and hepatitis C virus (HCV).<sup>1-3</sup> HAV is the most frequently type of viral hepatitis infection worldwide. It is very contagious and spread by oral-fecal route, when a healthy person ingests the virus from infected person through contaminated food and drinks.<sup>4</sup> The prevalence of HAV antibodies in Middle East, Asia, and Africa, reaches 90% in adult, while in Europe and some areas in Asia, only 50% to 60% in adults. However, the majority of population affected by HAV infection is children less than 6 years old, with estimated percentage (70%).<sup>5</sup> HBV is very contagious, and can be either acute or chronic disease. In the last 50 years, the prevalence and endemicity level of HBV infection was very high in low income countries.

\*Corresponding author: **Ibrahim G. Alghamdi**  
University of Al-Baha, College of Applied Medical Sciences,  
Saudi Arabia

Africa is considered one of the highest level of endemicity with HBV. In current decade, the incidence of acute and chronic hepatitis B has decreased in many countries because of the effectiveness of vaccination programs.<sup>6</sup> However, HBV infection is transmitted by sexual intercourse with infected partner with HBV, infected mother to her infant during delivery, and sharing contaminated utensils or blood transfusion from infected person with the virus.<sup>7</sup>

HCV is the leading cause of death and morbidity from liver cirrhosis with cancer.<sup>8-9</sup> It is highly contagious and can be either acute or chronic disease. A person recovering from HCV do not develop immunity and can be infected again with the virus.<sup>7</sup> The prevalence of HCV, estimated by World Health Organization (WHO) at 3% worldwide, affecting 170 million of the world population.<sup>10-11</sup> However, HCV is primarily transmitted by contaminated blood, and sharing contaminated instruments or blood transfusion from infected person with the virus.<sup>12</sup> Despite insufficient data regarding viral hepatitis disease in United Arab Emirate (UAE), with the

exception of the Dubai Statistics Centre, we attempt to study the CIR of hepatitis among Emirati and Non-Emirati residents in Dubai from 2008 to 2015. However, the primary aims of this study were to describe the pattern of viral hepatitis types in Emirate of Dubai adjusted by year of diagnosis and nationality during 8-years period (2008-2015).

**MATERIALS AND METHODS**

This is a retrospective descriptive epidemiological study of all viral hepatitis cases diagnosed between 2008 and 2015 in Dubai, UAE. The data was available and easily accessible from electronic gateway of the Dubai Statistics Centre, that is providing very important data for Emirate of Dubai. These data and statistics help the government leadership for planning and decision making.<sup>13</sup> Based on these data, the overall numbers and percentages of viral hepatitis cases, the CIR, the incidence rate ratio, stratified by year of diagnosis and nationality, were calculated from 2008 to 2015. The total number of population at risk was gathered from Dubai Statistics Centre (Table 1).

**Table 1** Total number of Dubai population at risk by year.

Yea	Total of Population
2015	2,446,675
2014	2,327,350
2013	2,213,845
2012	2,105,875
2011	2,003,170
2010	1,905,476
2009	1,770,978
2008	1,645,973

For data analysis, the Statistical Package for the Social Sciences version 20.0 (SPSS) was used. The descriptive statistics and parametric test was used to determine any significant differences in CIR of hepatitis cases among Emirati and Non-Emirati residents in Dubai, from 2008 to 2015. Furthermore, the changes in the CIR of hepatitis cases diagnosed between 2008 and 2015 were tested to identify any significant differences in the trend of hepatitis cases among Emirati and Non-Emirati residents in Dubai.

**RESULTS**

**HAV (Overall number of cases and CIR)**

**Distribution by Emirati residents in Dubai**

A total of 69 HAV cases were recorded in the Dubai Statistics Centre from 2008 to 2015, among Emirati residents in Dubai with an estimated average 8 cases per year (Table 2) and (Figure. 1A).

The CIR of HAV adjusted by year of diagnosis from 2008 to 2015 per 100,000 population indicate a steady trend of the disease among Emirati residents in Dubai (Figure. 1B). Furthermore, the overall CIR of HAV was only 0.4 per 100,000 population from 2008 to 2015 (Table 3). However, the changes in the CIR of HAV in 2008 and 2015 were not statistically significant p-value =0.63 (Table 4).

