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# Epidemiological Study of Acute Hepatitis A and C in Karbala Province from 2016-2020

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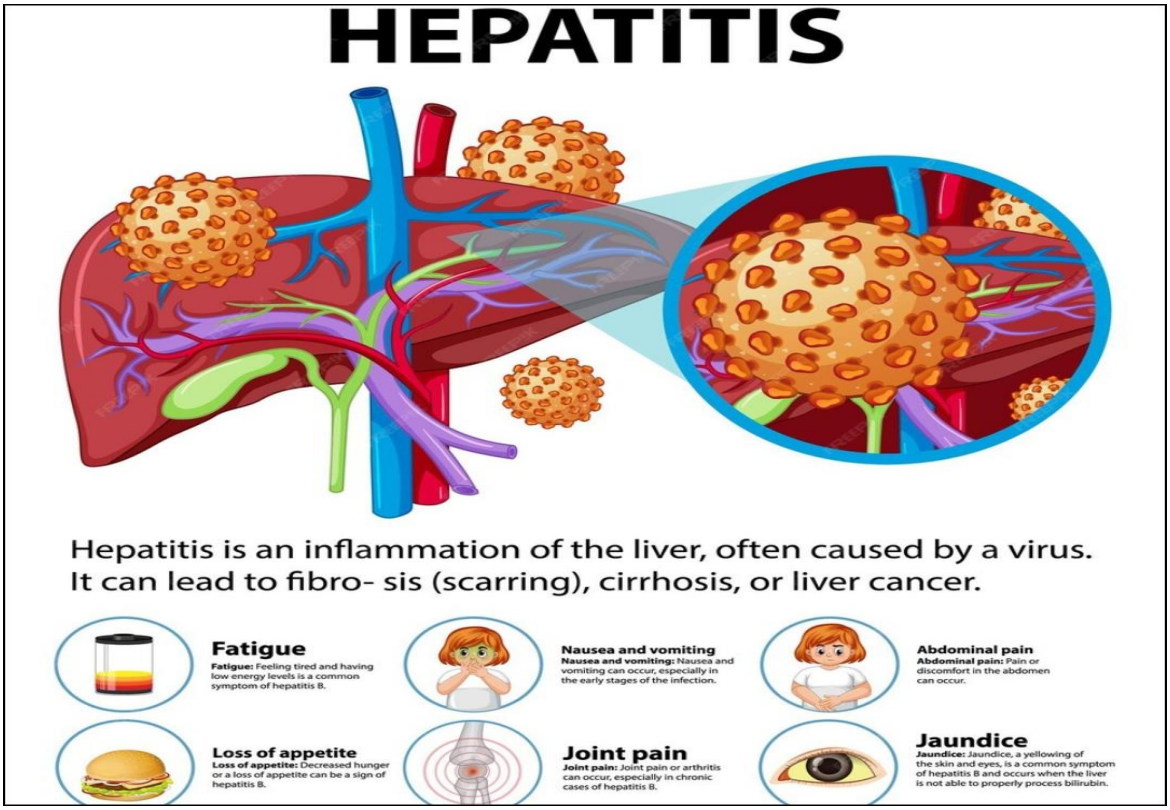
**Introduction:**

Viral disease is one of infectious that caused by viruses and cause harm to liver . and may be the harm permanents or temporary . characteristic by presences inflammatory cells with in liver tissue and it is happened when an organism's body is infected by pathogenic hepatitis viruses, and invaded virus particles attach to and enter susceptible cell. [1]

After this event, infection is spread by either local or across long distances via hematogenous, lymphatic, or neural routes [2].




There are 5 main hepatitis viruses types A, B, C, D and E. The 5 types are of greatest related to because of the death they cause and burden of illness and the potential for outbreaks and epidemic spread.

Hepatitis A causes acute liver failure rare with this being more common in children and adolescents [3]

Hepatitis B may develop a rapid onset of sickness with vomiting, yellowish skin, tiredness, dark urine, and abdominal pain. [4]

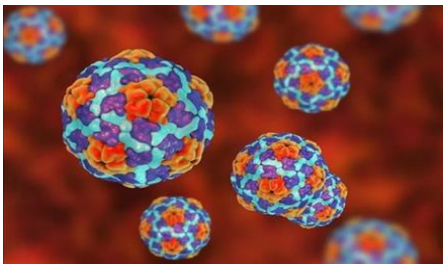
Most of those with chronic disease have no symptoms; however, cirrhosis and liver cancer may eventually develop. [5]

Hepatitis C, over many years, it often leads to liver disease and sometimes cirrhosis. [6] In some cases, those with cirrhosis have serious complications healthy problems s like liver failure, liver cancer, or dilated blood vessels in the esophagus and stomach. [7]

Hepatitis D, Inflammation led to damage organs. [8]

Hepatitis E, cause complications such as cirrhosis or liver failure. [9]

**Hepatitis A:**



Hepatitis A virus (HAV) is causes approximately half of the total number of hepatitis infections diagnosed world wide. HAV infection is mainly spread by the faecal oral route and as a result globalisation,.. [10]

You can get hepatitis A by:

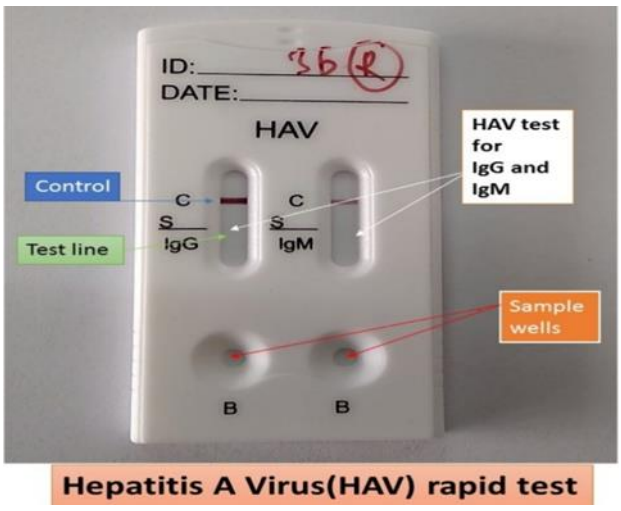
1. Eating food that is handled by preparers do not follow strict handwashing procedures before touch the food you are eat
2. Eat the raw oysters contaminated with sewage
3. Having sex with someone infected with hepatitis A virus
4. Drinks contaminated water
5. Contact with stool infected with hepatitis A

The symptoms last eight weeks and may include;

nausea, vomiting, diarrhea, jaundice, fever, and abdominal pain. Acute liver failure may rare with this being more common in children and adolescents. [3]

