



RESEARCH ARTICLE

EPIDEMIOLOGY OF HEPATITIS VIRUSES IN HAJJAH GOVERNORATE, YEMEN, BETWEEN 2020-2023

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Abstract

Viral hepatitis is now recognized as a major public health challenge that requires urgent response. They are also responsible for killing approximately 1.5 million people every year. The health care system in Yemen is fragile and cannot handle public health emergencies. Thus, this study aimed to determine the epidemiology of hepatitis A, E, B and C viruses in Hajjah governorate between 2020-2023, Yemen. This retrospective study was conducted in the Hajjah Governorate of Yemen for four years, 2020–2023. About 41162 cases were collected from clinical records of epidemiological surveillance in the Public Health Office of the Hajjah governorate that documented between 2020–2023. The required data were obtained and analyzed using SPSS. Out of 41162, 761 (1.85%) were positive for HAV and HEV, while 971 (2.36%) were positive for HBV and HCV. The highest rates of HAV and HEV were in 2022 (2.3%), whereas HBV and HC were in 2020 (2.9%). In addition, a higher rate of hepatitis HAV and HEV was detected among individuals from the Al Miftah district 116 (7.5%) in September 85 (2.6%), while HBV and HCV were higher in Hajjah city 579 (22.9%) and in October and November (2.8%). Additionally, all viral hepatitis cases were higher in the autumn. In spite of the low rate of hepatitis viruses observed in this study, these viruses will continue to pose a significant risk to public health. Therefore, enhancing sanitation practices, ensuring food safety, and promoting immunization are the most efficacious strategies for preventing hepatitis viruses.

Keywords: Hepatitis A, Hepatitis B, Hepatitis C, Hepatitis E, Epidemiology, Hajjah, Yemen.

Introduction

Viral hepatitis is now widely recognized as a significant public health issue that necessitates an immediate and comprehensive response. Several different viruses cause hepatitis, including hepatitis A, B, C, D, and E. Viral hepatitis can be transmitted through either contaminated food or water (types A and E) or through blood and bodily fluids (types B and C). Water and foodborne viruses typically cause self-limiting infections, leading to acute sickness that resolves completely. Bloodborne viruses, specifically hepatitis B and C, have the potential to induce both acute and chronic liver diseases [1].

According to the 2017 global hepatitis report by the World Health Organization (WHO), viral hepatitis resulted in 1.34 million fatalities in 2015 [2]. HAV and HEV infections have comparable patterns of occurrence and spread, but they also exhibit distinct variations. In communities with few resources and high rates of disease, the hepatitis A virus primarily infects young children, teenagers, and young adults. In developed countries, the hepatitis E virus infection rate tends to rise with age, predominantly affecting individuals who are 50 years old or older [3]. Both HBV and HCV can be passed from mother to child during childbirth, through the

exchange of bodily fluids during sexual activity, unsafe injections, and unscreened blood transfusions [1].

Globally, HAV is responsible for an estimated 1.4 million infections annually and caused about 7134 persons died, accounting for 0.5% of the mortality due to viral hepatitis [4]. Similarly, HEV responsible for infecting about 20 million of population and caused approximately 44,000 deaths, accounting for 3.3% of the mortality due to viral hepatitis [5].

Globally, 254 million people are estimated to have chronic hepatitis B infection in 2022, with 1.2 million new infections occurring every year. Approximately 1.1 million people died from cirrhosis and hepatocellular carcinoma in 2022 due to hepatitis B [6].

According to WHO estimates, 50 million individuals have chronic hepatitis C virus infection and approximately 1.0 million new infections occur annually worldwide. In addition, HCV is responsible for the death of 242,000 people, mostly due to cirrhosis and hepatocellular carcinoma [7]. In Yemen, the prevalence of HCV was ranged between 0.07%-8.5% [8].

Studies conducted in some regions of Yemen have focused on the prevalence of hepatitis viruses among a small population for a short duration [9-11]. Hajjah Governorate is a Yemeni governorate whose residents lack access to safe drinking water, good hygiene practices, widespread poverty, food insecurity, and limited healthcare access. All of these factors contribute to the risk of contracting infectious diseases [12-15].

Data on the epidemiology of hepatitis viruses in the Hajjah governorate are lacking. There is only one report that showed that about 1.1% of donors in Hajja had an HCV infection [16]. Therefore, this study aimed to highlight the epidemiology of hepatitis viruses in Hajjah governorate, Yemen, for four years, between 2020-2023.