**Distribution by Non-Emirati residents in Dubai**

A total of 606 HAV cases were recorded in the Dubai Statistics Centre from 2008 to 2015, among Non-Emirati residents in Dubai with an estimated average 76 cases per year (Figure. 1C). The CIR of HAV adjusted by year of diagnosis from 2008 to 2015 per 100,000 population indicate a slightly decreased of the disease trend among Non-Emirati residents in Dubai (Figure. 1D). Furthermore, the overall CIR of HAV was 3.7 per 100,000 population from 2008 to 2015. However, the changes in the CIR of HAV in 2008 and 2015 were not statistically significant p-value =0.54.

**HBV (Overall number of cases and CIR)**

**Distribution by Emirati residents in Dubai**

A total of 365 HBV cases were recorded in the Dubai Statistics Centre from 2008 to 2015, among Emirati residents in Dubai with an estimated average 46 cases per year (Table 2) and (Figure. 2A). The CIR of HBV adjusted by year of diagnosis from 2008 to 2015 per 100,000 population indicate a steady trend of the disease among Emirati residents in Dubai (Figure. 2B). Furthermore, the overall CIR of HBV was only 2.3 per 100,000 population from 2008 to 2015 (Table 3). However, the changes in the CIR of HBV in 2008 and 2015 were not statistically significant p-value =0.42 (Table 4).

**Distribution by Non-Emirati residents in Dubai**

A total of 6,412 HBV cases were recorded in the Dubai Statistics Centre from 2008 to 2015, among Non-Emirati residents in Dubai with an estimated average 802 cases per year (Figure. 2C). The CIR of HBV adjusted by year of diagnosis from 2008 to 2015 per 100,000 population indicate moderately decreased of the disease trend among Non-Emirati residents in Dubai (Figure. 2D). Furthermore, the overall CIR of HBV was 40 per 100,000 population from 2008 to 2015. However, the changes in the CIR of HBV in 2008 and 2015 were statistically significant p-value =0.03.

**Table 2** Overall number and percentage of all viral hepatitis types by nationality in Dubai from 2008 to 2015.

Year of Diagnosis	Number of Hepatitis Cases in Emirate of Dubai								All Total
	A		B		C		Total		
	Emirati	Non-Emirati	Emirati	Non-Emirati	Emirati	Non-Emirati	Emirati	Non-Emirati	
2008	11	79	62	802	124	275	197	1156	1353
2009	13	74	35	873	113	293	161	1240	1401
2010	9	69	31	922	114	462	154	1453	1607
2011	6	77	55	683	110	406	171	1166	1337
2012	7	66	61	821	137	472	205	1359	1564
2013	7	86	39	828	99	401	145	1315	1460
2014	8	80	36	761	78	370	122	1211	1333
2015	8	75	46	722	93	455	147	1252	1399
Total	69	606	365	6412	868	3134	1302	10152	11454
% Total	0.6	5.2	3.2	56	7.5	27.3	11.4	88.6	100
Mean	8	76	46	802	109	392	163	1269	1432