Although hepatitis A virus is excreted in the feces toward the end of the incubation period, a definite diagnosis is made by detecting HAV-specific IgM antibodies in the blood. IgM antibodies are found in the blood after acute hepatitis C infection. It can be detected one to two weeks after the initial infection and lasts up to 14 weeks. presence of IgG AB in the blood avidance led to means that the acute phase of the disease has passed and the person is immune to further infection. IgG antibodies to hepatitis C virus are also found in the blood after vaccination, and tests for immunity to the virus depend on detecting these antibodies [11]

HAV RT-PCR Kit 1.0 is an in vitro diagnostic test, based on real-time PCR technology, to detect RNA of hepatitis A virus (HAV). The assay uses reverse transcriptase (RT) to convert RNA to complementary DNA (cDNA), polymerase chain reaction (PCR) to amplify specific target sequences and specific targeted probes to detect the amplified DNA. The test consists of three steps in a single tube examination. Reverse transcription of target and internal control cDNA into cDNA, PCR amplification of target and internal control cDNA and detection of PCR amplifiers by a fluorescent dye-labeled probe [12]



Hepatitis A Virus(HAV) rapid test

**Hepatitis C:**

Hepatitis C is a infactious disease mainly affects the liver. Hepatitis C virus (in English: the HCV) is the cause of this disease. [16] Hepatitis C usually has no symptoms but chronic infection may lead to scarring on the liver, and after several years it may lead to cirrhosis. In some cases, patients with cirrhosis also suffer from liver failure, liver cancer, or from severely swollen veins in the esophagus and stomach, which can lead to severe bleeding and death.

Infection with hepatitis C virus occurs mainly through blood mixing ,contaminated and unsterilized medical equipment, and blood transfusion. An estimated 130-170 million people are infected with Hepatitis C in the worldThe two drugs are interferons and ribavirin two drugs for the treatment of the two main virus c. About 50 - 80% of patients treated with these two drugs are cured. Those who develop cirrhosis or liver cancer may need a liver transplant, but the virus usually reappears after the transplant is completed. [18] It should be noted, however, that there is no vaccine that prevents hepatitis C virus.


Hepatitis c is A chronic viral infection effected on the liver of human and long-term disease that may lead to death. Its severity varies from person to person The way hepatitis C is transmitted is through contact with contaminated blood, which can happen By or through the exchange of needles or syringes Unsafe medical procedures such as blood transfusion Transfusions using untested and contaminated blood Blood products.

And the symptoms are Hepatitis C virus:

Fever, fatigue, loss of appetite, nausea.

Vomiting, abdominal pain, dark urine,

Yellowing of the skin or eyes (jaundice).

There is no vaccine against hepatitis, but it can be treated with medications.. [19] Severe symptoms appear in about 25% of those infected. [6] This usually occurs 4-12 weeks after infection (but may take from 2 weeks to 6 months). When there are severe symptoms. [20] Symptoms are generally mild and vague, and may include fatigue, nausea, and vomiting. Fever, muscle or joint pain, and abdominal pain.

Hepatitis C virus:

Decreased appetite and weight loss, jaundice in part of those affected, dark stools, and clay-colored stools. [21] [22] However, there is no evidence that acute hepatitis can cause acute liver failure Although liver injury may occur and there may be an increase in liver enzymes. [23]

**Materials and methods:**

Study Population:

All Karbala hepatitis patients present in Al Hussieny Hospital , Paediatrics Hospital, Maternity and Obstetrics Hospital, Central Public Health Laboratory, Blood Bank and all the Primary Health Care centers across Kerbela governorate with jaundice or signs and symptoms suggestive of acute viral hepatitis were include in the study

Case Definition and Criteria of Inclusion:

Individuals included in this study had a positive blood test for hepatitis C virus. Serology (HAV-specific IgM and IgG antibodies) [30]. The first test is performed in the hospital or health centers, then the confirmatory test is performed in the public health laboratory in Karbala, and the last confirmatory test is performed in the central public health laboratory in Baghdad. This study

includes individuals of different genders and includes children and adults. Thus, age is divided into five groups: less than one year, 1-4 years, 5-14 years, 15-45 years, >45 years. The study population is divided into four groups according to their place of residence according to the primary health care sectors in Karbala (Karbala Primary Health Care Center, Hindi Primary Health Care Center, Al-Hussainiya Primary Health Care Center, Al-Hur Primary Health Care Center Study Sample All eligible subjects registered during the period The eight-year study spanning from the beginning of January 1, 2016 to December 31, 2020 in the study.

Data collection:

Infectious disease registration system database in the Karbala Health Directorate

It is revised to review all hepatitis cases registered between 2016 and 2020. All information on hepatitis cases is entered into an Excel database and all variables including age, gender, occupation, and place of residence are coded and then entered for analysis. Additional information was obtained from annual reports of the Iraqi Ministry of Health between 2010 and 2016. Laboratory testing Blood samples are tested by enzyme-linked immunosorbent assay (ELISA). A sample of suspected patients is sent to the Central Health Laboratory in Karbala Governorate. Repeated confirmatory testing of positive samples was performed with a more advanced device from Roche (COBAS). 10% of positive results are sent for further confirmatory ELIZSA and PCR testing at the Central Laboratory of the Ministry of Health in Baghdad in accordance with the Establishment Agreement of the Ministry of Health.

**Results:**

1. Hepatitis A:

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| Age Category | Less than one year | 10 | 0.31 |
| | 1-4 year | 949 | 29.481 |
| | 5-14 year | 1933 | 60.049 |
| | 15-45 year | 317 | 9.847 |
| | >45 year | 10 | 0.31 |
| Total | | 3219 | 100 |