Materials and Methods

Study design and area

This retrospective study was conducted in the Hajjah Governorate of Yemen for four years, 2020– 2023. Hajjah Governorate is located in northwestern Yemen, about (123) kilometers from the capital, Sana'a. It connects with the Sa'ada governorate and the Kingdom of Saudi Arabia from the north, the Amran governorate from the east, the Al Mahwit and Al Hudaydah governorates from the south, and the Red Sea and part of the Al Hudaydah governorate from the west. The size of the governorate is approximately 10,141 km² (3,915 sq. mi), with a population of 2,782,000 individuals. The mountainous regions of Hajjah Governorate enjoy a mild climate in summer and cold in winter, whereas the coastal plains regions are dominated by a hot and humid tropical climate in summer and mild winters. Hajjah

Governorate is divided into 31 districts, which are further divided into sub-districts and further subdivided into villages.

Study Population

Data were collected from the clinical records of epidemiological surveillance in the Public Health Office, Early Warning, Alert and Response System (EWARS) of the Hajjah Governorate. All cases were diagnosed in different laboratories based on direct observation of hepatitis A, E, B, and C in the blood samples.

Data Collection

The data required in this study included information such year of infection, weekly number, district name, month, and season,

Statistical analysis

The data were categorized into quantitative variables and presented as frequencies and percentages in tables and figures. In addition, the Statistical Package for Social Sciences (SPSS) program was used to calculate the confidence interval (CI 95%) and chi-square test (χ^2) between variables. A probability (P) value was considered statistically significant at ≤ 0.05 .

Results

Distribution of samples

A total of 41162 cases were collected between 2020 and 2023 in patients from different districts of the Hajjah governorate. The majority of specimens were more in the years 2023 at 12673 (30.8%) and the lowest in 2020 at 3499 (8.5%). Most cases were documented in November at 4148 (10.1%), and few cases were documented in February 2926 (7.1%). In addition, most specimens were collected in summer at 11116 (27.0%) and the lowest was in winter at 9124 (22.2%), as summarized in Table 1.

The present findings showed that most specimens were collected from Bani Qais at 2635 (6.5%), and the lowest was from Hayran 36 (0.1%), as summarized in Figure 1.

Frequency of hepatitis viruses

Figure 2 shows that the prevalence rates of HAV and HEV were 761 (1.85%), whereas those of HBV and HCV were 971 (2.36%) among the study subjects.

Table 1. Distribution of collected samples from study area concerning years, months, and seasons

Variables	Years	No.	Rate (%)	95% CI	χ^2	P value
Year of infection	2020	3499	8.5	2.83-2.86	589.5	0.000
	2021	12380	30.1			
	2022	12610	30.6			
	2023	12673	30.8			
Month	January	3177	7.7	6.61-6.68	417.75	0.000
	February	2926	7.1			
	March	3355	8.2			
	April	3080	7.5			
	May	3530	8.6			
	June	3783	9.2			
	July	3425	8.3			
	August	3908	9.5			
	September	3323	8.1			
	October	3486	8.5			
	November	4148	10.1			
	December	3021	7.3			
Seasons	Spring	9965	24.2	2.45-2.48	243.13	0.000
	Summer	11116	27.0			
	Autumn	10957	26.6			
	Winter	9124	22.2			

95% CI = Confidence interval. χ^2 = Chi-square test, P value < 0.05 (statistically significant)

