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ORIGINAL RESEARCH article

Prevalence of acute infectious hepatitis in Eastern Libyan pediatrics

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Abstract: Viral hepatitis is one of the main public health concerns around the world. Even though infection management techniques have been implemented over the last few decades, eradication or significant reduction has remained a mystery. The purpose of this study is to look into the prevalence of acute infectious hepatitis in the East of Libya and how the type of virus, age, gender, clinical manifestations, and outcome are related. This is a hospital-based retrospective study. The data on the frequency and distribution of viral hepatitis based on age, gender, seasonal, clinical, and ultrasound findings, and the outcomes during a period of two years from January 2020 to December 2021 were collected and analyzed. Of the 0.39% (72 cases) of total hospital admissions (18340) under the age of 15 years old for acute infectious hepatitis patients, the most common age group was 5-12 years (79.6%). Winter accounted for 41.6% of all the cases. Females made up 65.3% of the cases. Jaundice was the most prevalent presentation (87.5%). Hepatomegaly was seen in 83.3% of the patients. Most of the cases have mild hyperbilirubinemia (5-9 mg/dL, 75.0%). Approximately 1/5th of the patients' serum glutamic-oxaloacetic transaminase (SGPT), and nearly 1/3rd of the patients' SGPT levels were in the range of 1000-2000. One patient's hepatitis C was positive, one patient's hepatitis B was positive, and 97.2% were positive for hepatitis A. 88.8% of the individuals recovered without complications, whereas 11.1% showed symptoms of hepatic failure but recovered. The present study indicates that acute hepatitis A is more prevalent, especially in the winter. Those who are females and 5-12 years of age were more affected by acute viral hepatitis in Libya.

Introduction

Viral hepatitis is a group of viral illnesses that affect the liver and are caused by various viruses. Many developing countries, notably in Africa, Asia, and Central and South America, are endemic to hepatitis A (HAV) [1]. It is most typically seen in regions with inadequate sanitation and hygiene standards, as well as significant poverty and overcrowding, as these factors can aid in the virus's propagation [1]. HAV can be transmitted by contaminated food and water and by close personal contacts, such as in houses, schools, and childcare facilities [2]. HAV is