**Table 1: Hepatitis A for age group**

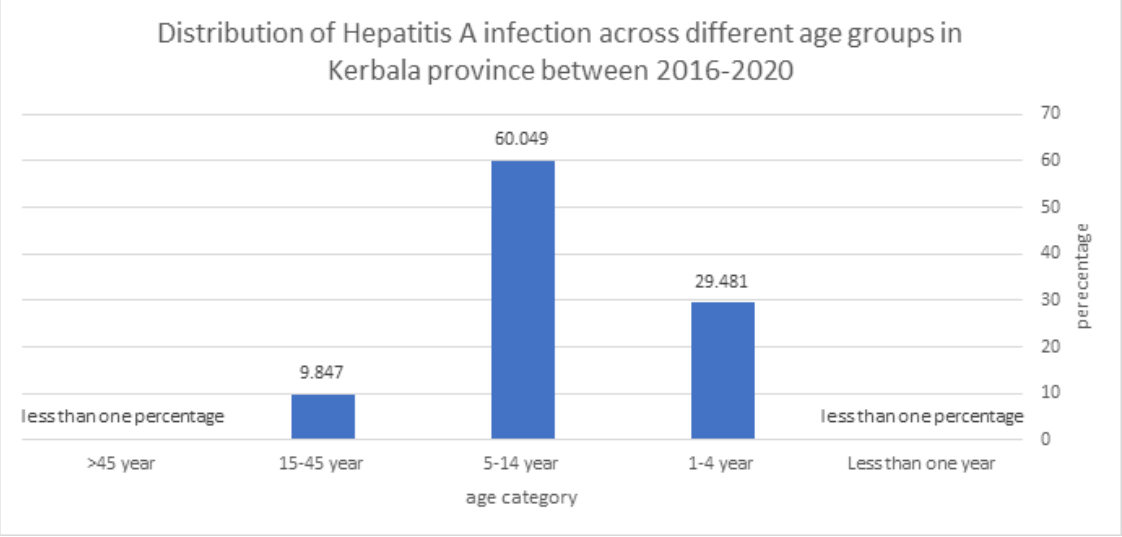



**Figure 1: Distribution of Hepatitis A for age group**

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| **Gender** | Male | 1740 | 54.054 |
| | Female | 1479 | 45.945 |
| **Total** | | 3219 | 100 |

**Table 2: Hepatitis A for gender**

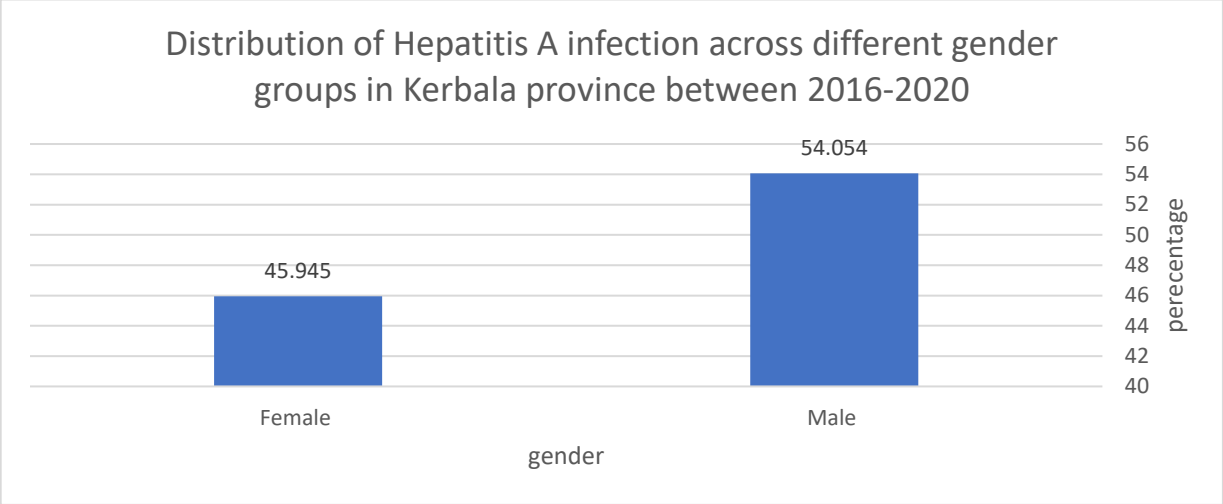



**Figure 2: Distribution of Hepatitis A for gender**

| monthly distribution | |
|---|---|
| **month** | frequency |
| **January** | 229 |
| **February** | 222 |
| **March** | 160 |
| **April** | 151 |
| **May** | 229 |
| **June** | 512 |
| **July** | 578 |
| **August** | 435 |
| **September** | 246 |
| **October** | 148 |
| **November** | 124 |
| **December** | 185 |
| **total** | 3219 |

**Table 3: Hepatitis A for monthly distribution**

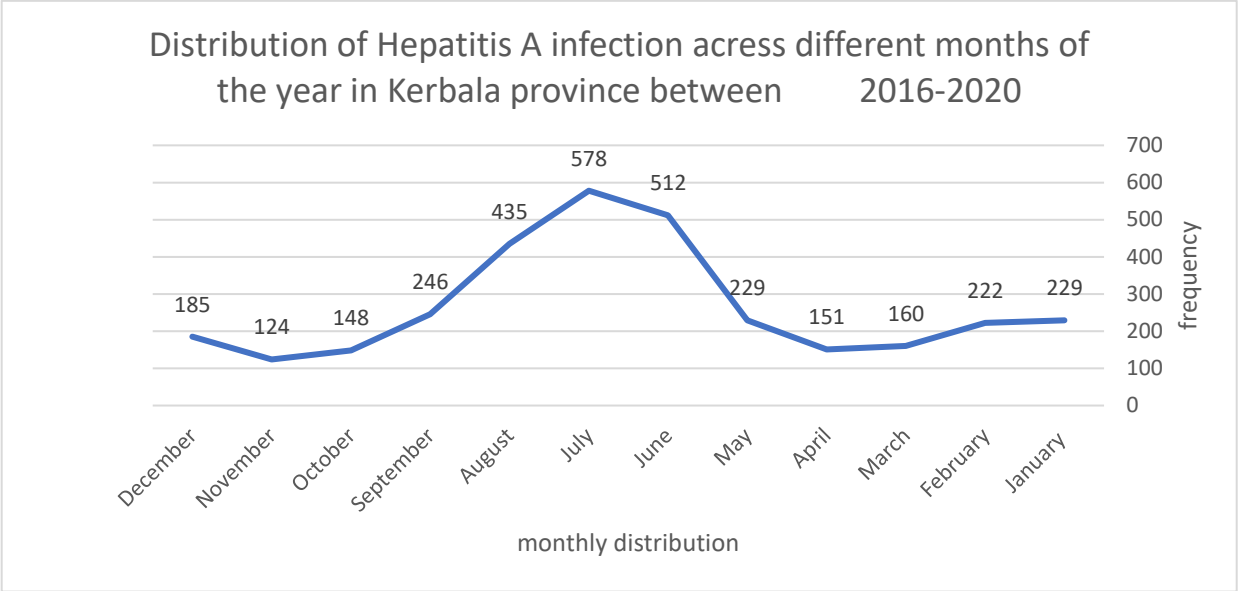



**Figure 3: Distribution of Hepatitis A for months of the year**

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| **Primary Health Sectors** | Kerbala Centre PHC | 2154 | 66.915 |
| | Hindia PHC | 155 | 4.815 |
| | Hussainia PHC | 210 | 6.523 |
| | Hurr PHC | 700 | 21.745 |
| | Total | 3219 | 100 |