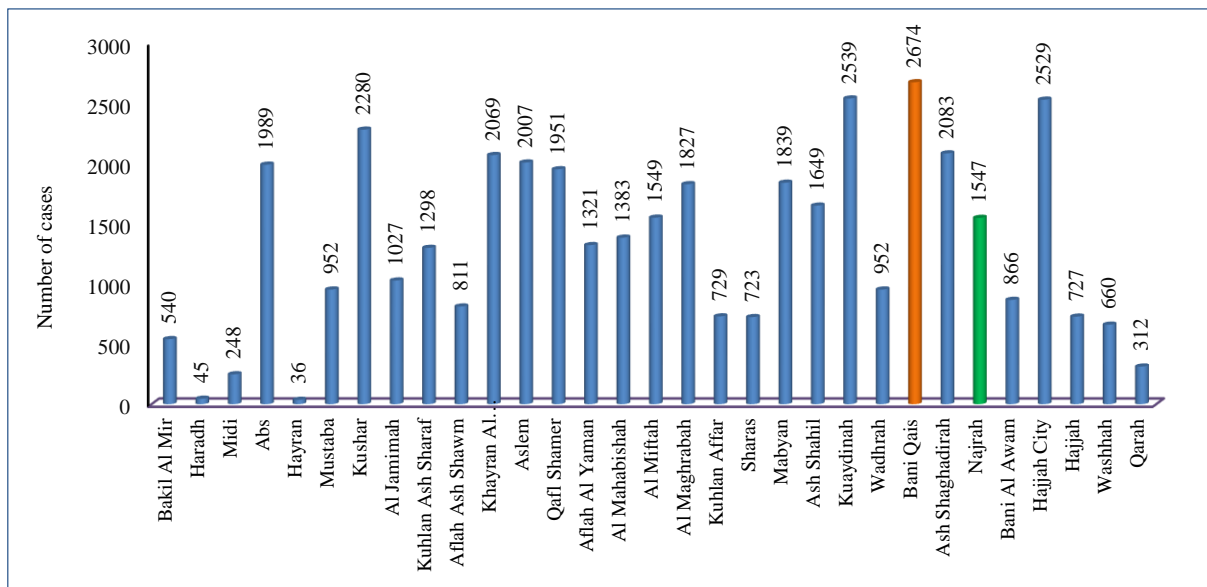


Fig. 1. Distribution of collected samples from study area concerning districts

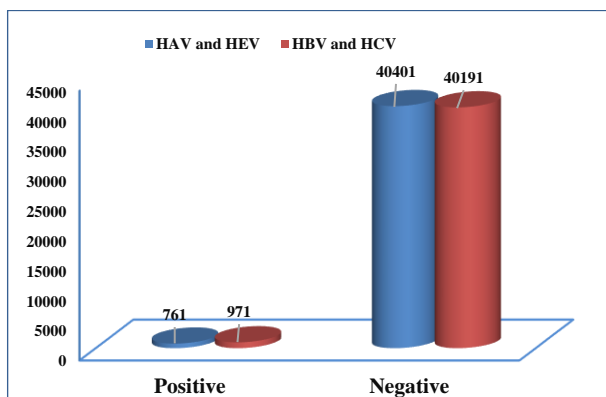


Fig. 2. Frequency of hepatitis viruses in Hajjah governorate between 2020-2023

The present results showed that the highest rate of HAV and HEV was in 2022 (2.3%), whereas HBV and HCV were in 2020 (2.9%), with statistically significant differences ($P = 0.000$), as summarized in Table 2.

This finding showed that a higher rate of HAV and HEV was detected among individuals from Al Miftah District 116 (7.5%). In addition, a higher rate of hepatitis HBV and HCV was observed in Hajjah City at 579 (22.9%), as shown in Table 3.

Table 2. Frequency of Hepatitis viruses concerning year of infection

Years	No. (%)	HAV and HEV		P value	HBV and HCV		P value
		ve+	ve-		ve+	ve-	
2020	3499(8.5)	67(1.9)	3432(98.1)	0.000	103(2.9)	3432(97.1)	0.000
2021	12380(30.1)	241(1.9)	12139(98.1)		324(2.6)	12139(97.4)	
2022	12610(30.6)	284(2.3)	12326(97.7)		315(2.5)	12326(97.5)	
2023	12673(30.8)	169(1.3)	12504(98.7)		229(1.8)	12504(98.2)	

P value < 0.05 (statistically significant)