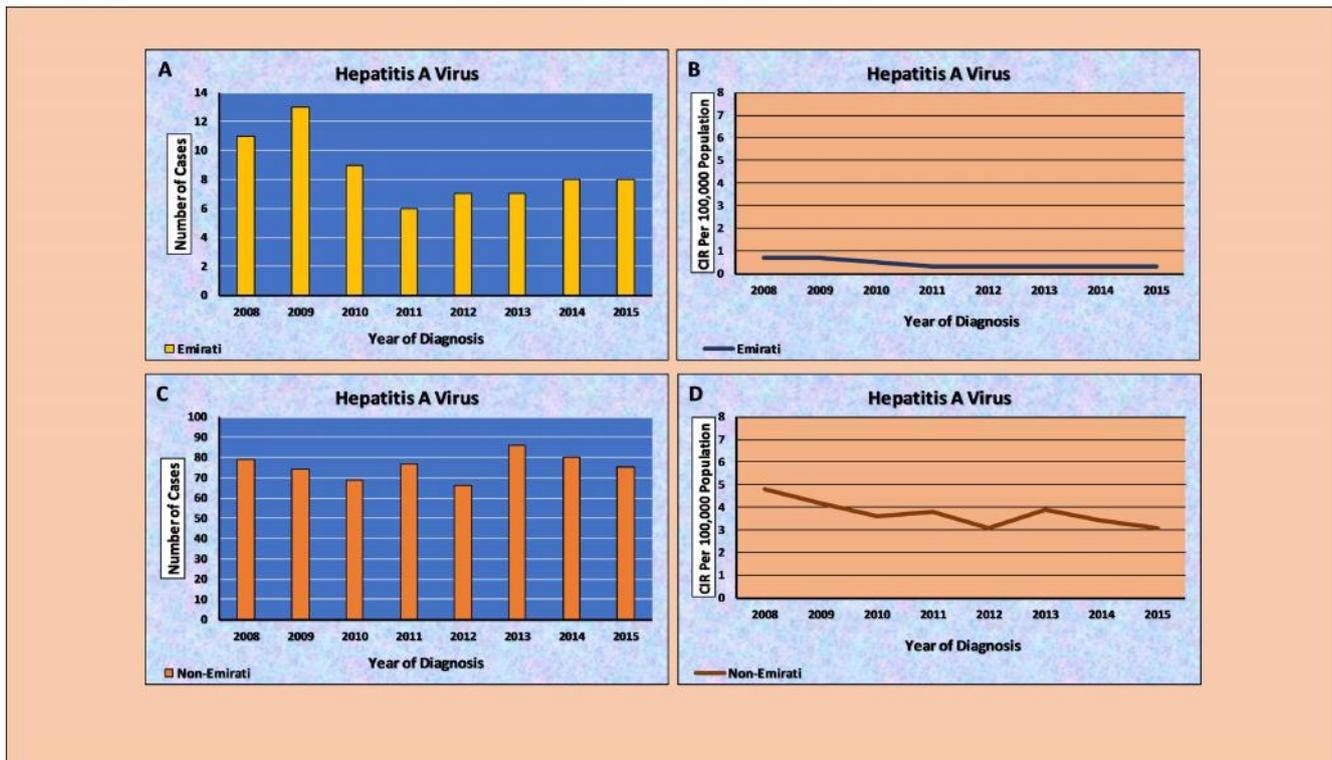


Figure 1 A & B The number and crude incidence rate of HAV cases in Emirati residents in Dubai from 2008 to 2015. C & D: The number and crude incidence rate of HAV cases in Non-Emirati residents in Dubai from 2008 to 2015.

Table 3 Overall crude incidence rate of all viral hepatitis types by nationality in Dubai from 2008 to 2015.

Year of Diagnosis	Crude Incidence Rate of Hepatitis Cases Per 100,000 Population in Emirate of Dubai									
	A		B		C		Total		Ratio	All Total
	Emirati	Non-Emirati	Emirati	Non-Emirati	Emirati	Non-Emirati	Emirati	Non-Emirati		
2008	0.7	4.8	3.8	48.7	7.5	16.7	12.0	70.2	1/17	82.2
2009	0.7	4.2	2.0	49.2	6.4	16.5	9.1	69.9	1/13	79
2010	0.5	3.6	1.6	48.3	6.0	24.2	8.1	76.1	1/11	84.2
2011	0.3	3.8	2.7	34.1	5.5	20.2	8.5	58.1	1/15	66.6
2012	0.3	3.1	2.9	40.0	6.5	22.4	9.7	65.5	1/15	75.2
2013	0.3	3.9	1.8	37.4	4.5	18.1	6.6	59.4	1/11	66
2014	0.3	3.4	1.5	32.6	3.4	15.8	5.2	51.8	1/10	57
2015	0.3	3.1	1.9	29.5	3.8	18.6	6.0	51.2	1/12	57.2
Mean	0.4	3.7	2.3	40.0	5.5	19.1	8.2	62.8	1/13	70.9

Table 4 The changes in the crude incidence rate of all viral hepatitis types by nationality in Dubai from 2008 to 2015