**Table 4: Hepatitis A for geographical distribution**

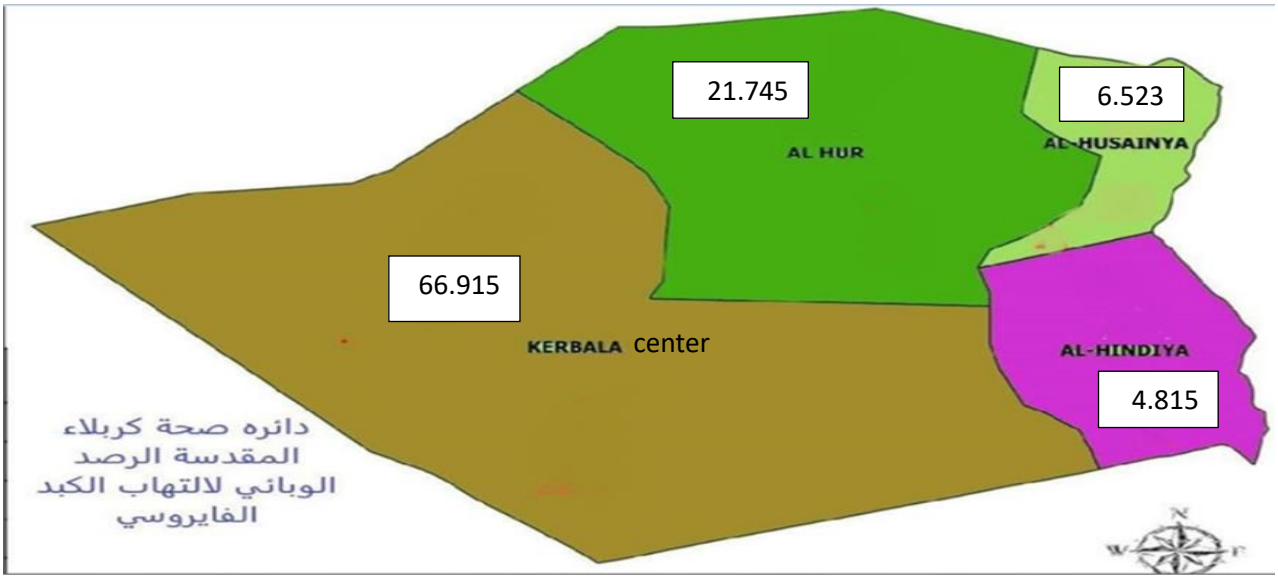



**Figure 4: Distribution of Hepatitis A for geographical**

| Type | Frequency | Percentage |
|---|---|---|
| **Urban** | 2154 | 66.915 |
| **rural** | 1065 | 33.084 |
| **total** | 3219 | 100 |

**Table 5: Hepatitis A for communities**

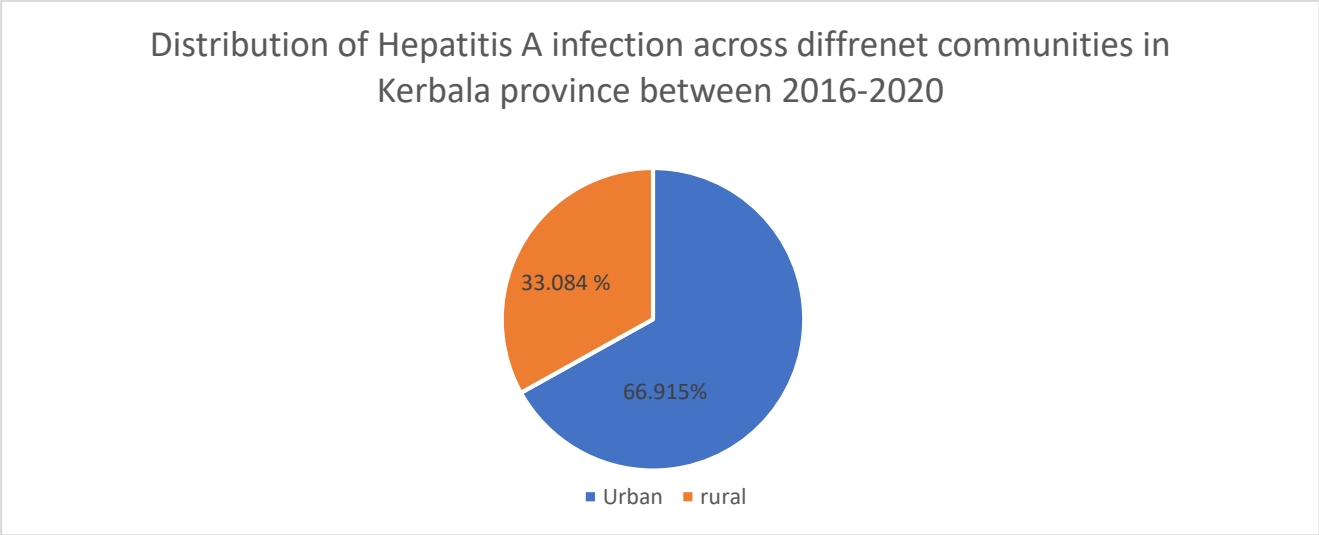



**Figure 5: Distribution of Hepatitis A for communities**

**2- Hepatitis C**

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| **Age Category** | Less than one year | 12 | 1.314 |
| | 1-4 year | 17 | 1.861 |
| | 5-14 year | 36 | 3.943 |
| | 15-45 year | 498 | 54.545 |
| | >45 year | 350 | 38.335 |
| **Total** | | 913 | 100 |