Table 3. Frequency of hepatitis viruses concerning district name

District name	HAV and HEV		P value	HBV and HCV		P value
	ve+	ve-		ve+	ve-	
Bakil Al Mir	0 (0.0)	540 (100)	0.000	0 (0.0)	540 (100)	0.000
Haradh	0 (0.0)	45 (100)		0 (0.0)	45 (100)	
Midi	6 (2.4)	242 (97.6)		0 (0.0)	248 (100)	
Abs	49 (2.5)	1940 (97.5)		78 (3.9)	1911 (96.1)	
Hayran	0 (0.0)	36 (100)		0 (0.0)	36 (100)	
Mustaba	0 (0.0)	952 (100)		12 (1.3)	940 (98.7)	
Kushar	3 (0.1)	2277 (99.9)		2 (0.1)	2278 (99.9)	
Al Jamimah	0 (0.0)	1027 (100)		0 (0.0)	1027 (100)	
Kuhlan Ash Sharaf	41 (3.2)	1257 (96.8)		5 (0.4)	1293 (99.6)	
Aflah Ash Shawm	2 (0.2)	809 (99.8)		1 (0.1)	810 (99.9)	
Khayran Al Muharraq	39 (1.9)	2030 (98.1)		104 (5.0)	1965 (95)	
Aslem	0 (0.0)	2007 (100)		1 (0.01)	2006 (99.09)	
Qafil Shamer	0 (0.0)	1951 (100)		0 (0.0)	1951 (100)	
Aflah Al Yaman	0 (0.0)	1321 (100)		0 (0.0)	1321 (100)	
Al Mahabishah	18 (1.3)	1365 (98.7)		15 (1.1)	1368 (98.9)	
Al Miftah	116 (7.5)	1433 (92.5)		87 (5.6)	1462 (94.4)	
Al Maghrabah	5 (0.3)	1822 (99.7)		2 (0.1)	1825 (99.9)	
Kuhlan Affar	3 (0.4)	726 (99.6)		0 (0.0)	729 (100)	
Sharas	0 (0.0)	723 (100)		0 (0.0)	723 (100)	
Mabyan	127 (6.9)	1712 (93.1)		49 (2.7)	1790 (97.3)	
Ash Shahil	42 (2.5)	1607 (97.5)		0 (0.0)	1649 (100)	
Kuaydinah	119 (4.7)	2420 (95.3)		19 (0.7)	2520 (99.3)	
Wadhrah	10 (1.1)	942 (98.9)		0 (0.0)	952 (100)	
Bani Qais	44 (1.6)	2630 (98.9)		14 (0.5)	2660 (99.5)	
Ash Shaghadirah	2 (0.1)	2081 (99.9)		0 (0.0)	2083 (100)	
Najrah	47 (3.0)	1500 (97)		3 (0.2)	1544 (99.8)	
Bani Al Awam	2 (0.2)	864 (99.8)		0 (0.0)	866 (100)	
Hajjah city	86 (3.4)	2443 (96.6)		579 (22.9)	1950 (77.1)	
Hajjah	0 (0.0)	727 (100)		0 (0.0)	727 (100)	
Washhah	0 (0.0)	660 (100)		0 (0.0)	660 (100)	
Qarah	0 (0.0)	312 (100)		0 (0.0)	312 (100)	

P value < 0.05 (statistically significant)

Figure 3 shows that the highest percentage of HAV and HEV cases was documented in week No. (47) at 27 (3.8%) and the lowest was in week No. (26) at 17 (0.4%). The highest rates of HBV and HCV infections were observed in week No. (46) at 17 (4.2%) weeks, and the lowest was observed in week No. (53) at 5 (0.4%).

In total, high rates of HAV and HEV (2.6%) were observed in September, whereas HBV and HCV were higher in October and November (2.8%), with statistically significant differences ($P = 0.000$). According to the month of infection, HAV and HEV infections were significantly higher in September 2020 (3.3 %), November 2021 (3.5%), July 2022 (3.6%), and January 2023 (3.8%). Similarly, HBV and HCV

infections were found to be higher in January 2020 and 2021 at 8.7% and 3.3%, respectively, June 2022 at 3.8%, and January and November 2023 at 2.3%, as shown in Figure (4).

In total, high rates of HAV and HEV (2.2%) and HBV and HCV (2.6%) were observed in autumn with statistically significant differences ($P = 0.000$). Regarding year, HAV and HEV infections were significantly higher in autumn in 2020 and 2021 (2.7% and 3.2%, respectively), and in winter in 2022 and 2023 (2.6% and 2.9%, respectively). Similarly, HBV and HCV infections were found to be higher in autumn 2020 at 4.7%, summer 2021 at 2.9%, autumn 2022 at 2.9%, and winter 2023 at 2%, as shown in Figure (5).