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less frequent in developed countries, although it can still be detected in specific populations, such as those who are homeless, use illegal substances, or participate in high-risk sexual practices. The outbreaks in these countries are the result of poor hygiene or a large influx of infected people [2]. HAV causes liver inflammation, fatigue, nausea, vomiting, abdominal pain, lack of appetite, fever, dark urine, clay-colored feces, joint pain, and skin yellowing are the most prevalent symptoms. These symptoms, which can range from mild to severe, usually appear 2-6 weeks after a viral infection [3]. Most infections are cured on their own within a few weeks to a few months and do not cause long-term liver damage. However, in rare cases, it can cause severe liver damage and even death, particularly in the elderly or those with pre-existing liver disease [4]. Hepatitis B is most common in sub-Saharan Africa and Asia, where around 8.0% of the population is infected. It is frequently spread horizontally (from person to person) in certain areas throughout early childhood [2]. In contrast, hepatitis B is more typically transmitted in developed countries like the United States through vertical transmission from mother to child during delivery or through high-risk behaviors such as injectable drug use or unprotected sex [2]. The clinical manifestations of hepatitis B range from an asymptomatic infection to severe liver damage. Some people may develop fatigue, stomach discomfort, jaundice, or a lack of appetite, others may not exhibit any symptoms [5]. In general, if hepatitis B is detected and treated early, the prognosis is favorable. Most individuals who get hepatitis B recover completely, but a tiny minority develop chronic hepatitis B, which can progress to significant liver disorders like cirrhosis and liver cancer [6]. Hepatitis C is most common in Egypt, Pakistan, and China, with an estimated 2.0% of the population affected [7]. However, the frequency of hepatitis C varies greatly among areas and nations. Although the frequency of hepatitis C has decreased in developed nations such as the United States, it remains a major public health problem, particularly among drug users [2]. It is spread mostly by contact with contaminated blood, such as through injectable drug usage, blood transfusions, and sexual intercourse [8]. The clinical manifestations of hepatitis C range from an asymptomatic infection to severe liver damage. Some people may develop fatigue, stomach discomfort, jaundice, or a lack of appetite, others may not exhibit any symptoms [9]. In general, if hepatitis C is detected and treated early, the prognosis is favorable. Most people with hepatitis C can be cured with antiviral drugs; however, chronic hepatitis C affects a small number of people and can progress to major liver disorders such as cirrhosis and liver cancer [10]. Hepatitis E (HEV) is found all across the world; however, it is the most frequent in East and South Asia [11]. HEV-endemic areas are home to one-third of the world's population [12]. HEV is the most common cause of acute viral hepatitis worldwide, particularly in underdeveloped nations [2]. It is frequent in low- and middle-income nations when access to basic water, sanitation, hygiene, and health services is restricted [2]. The illness appears in these places as outbreaks and sporadic occurrences. Outbreaks are typically caused by fecal contamination of drinking water. Some have occurred in situations of conflict and humanitarian crisis, such as war zones and refugee camps, where sanitation and clean water supply are particularly difficult to achieve [12]. Sporadic instances are due to water pollution but on a lower scale. Cases in these places are usually caused more by genotype 1 viral infections than genotype 2 infections [12]. HEV infection is rare in locations with improved sanitation and water supply, with only sporadic instances. The majority of these cases are caused by the genotype 3 virus and are caused by infection with an animal-originating virus through the consumption of raw animal products, particularly pork flesh and liver [13]. The disease is particularly prevalent in young individuals (15-40 years old) [11]. In these areas, although infection does occur in children, it frequently remains misdiagnosed because children are generally asymptomatic [11]. The fecal-oral mode of transmission of the virus is mostly through contaminated water. 2 to 10 weeks pass during the incubation phase. The virus is released by infected people between a few days before and 3 to 4 weeks after the sickness begins. Rarely, acute hepatitis E can be severe, resulting in fulminant hepatitis or death [11]. Pregnant women, immunosuppressed people, and those with genotype 3 or 4 HEV infection are at increased risk of acute

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liver failure and mortality. The diagnosis of viral hepatitis is made through a blood test to detect the presence of hepatitis antibodies [11]. Prevention of HAV can be accomplished via vaccination, which is advised for individuals who are at high risk of acquiring the virus or for those with compromised immune systems [2]. Additionally, it is advised that, as part of their normal vaccinations, all babies receive the hepatitis B vaccine. Similarly, hepatitis B vaccinations should be given to people who are at a high risk of getting the virus, such as healthcare professionals and those who have several sexual partners [11]. On the other hand, no vaccine is currently available for hepatitis C, however, using sterile injection equipment and engaging in safe sex are two practices that lower the chance of exposure to contaminated blood and can help prevent hepatitis C. Additionally, as hepatitis C was not regularly checked for in the blood before 1992, anyone who underwent blood transfusions or organ transplants should be tested. Although developed and licensed in China, a vaccination to prevent HEV virus infection is still not widely accessible outside of that country [13]. This study aims to look at the prevalence of acute infectious hepatitis in the east of Libya and how age, gender, clinical manifestations, and outcome are linked to it.

Materials and methods

This hospital-based, cross-sectional study was carried out from January 2020 to December 2021, at the Children's Hospital, Benghazi, Libya. The study was approved by the Libyan Institutional Ethical Review Board (2019). All children (1-15 years of age) who were admitted with acute hepatitis symptoms and signs were included in the study. The study excluded children who had a history of previous liver illnesses. A case of acute hepatitis was defined as a child presenting with an acute illness of ≤ 21 days duration with any sign or symptom, e.g., fever, increased alanine aminotransferase, yellowing of the eyes and urine, appetite loss, nausea, vomiting, and abdominal pain. Gender and age were among the demographic variables that were collected from the admitted children's medical records within the specified age range. Clinical manifestations associated with acute hepatitis such as fever, vomiting, nausea, yellowing of the eyes and urine, abdominal pain, and lack of appetite. The presence or absence of these symptoms was collected. All cases had an assessment of anti-HAV (IgM), anti-HBV (HBsAg), anti-HCV total antibodies, and anti-HEV IgM antibodies using an enzyme-linked immunosorbent assay (ELISA) test (DSI, SRL Italy). Complete blood count and blood glucose were included. Laboratory parameters related to acute hepatitis that were assessed, such as prothrombin time, aminotransferase (ALT), aspartate aminotransferase (AST), and total bilirubin were measured using a commercially available enzymatic assay kit (activity colorimetric assay Kit, K2171).