**Table 6: Hepatitis C for age group**

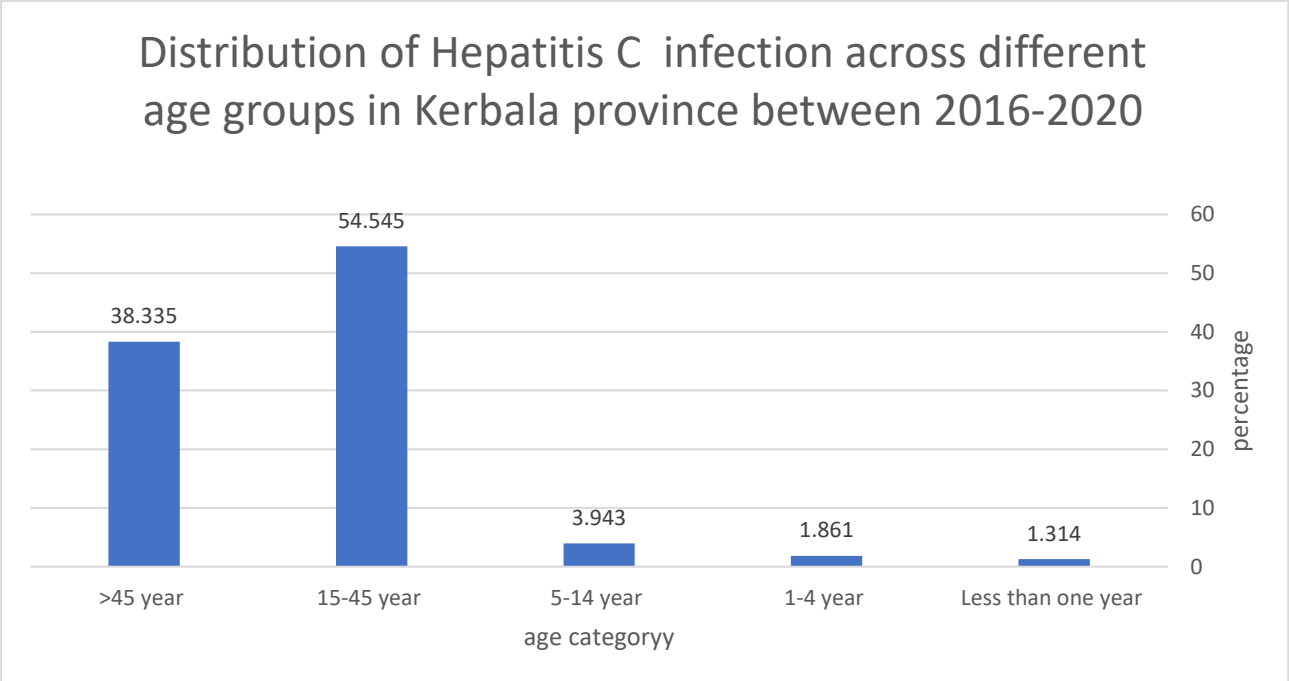



**Figure 6: Distribution of Hepatitis C for age group**

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| **Gender** | Male | 526 | 57.612 |
| | Female | 387 | 42.387 |
| **Total** | | 913 | 100 |

**Table 7: Hepatitis C for gender**

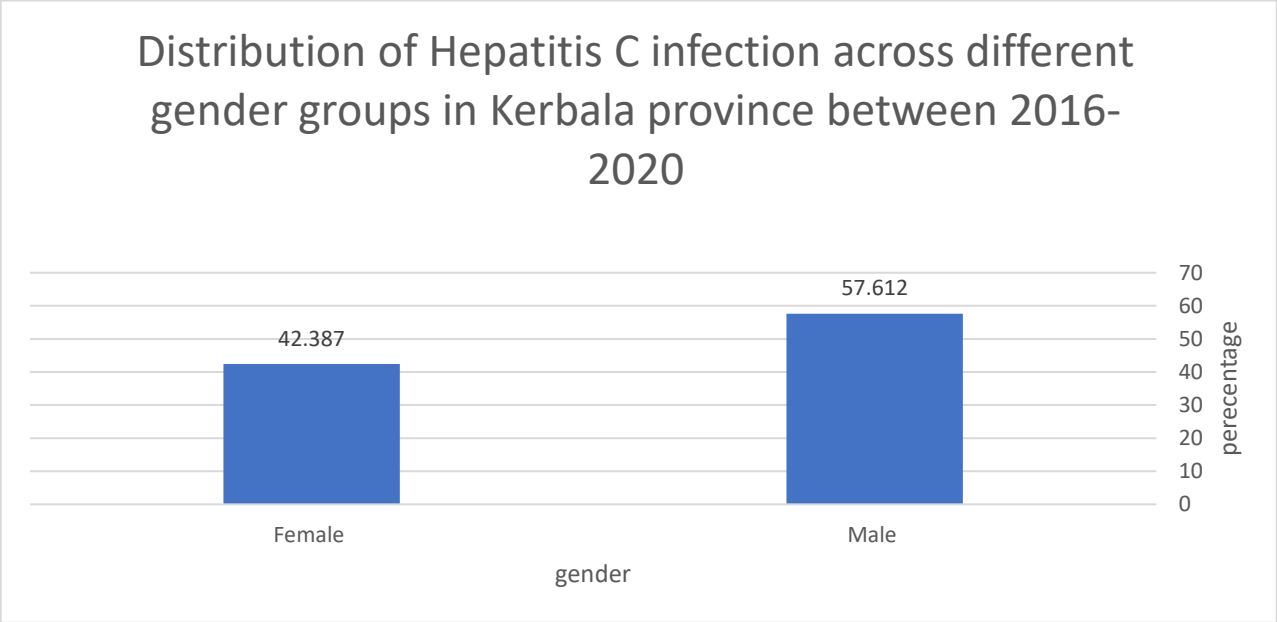



**Figure 7: Distribution of Hepatitis C for gender**

| monthly distribution | |
|---|---|
| **month** | frequency |
| **January** | 102 |
| **February** | 80 |
| **March** | 100 |
| **April** | 62 |
| **May** | 62 |
| **June** | 62 |
| **July** | 55 |
| **August** | 74 |
| **September** | 85 |
| **October** | 64 |
| **November** | 64 |
| **December** | 103 |
| **total** | 913 |