Nationality	HAV				HBV				HCV			
	CIR Per 100,000 population		diff	P-value	CIR Per 100,000 population		diff	P-value	CIR Per 100,000 population		diff	P-value
	2015	2008			2015	2008			2015	2008		
Emirati	0.3	0.8	-0.5	0.63	1.9	3.8	-1.9	0.42	3.8	7.5	-3.7	0.27
Non-Emirati	3.1	4.8	-1.7	0.54	29.5	48.7	-19.2	0.03	18.6	16.7	1.9	0.75

**HCV (Overall number of cases and CIR)**

**Distribution by Emirati residents in Dubai**

A total of 868 HCV cases were recorded in the Dubai Statistics Centre from 2008 to 2015, among Emirati residents in Dubai with an estimated average 109 cases per year (Table 1) and (Figure. 3A). The CIR of HCV adjusted by year of diagnosis from 2008 to 2015 per 100,000 population indicate a steady trend of the disease among Emirati residents in Dubai (Figure. 3B). Furthermore, the overall CIR of HCV was only 5.5 per 100,000 population from 2008 to 2015 (Table 2). However, the changes in the CIR of HCV in 2008 and 2015 were not statistically significant p-value =0.27 (Table 4).

**Distribution by Non-Emirati residents in Dubai**

A total of 3,134 HCV cases were recorded in the Dubai Statistics Centre from 2008 to 2015, among Non-Emirati residents in Dubai with an estimated average 392 cases per year (Figure. 3C). The CIR of HCV adjusted by year of diagnosis from 2008 to 2015 per 100,000 population indicate a steady trend of the disease with a slight increase observed in 2010 and 2012 among Non-Emirati residents in Dubai (Figure. 3D). Furthermore, the overall CIR of HCV was 19.1 per 100,000 population from 2008 to 2015. However, the changes in the CIR of HCV in 2008 and 2015 were not statistically significant p-value =0.75.

**All hepatitis types (Overall number of cases and CIR)**

**D-1 Distribution by Emirati residents in Dubai**

A total of all hepatitis types 1,302 cases was recorded in the Dubai Statistics Centre from 2008 to 2015, among Emirati residents in Dubai with an estimated average 163 cases per year.

**Distribution by Non-Emirati residents in Dubai**

A total of all hepatitis types 10,152 cases was recorded in the Dubai Statistics Centre from 2008 to 2015, among Non-Emirati residents in Dubai with an estimated average 1,269 cases per year. The overall CIR of all hepatitis types was 62.8 per 100,000 population from 2008 to 2015 (Table 2).