Statistical analysis: Data analysis was done using IBM Corporation's SPSS program, (Windows Armonk, NY, USA, version 24). Descriptive analysis was performed for demographic, clinic-epidemiological characteristics, and etiological distribution data and represented as frequency and percentage.

Results

Over the study period from January 2020 to December 2021, there were 72 cases of infectious hepatitis out of 18340 patients admitted to the children's hospital. Therefore, infectious hepatitis represented 0.39% of total admissions. There was a history of contact with jaundiced people in 27 cases (37.5%). Out of 72 cases of hepatitis, 35 patients were admitted in 2018 and 37 patients were admitted in 2019. Regarding virus type: our results illustrated that one patient was HCV positive (1.4%), another patient was HBV positive (1.4%), and 97.2% were positive for HBV. Regarding age distribution, the age range of 5-8 years was the most prevalent (45.8%), as seen

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in **Figure 1**. Age groups 9-12 (33.8%) and 1-4 (15.3%) were next in line. Ages 13-16 were the least prevalent (05.6%). Regarding gender distribution, 25 patients were male and 47 patients were female, with a ratio of M: F of 1:1.9 (**Figure 2**). **Figure 3** shows the seasonal distribution of the patients. Thus, viral hepatitis is more common in winter with 41.6%, followed by autumn (29.1%), however, spring was the least common season with only 12.5%.