**Table 8: Hepatitis C for monthly distribution**

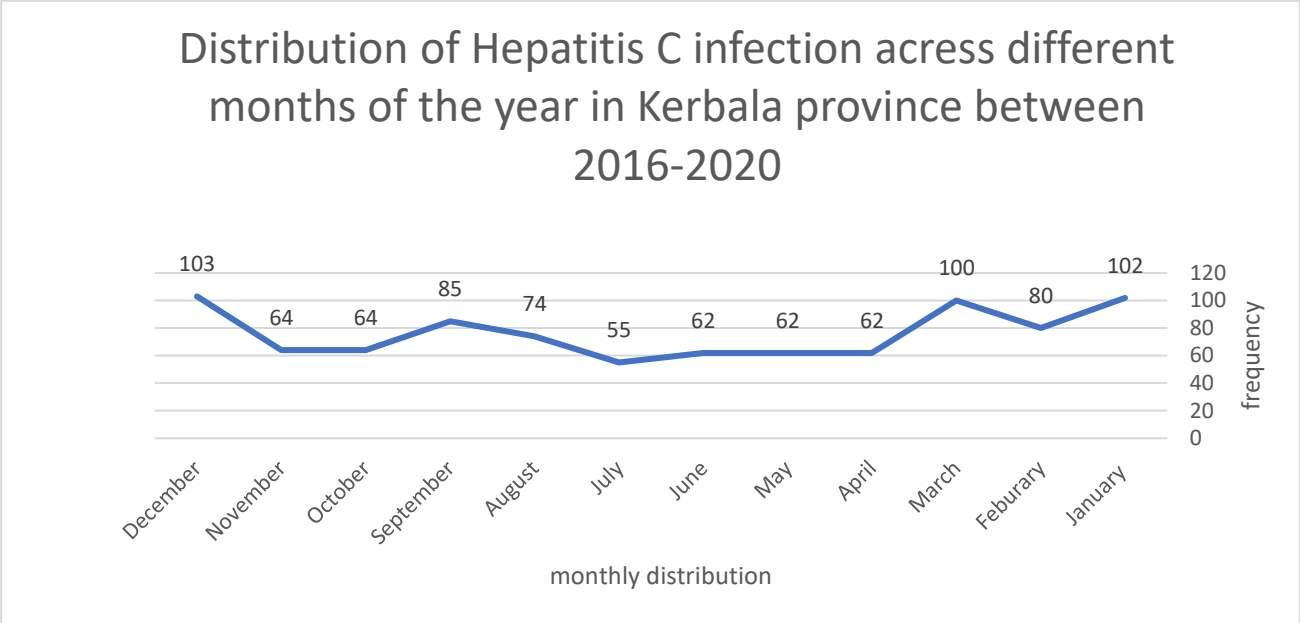



**Figure 8: Distribution of Hepatitis C for months of the year**

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| **Primary Health Sectors** | Kerbala Centre PHC | 575 | 62.979 |
| | Hindia PHC | 106 | 11.61 |
| | Hussainia PHC | 74 | 8.105 |
| | Hurr PHC | 158 | 17.305 |
| | total | 913 | 100 |

**Table 9: Hepatitis C for geographical distribution**

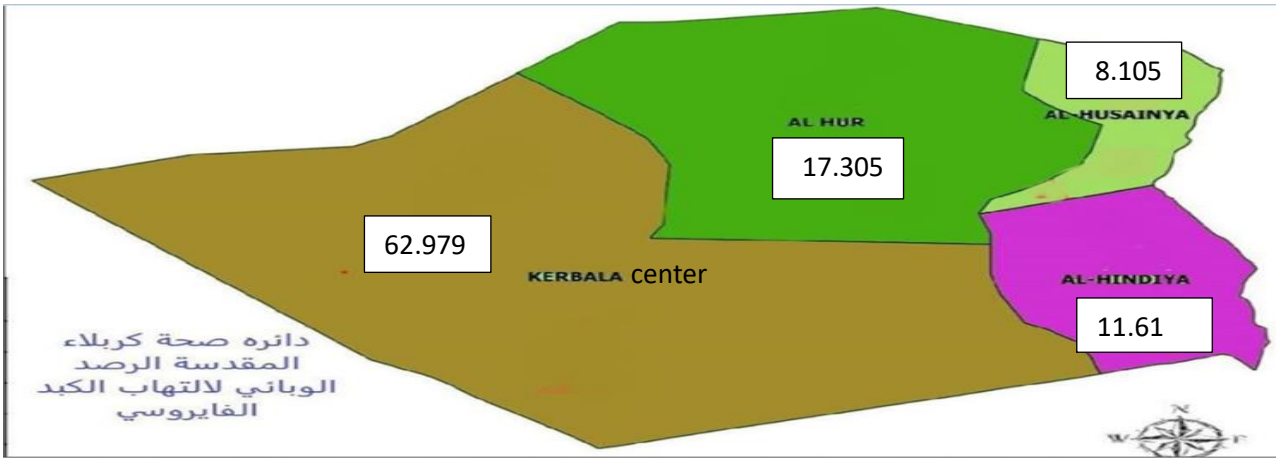



**Figure 9: Distribution of Hepatitis C for geographical**

| Type | Frequency | Percentage |
|---|---|---|
| **Urban** | 575 | 62.979 |
| **rural** | 338 | 37.02 |
| **total** | 913 | 100 |

**Table 10: Hepatitis C for communities**

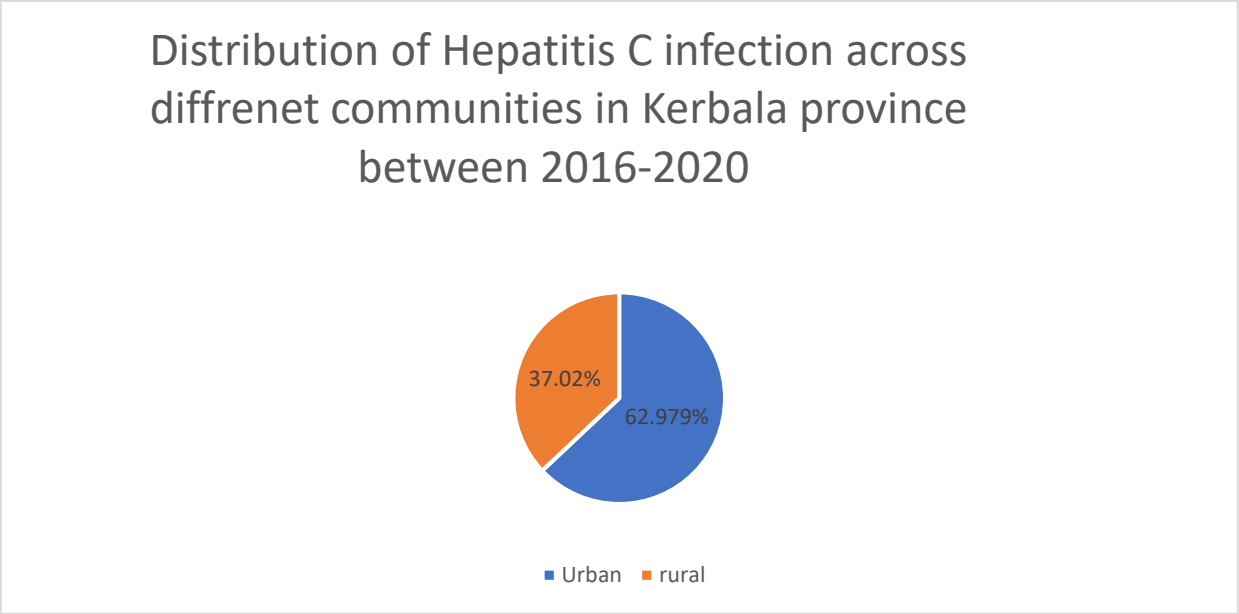



**Figure 10: Distribution of Hepatitis C for communities**

**3- Acute Hepatitis infection of type A and C:**

| Type of hep infection | Number | percentage |
|---|---|---|
| Type A | 3219 | **56.4** |
| Type B | 1573 | **27.5** |
| Type C | 913 | **16** |
| Total | 5705 | **100** |