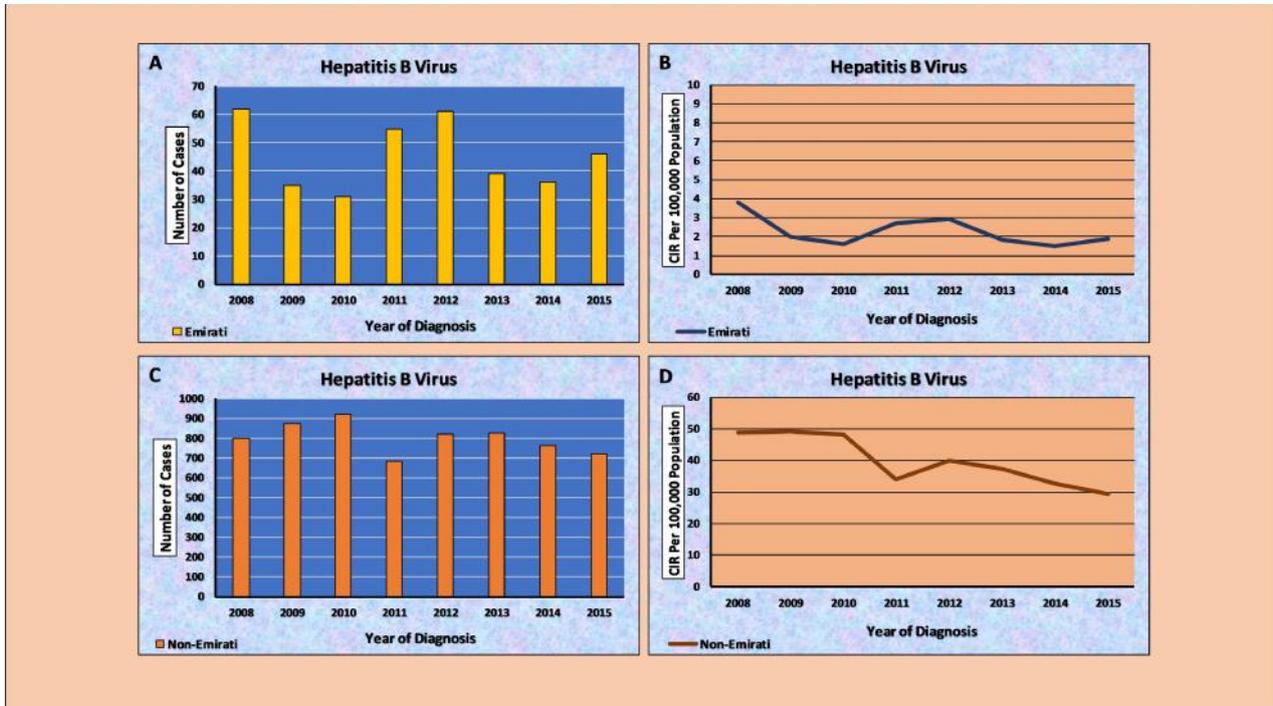


Figure 2A & B The number and crude incidence rate of HBV cases in Emirati residents in Dubai from 2008 to 2015. C & D: The number and crude incidence rate of HBV cases in Non-Emirati residents in Dubai from 2008 to 2015.



Figure 3A & B: The number and crude incidence rate of HCV cases in Emirati residents in Dubai from 2008 to 2015. C & D: The number and crude incidence rate of HCV cases in Non-Emirati residents in Dubai from 2008 to 2015.

The overall CIR of all hepatitis types was 8.2 per 100,000 population from 2008 to 2015 (Table 2). However, the CIR of HCV was higher than the CIR of HBV and HAV among Emirati residents in Dubai (Figure. 4A).

However, the CIR of HBV was higher than the CIR of HCV and HAV among Non-Emirati residents in Dubai (Figure. 4B).

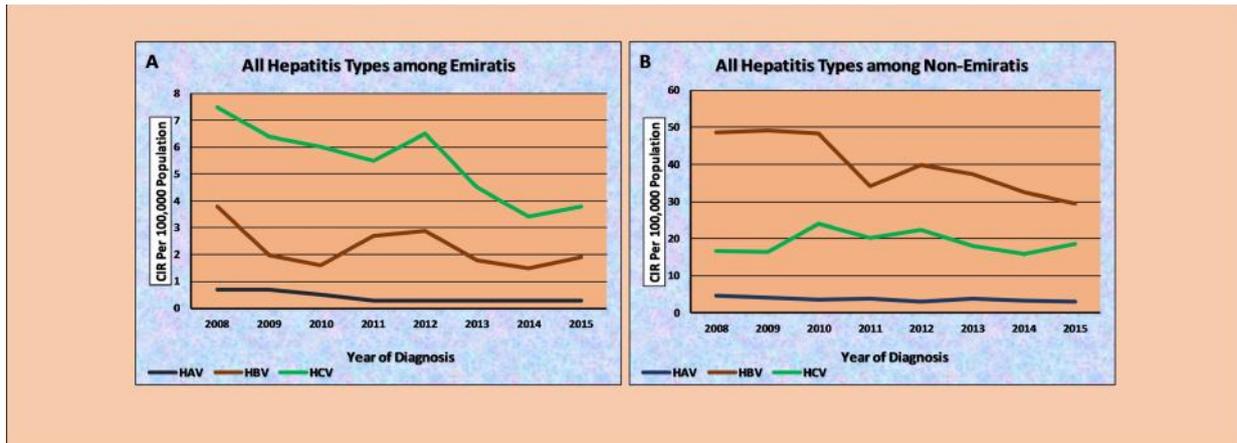


Figure 4 A The crude incidence rate of all hepatitis types among Emirati residents in Dubai from 2008 to 2015. B: The crude incidence rate of all hepatitis types among Non-Emirati residents in Dubai from 2008 to 2015.