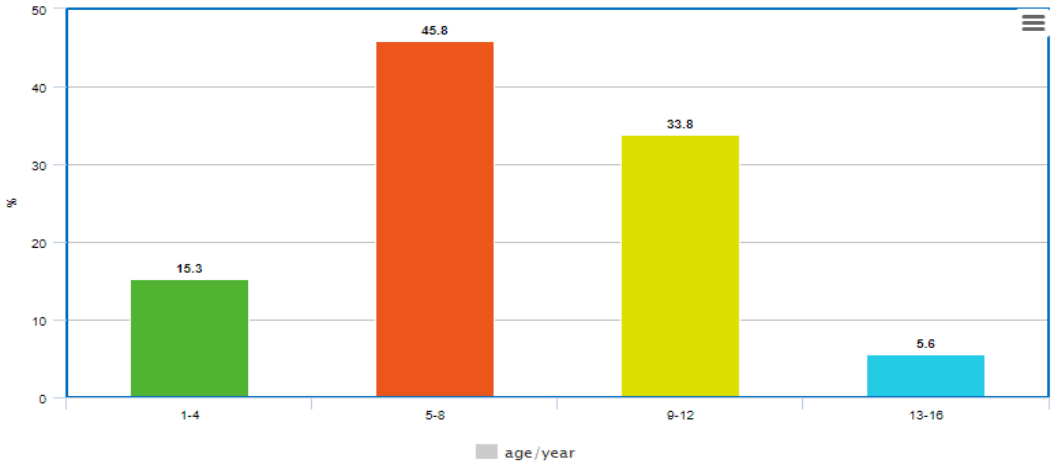

Figure 1: Distribution of the cases according to the age group

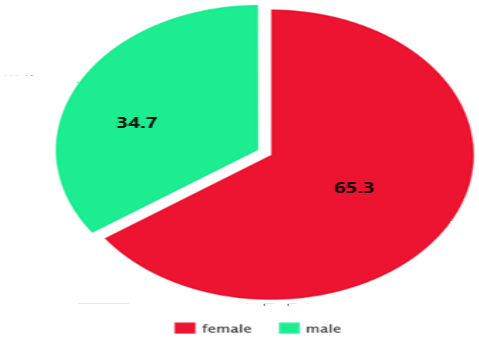

Figure 2: Distribution according to the gender

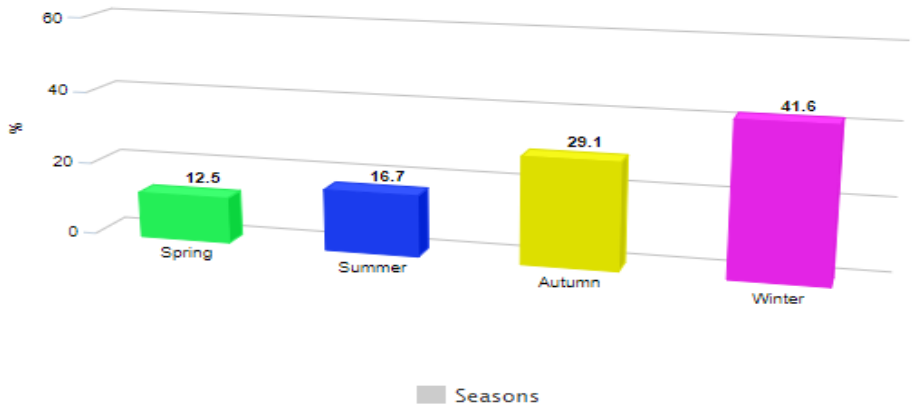

Figure 3: Distribution of cases according to the season

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Table 1 shows the distribution of acute hepatitis patients according to their symptoms. Jaundice (yellow coloring of the skin), vomiting, and changes in the color of the urine were the most typical signs of acute hepatitis. Abdominal discomfort (68.0%), anorexia (56.9%), fatigue (44.4%), and itching (33.3%) were other typical symptoms. Sleepiness and vague symptoms were rare, and fever and diarrhea were fewer common symptoms.

Table 1: Distribution of cases according to symptoms of acute hepatitis

Symptoms	Number of cases	%
Yellow discoloration of the skin	63	87.5
Vomiting	62	86.1
Change the color of urine	59	81.9
Abdominal pain	49	68.0
Anorexia	41	56.9
Lethargy	32	44.4
Itching	24	33.3
Fever	23	31.9
Diarrhea	10	13.8
Sleeplessness	08	11.1
Others	16	22.2

In **Figure 4**, the distribution of cases based on bilirubin levels is as follows: 75.0% of the cases exhibited serum bilirubin levels ranging from 5 to 9 mg/dL, 9.0% had levels between 10 and 19 mg/dL, and 4.3% fell within the range of 20 to 29 mg/dL. In addition, in 2.8% of the cases, the serum bilirubin level exceeded 30 mg/dL.

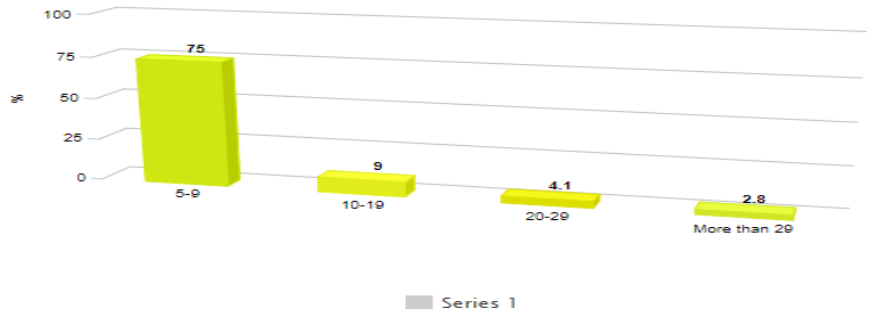

Figure 4: Distribution of cases according to the level of bilirubin

Distribution according to liver enzymes: as can be seen in **Table 2**, SGOT levels for almost one-fifth of patients and SGPT levels for about one-third of patients were between 1000 and 2000 unit/l. Only 16.7 and 11.1 patients, respectively, obtained normal SGOT and SGPT results. Very high SGOT and SGPT enzyme values (5000) were present in only 04.2% of individuals.