**Table 11: Type of hepatitis infection A, B, C**

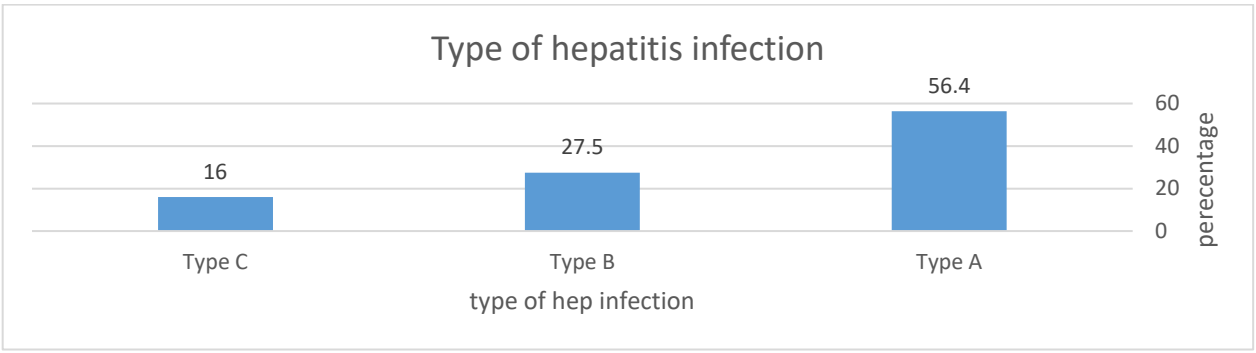



**Figure 11: Type of hepatitis infection A, B, C**

| Type of hep infection | Percentage |
|---|---|
| Acute infection (A,C) | **72.4** |
| Chronic infection (B) | **27.5** |
| Total | **100** |

**Table 12: Acute infection and chronic**

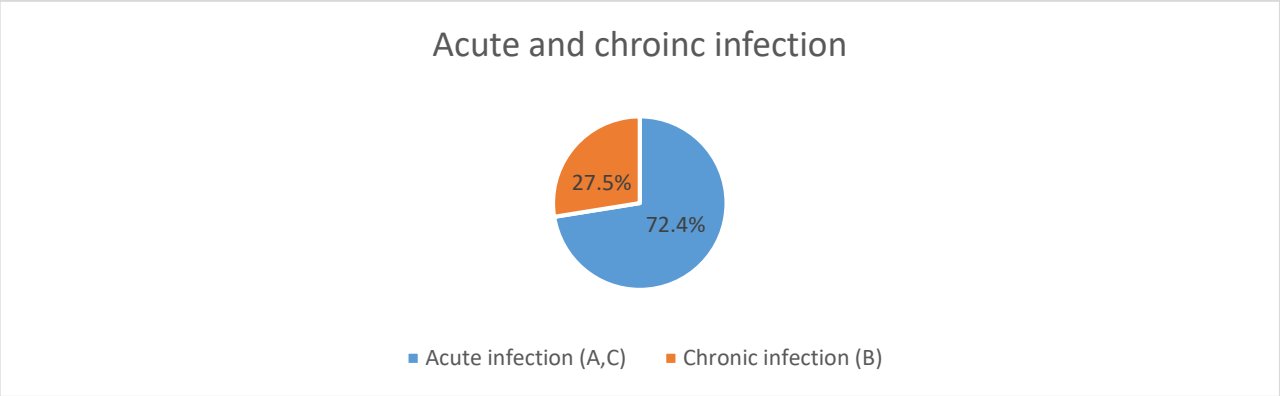



**Figure 12: Acute infection and chronic**

**Discussion:**

**1-** Hepatitis A:

Figure 1 refers to the clinical symptoms of people with viral hepatitis (A) and the rate of infection between age groups differ from one age group to another. In people whose age is less than one year, the infection rate is less than (1%) because they are under supervision and good health care and are not exposed to the causes That lead to their injury [31] [32]. The age group is from (5_14) years in the highest classification in terms of infection rate, as the rate reaches (70%). Among them in schools and recreational areas, for example, this increases the incidence of infection, as well as eating contaminated food, especially by street vendors, or drinking contaminated water from wells and rivers [31,32]. As well as the lack of health awareness and advice in our societies and the failure to wash hands well after playing in the streets and public entertainment places [33]. Then comes in the second degree the age group of (1_4) years, where the percentage of infection in them reaches more than (25%) because this group is less active than the previous groups and less exposed to contaminated food and water, or in general the lack of exposure of this group to pathogens [34]. As for adults and the elderly, the infection rate is less than (5%) and this is due to they have more health awareness and their ability to withstand infection at a higher rate than the lower age groups [35].

Meanwhile, figure 2 indicates a difference in the rate of infection and some clinical symptoms between males and females, the infection in males is higher than females, and males are more likely than females in the possibility of infection, as the percentage of infection in males reaches approximately (55%), and this is due to several reasons, including the nature of the work that is performed in it, men work in various fields in more numbers than women. The frequent movement and their exposure to mixing with members of society on many occasions, is more in males than in females. As for the second place in the number of injuries, it is in women, where the percentage of infection is approximately (45%). Among the reasons for the low incidence of infection in women is the lack of their work in the public sectors or their lack of mixing with members of society, where the largest percentage of women work as housewives, and these reasons make women less vulnerable to infection than other men [37].

Looking at the environmental impact on the rate of occurrence, figure 3 reveals that There are large and wide differences in the number of infections with viral hepatitis during the months of the year, where the highest percentage of infections occurs during the hot summer months especially during the month of June, July and August. Where the percentage of injuries in the hot months is more than the number of injuries in the cold months or the temperate months. This is likely to be due to environmental factors mostly, as temperatures reach more than 50 degrees Celsius in Karbala [38]. In addition to the influx of visitors and pilgrims to the province of Karbala and the many religious occasions in the province [39].

Furthermore, Figure 4 shows that the percentage of infections in Karbala governorate varies from one area to another, where the city center sector comes in the first place in the number of infections,

as the percentage of infections reaches approximately (45%) of the total number of infections [40]. The reason for the high infections in the center is due to several reasons, including the large number of tourists and visitors from Inside or outside Iraq. This leads to an increase in population density in the city center and a high incidence of infection. Al-Hussainiya sector comes in second place in terms of the total number of infections, as the percentage of infections in it reaches approximately (40%) of the total number of infections, as it is near the city center and is affected by visitors or displaced people from other governorates or those coming from other countries [41]. AL-Hurr sector comes in third place, and in fourth place is the AL-Hindia sector. Where the percentage of infections in the Hurr is approximately (13%). The percentage of infections in Hindia is approximately (3%). The reason for the decline in these areas is that most of their areas are rural areas with low population density and lack of movement [34].