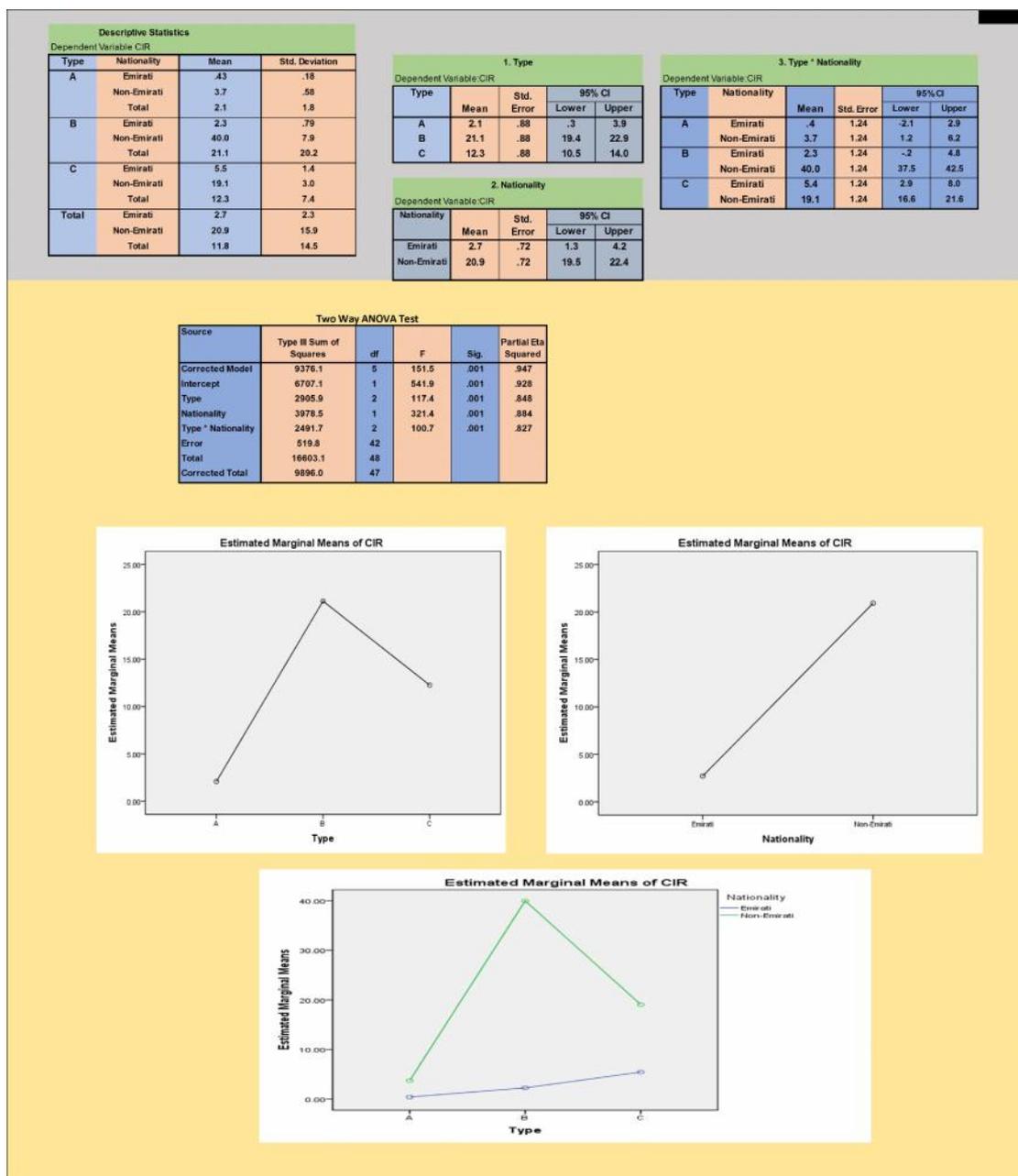


Figure 5 The results of statistical analysis showing significant differences of the overall CIR of hepatitis types and nationality in Dubai during the years 2008 to 2015.

### Results of analysis of variance (ANOVA) by nationality and hepatitis types

The results show that there were significant differences in the overall CIR of hepatitis A, B, and C types ( $F [2,42] = 117.4, P < 0.05$ ). The overall CIR of HBV was the highest rate compared to HBV and HCV during the years 2008 to 2015 in Emirate of Dubai.