Table 2: Distribution of cases according to liver enzyme activities

Enzyme activity	Serum glutamic-oxaloacetic transaminase (sGOT)		Serum Glutamic Pyruvic Transaminase (sGPT)	
units/litre	Frequency	Percentage	Frequency	Percentage
< 250	12	16.7	8	11.1
250-500	10	13.9	8	11.1
500-1000	9	12.5)	13	18.1
1000-2000	15	20.8	20	27.8
2000-3000	11	15.2	10	13.9
3000-4000	9	12.5	5	6.9
4000-5000	3	4.2	5	6.9
> 5000	3	4.2	3	4.2

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About the distribution of the cases according to ultrasound findings, as illustrated in **Figure 5**, 83.3% of the patients had hepatomegaly. Cirrhotic changes were seen in only 1.4% of the patients. Splenomegaly was seen in 9.7% of the patients. Ascites was present in 2.8% of the instances. Gallbladder wall thickness and edema were present in 8.3% of the patients. **Figure 6** shows that 64 patients of the total cases recovered without complications (88.8%), while only eight patients (11.1%) developed signs of hepatic failure. However, in the end, all the patients recovered. In this study, other investigations were investigated (partial thromboplastin time, PPT). Thus, 9 patients showed prolonged PT (12.5%) and 16 patients showed prolonged APTT (22.2%). 6 patients developed hypoglycemia (blood glucose less than 50 mg %) (8.3%), leukocytosis occurred in 4 individuals (5.5%), and leukopenia in 13 patients (25.0%), respectively.

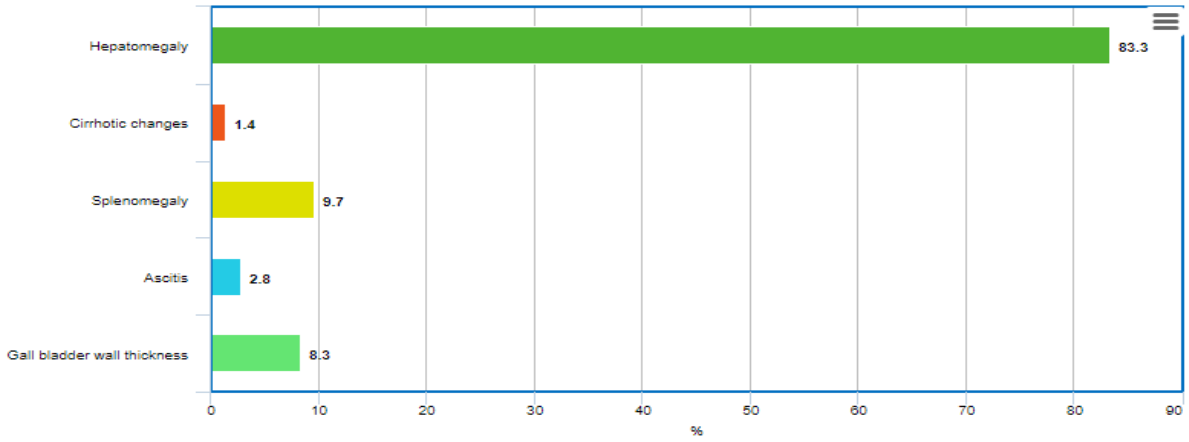

Figure 5: Ultrasound findings of the Libyan patients

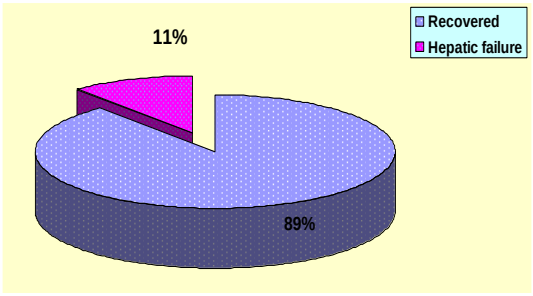

Figure 6: Distribution of cases according to prognosis

Discussion

Compared to other illnesses, our investigation revealed that HAV infection stands out as the predominant cause of acute hepatitis. These findings align with a 2021 study indicating HAV prevalence in the majority of patients (73.2%), while HEV was detected in only 10.7% of the cases [14]. Similarly, a 2016 study found HAV responsible for 63.2% of cases in pediatric acute viral hepatitis, followed by HBV (10.5%) and HEV (5.3%) [15]. Another study in 2019 noted a high HAV frequency (95.1%) [16], contrasting with a significantly lower HEV frequency (13.1%). Despite HAV immunization availability reducing its frequency in some nations [17]. Libya, lacking routine vaccinations, still experiences a high incidence.