Drawing from above, figure 5 identifies whether reported cases of HAV were mainly catogerised within cities or rural areas, where the percentage of infections in cities and urban areas rises to higher levels than the rates of infections in villages and rural areas. The rate of infection in cities may reach approximately (60%), and in the second place comes rural areas, where the rate of infection is approximately (40%) [42].

**2.** Hepatitis C:

Figure6, distributes people with hepatitis C infection whose showed clinical symptoms of infection into age groups in which they are differ from one age group to another. The injury is in the age groups from 15 to 45 years more than the other age groups present by 45%, and this is because of the nature of their work, or they may be undergoing dialysis, or they work in health care and hospitals, or perhaps because they are subjected to transfers blood transfusion, or going to beauty centers, using razors and tools for the care of hands and feet, and be in contact with people infected with hepatitis C. [44] It is due to abnormal results of liver function tests without a specific reason, or the use of cooking and food utensils for infected people, such as street vendors and buying food from them. [45] The age group older than 45 comes second, 35%, and the rest of the age groups are 20%. [46]

Looking at the gender aspect, Figure 7 concludes that hepatitis C is more frequent in males than females, where the incidence of males is 60% and in women 40% due to the nature of their work, where they work in more numbers than women in hospitals, and thus they are more likely to be infected with cutting tools, blades and needles contaminated with the blood of people are injured. [47] Also because males do tattoos or piercings on different areas of the body in greater proportions than women and use razors more than women in beauty centers.

Figure8, spread out the monthly distribution of Hepatitis C in which they concentrated more cold months, such as January, February, March and December, where the incidence of infection in the cold months is more than in the hot months. [49] It may be due to visits in these months and the increase in arrivals to the governorate, which increases the rate and number of infections in these months. [50]

Figure 10 consolidate that Hepatitis C infection is frequent in the city center from Karbala governorate, as it comes in the first place, where the rate of infection is about more than 50%, due to the population density and the arrival of the bereaved and travelers from different countries and the large number of health centers and hospitals inside the center, as well as the presence of many beauty centers unlike other sectors where there is a small percentage.[51] The free sector comes in second place, where the population is large, and the infection rate in it is about 25%. Then comes the Indian sector in third place, and the infection rate in it is approximately 20%, and in the fourth place is the Husseiniya sector, and the infection rate in it is about 5% of the total injuries in Karbala governorate. [52]

To echo the above, figure 11 illustrates that hepatitis C infection is more common in the city than in the countryside, where the highest percentage takes place in the city and is about 60%, unlike the rural percentage, where it is 40%. This is because hospitals are few in the countryside, and beauty

centers are more in the city. [53] Also, because of the population density in the cities more than the population density in the countryside, as a result of the arrival of the displaced and immigrants from the neighboring governorates that settle in the cities instead of the countryside, and this leads to an increase in the number of infections in the cities more than the countryside, and thus the infection of hepatitis C virus is less in the countryside. [55]

**3.** Acute infection by Hepatitis virus type A and C:

Table 1 and figure 11 clearly demonstrate the percentage of the occurrence of each type of Hepatitis in Kerbala province across the past five years. obviously, Hepatitis A occupies the first place in terms of the number of infections, as it occupies 57% of the total number of viral hepatitis infections. This is come in a line with Sánchez G, et al study in 2007 in which he stated that ‘’Hepatitis A virus (HAV) is responsible for around half of the total number of hepatitis infections diagnosed worldwide.[10]

The second type of hepatitis, which is type B, ranked second, accounting for approximately 27% of the total, while the third type, which is type C It came in third place, as it ranked third and accounted for 16% of the total infections due to the fact that Hepatitis C is often has no symptoms.

based on this, figure 12 illustrates the percentage of acute infections, which include hepatitis A and C, was the massively larger and accounted for approximately 72% of the total infections while and the chronic infections represented by hepatitis B were constituted about 27% of the total number of infections.

Further observations were noticed when comparing the mode of infection among acute infection as we noticed that infections are more frequent in children aged 5 to 14 years with hepatitis as for hepatitis C, it was more common in adolescents and adults from the age of 15 to 45 years. In comparsion to the United States of America, we noticed that hepatitis A did not appear in the same age group, but the disease appeared in adolescents and adults belonging to groups at high risk of infection, such as injecting drug users, men who have sex with other men, and travelers to areas where the disease is endemic at high rates.[56]

As for gender, infections with both types of hepatitis A and C affect males more than females so they are more vulnerable to infection as they are more expose to cutting tools, blades and contaminated needles, blood of infected people and the practice of bad habits. similarly percentage of the number of injuries in males more than women in the United States of America was also reported. [57]

Very interestingly, our study shows that the onset of the two types of acute hepititis is differ in terms of the seasonal distrubtion in which the majority number of infection with hepatitis A was over the three months of summer (June, July and August) as it reached over 47% of the total number all over the year. This is due to consumption of refreshments and high temperatures in these months, unlike hepatitis C, where infections are more frequent in the cold winter months of December and January.[58]

As for the geographical distribution both types of hepatitis A and C, it has been observed that infections are more frequent in the city and less in the countryside. The reason lies in Kerbala city is the most visited city in Iraq for reglious and tourisits reason as well as the population density in city is much higher comparing to other sectors in the governate.[59] And we have noticed through the results that we have in hepatitis A and C that infections are more frequent in men than women and this is due to the nature of work and their going out of the house and mixing with others is more than women. And also in both types, it was noted that the injuries were in the center of the governorate more than the rest of the sectors, especially the center, and this indicates that the city has more injuries than the countryside. Either in the monthly distribution, as hepatitis A is more common in the summer and hot weather, and type C is more common in cold weather. As for the ages, as we saw through the results that we have that hepatitis A affects the age group from 5 to 14 years, unlike type C, the infection is more common in terms of age groups from 15 to 45 years.

**Recommendations:**

1. Increasing and promoting health awareness in our communities and washing hands well after playing in the streets, recreational and public places.
2. Refrain from eating uncooked food and make sure to wash vegetables and fruits.
3. One of the most effective preventive measures is the hepatitis A virus vaccination, as these vaccinations are recommended for all children as an important part of health care.
4. Make sure to teach the child healthy practices, such as washing hands thoroughly before eating and after using the bathroom.
5. Availability of safe water supply, food safety and improved sanitation.
6. In addition to men working in health fields, gloves must be worn as a prerequisite when handling clinical samples and any other materials that may be contaminated with blood and body fluids, and not use the mouth to withdraw solutions through pipettes and eat food, water or smoke while doing their work in these laboratories.
7. Avoid drinking contaminated tap water, rivers and wells, and use bottled and sterilized water.
8. Wash and sterilize fresh and frozen fruits well.
9. Providing adequate supplies of potable water to the restricted areas.