In addition, the overall CIRs of all hepatitis types among Non-Emirati residents in Dubai were significantly higher than Emirati individuals living in Dubai ( $F [1,42] = 321.4, P < 0.05$ ) (Figure. 5).

### DISCUSSION

This epidemiological study of viral hepatitis disease in Dubai, UAE explores an important description for the pattern and recent trend, confirming the significance of the disease among Emirati and Non-Emirati residents in Dubai. The results of our study are based on the data recorded in the Dubai Statistics Centre, describing the frequency number of cases and CIR of all hepatitis types adjusted by years of diagnosis and nationality during the years 2008 to 2015 in Dubai, UAE. Despite insufficient data regarding viral hepatitis disease in Dubai, except information reported by the Dubai Statistics Centre, we attempt to describe the real pattern of all hepatitis types among Emirati and Non-Emirati residents in Dubai, during the years 2008 to 2015.

In this study, we have observed that the overall CIR of HAV cases was low in Emirati and Non-Emirati residents in Dubai, during the years 2008 to 2015. The likely explanation for decreasing HAV rates suggest that the city of Dubai has a good sanitary and hygienic conditions that include safe drinking water, good sanitary disposal of sewage, and proper personal hygiene. However, a high level of hygiene helps to stop person to person mode transmission and the outbreak dies out quickly.<sup>14</sup>

The findings of this study show that the overall CIR of HBV cases were very high in Non-Emirati individuals compared to Emirati residents in Dubai during the years 2008 to 2015. The overall CIR of HBV cases among Non-Emirati residents in Dubai was 20-fold higher than Emirati individuals. Therefore, a Non-Emirati residents in Dubai were 20 times more likely exposed to the risk factors of HBV than Emirati population in Dubai. In addition, the HBV infection can be prevented by receiving the hepatitis B vaccine, using a condom with sexual intercourse, and avoiding contact with the body fluids of infected person with HBV.<sup>15</sup> However, the CIR of HBV cases was higher than the CIR of HCV and HAV among Non-Emirati residents in Dubai, during the years 2008 to 2015.

The overall CIR of HCV cases were four times more likely higher in Non-Emirati individuals compared to Emirati residents in Dubai during the years 2008 to 2015. Therefore, a Non-Emirati residents in Dubai were 4 times more likely exposed to the risk factors of HCV than Emirati population in Dubai. In addition, the HCV infection can be prevented by following the preventive measures of the disease, using a condom when having a sexual intercourse, testing of donating blood for hepatitis B and C, and avoiding contact with the body fluids of infected person with HBV.<sup>16</sup> However, the CIR of HCV cases was higher than the CIR of HBV and HAV

among Emirati residents in Dubai, during the years 2008 to 2015.

Finally, the differences in the CIR between 2008 and 2015 were calculated from the data of the Dubai Statistics Centre. The highest differences in the CIR of HBV from 2008 to 2015, were only observed in Non-Emirati residents in Dubai. Therefore, the likely explanation for these differences in rates suggest that the health authority of Dubai takes strict actions to prevent and control the risk factors of hepatitis disease in the entire population.

### CONCLUSION

Our study revealed that there was a notable decreased of the CIR of all hepatitis types in Emirate of Dubai, during the years 2008 to 2015. The overall CIRs of all hepatitis types were higher in Non-Emirati residents in Dubai, than Emirati population. In addition, the CIR of HBV cases was higher than the CIR of HCV and HAV among Non-Emirati residents in Dubai, during the years 2008 to 2015, while the CIR of HCV cases was higher than the CIR of HBV and HAV in Emirati residents in Dubai. However, further epidemiological studies should be conducted in Emirate of Dubai to understand the reasons for a high CIR of hepatitis in Non-Emirati population living in Dubai.

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**How to cite this article:**

Ibrahim G. Alghamdi (2017) 'The Pattern Of Viral Hepatitis Disease in The United Arab Emirate, Dubai: An Observational Descriptive Epidemiological study Of Data From The Dubai Statistics Center 2008-2015', *International Journal of Current Advanced Research*, 06(06), pp. 4418-4424. DOI: <http://dx.doi.org/10.24327/ijcar.2017.4424.0510>

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