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In our study, the majority of patients were in the 5-8 age group, followed by the 9-12 and 1-4 age range. This contrasts with a 2020 study where a similar age group was more severely affected [18]. Additionally, 52.0% of affected children in a Bangladesh study were between 5-10 years old [19]. Notably, our research diverges from an Indian study, revealing the majority of patients aged 1 to 5 (45.0%) and 6 to 10 (40.0%) [20]. HAV prevalence in children aged 5 to 12 is linked to unsanitary school environments. Contrary to the Centers for Disease Control and Prevention's data indicating a higher prevalence in men [2], however, our study sample was predominantly female. This contrasts with Karachi's findings, where men predominated (86.0%) [21], and studies from India showing a male-to-female ratio of 2.1 : 1 [22, 23]. A supplementary study also noted that male patients had a higher frequency of HAV (60.8%) compared to female patients (39.3%) [24]. Similar results were reported by another study performed in 2022, which had 49.0% female and 51.0% male patients [20]. The current study reflects an inverse pattern, suggesting occupational or behavioral exposures influence infection rates.

Regarding seasonal distribution, our analysis identified winter as the most prevalent season, followed by autumn, while spring had the fewest cases. This differs from Muralitharan's study [25] and northwest Argentina's study [26] but aligns with the notion of rainfall-induced HAV spread due to its persistence in water [27]. Sewage and water system disruptions likely contribute to seasonal HAV recurrence. [28-31]. Concerning symptoms, yellow skin discoloration, vomiting, and changes in urine color were prominent in acute hepatitis. Anorexia, lethargy, itching, and stomach discomfort were also common, while fever and diarrhea were less frequent. This aligns with studies reporting icterus as the most prevalent symptom [14, 20, 32-34], but our findings conflict regarding fever prevalence. Regarding bilirubin levels, 75.0% of cases had serum bilirubin between 5 and 9 mg/dL, differing from the previous study [35]. Our study included only hospitalized patients with bilirubin levels above 5, while the other study included all hepatitis patients. SGOT and SGPT levels exhibited variations compared to Kumar [21] and Muralitharan's data [22] likely influenced by different inclusion criteria. In ultrasound findings, hepatomegaly was prevalent (83.3%) in contrast to other studies [21, 22, 35] with varying rates. Splenomegaly, cirrhotic alterations, ascites, and gallbladder issues varied in prevalence, showcasing differences among studies. Regarding prognosis, 88.8% of patients recovered without complications, 11.1% developed hepatic failure signs but recovered, and mortality was 01.3%, primarily due to fulminant hepatic failure. Most children recovered fully within two months, with a couple experiencing prolonged cholestasis. However, our study had some limitations, including the relatively small number of participants and missing epidemiological evidence about their age at the time of encountering the HCV infection. Current research holds significance as it addresses a critical gap in our knowledge of the prevalence of acute infectious hepatitis in Eastern Libyan pediatric age groups. The scarcity of comprehensive data in this region has impeded the implementation of effective public health interventions, and our study aims to fill this void. Notably, HAV-induced acute viral hepatitis emerged as the more prevalent form, with the most typical age range being 6 to 10 years. The current findings underscore the importance of incorporating HAV vaccination as a standard component of immunization programs. To curb the spread of the disease, it is imperative to provide health education to the general population, emphasizing preventive measures such as maintaining clean toilets, ensuring access to safe drinking water, promoting good hand hygiene, and encouraging proper waste disposal. Recognizing the clinical signs and symptoms of acute viral hepatitis is crucial for prompt diagnosis and timely treatment, ultimately reducing morbidity and preventing fatalities associated with the disease.

Conclusion: The findings indicate that acute hepatitis A is more prevalent, especially in the winter season. Those who are female and 5-12 years of age are more affected by acute viral hepatitis in Libya.

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