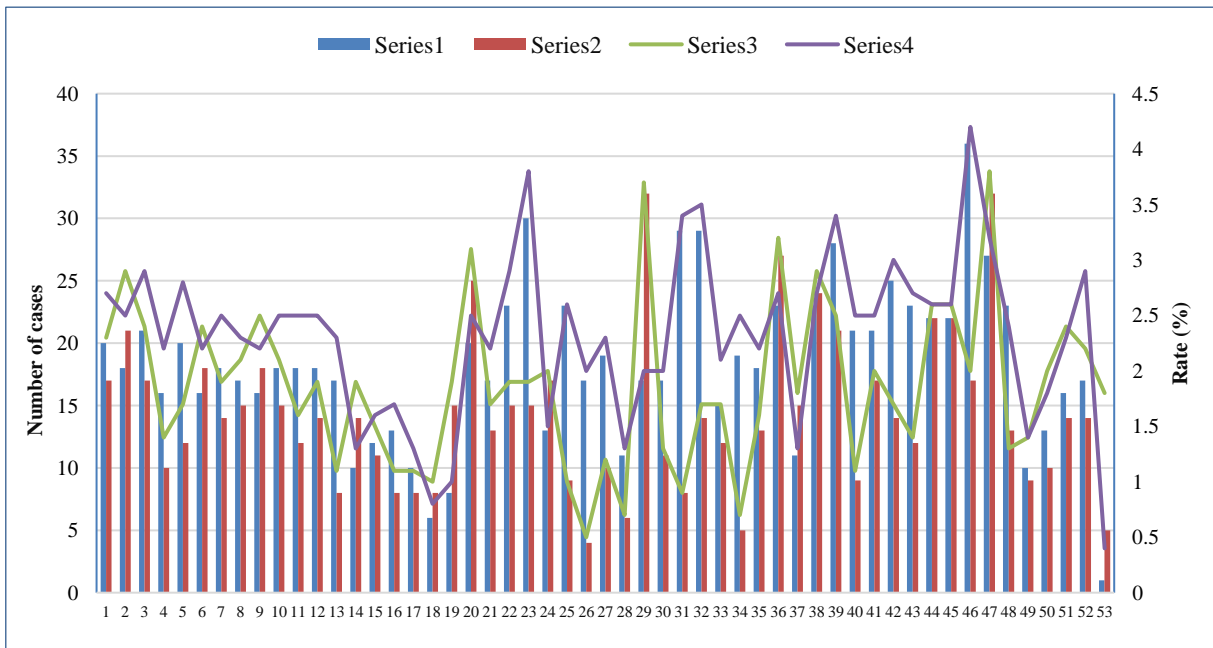


Fig. 3. Weekly trends of hepatitis viruses in Hajjah between, 2020 and 2023

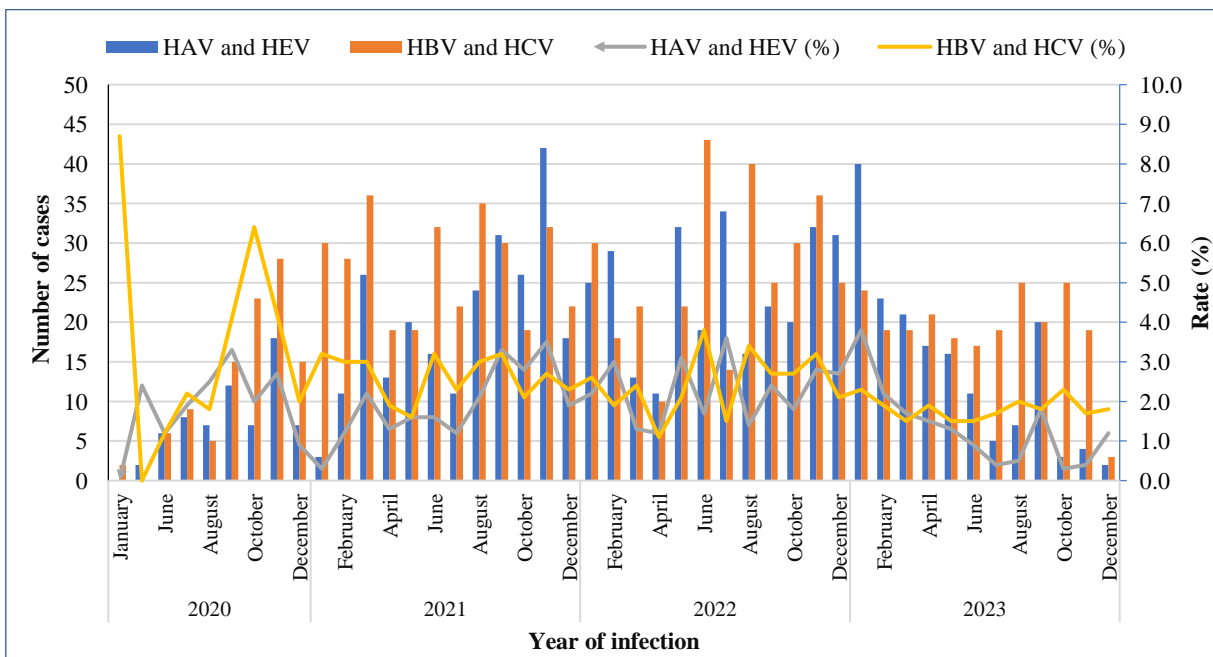


Fig. 4. Monthly trends of hepatitis viruses in Hajjah between, 2020 and 2023

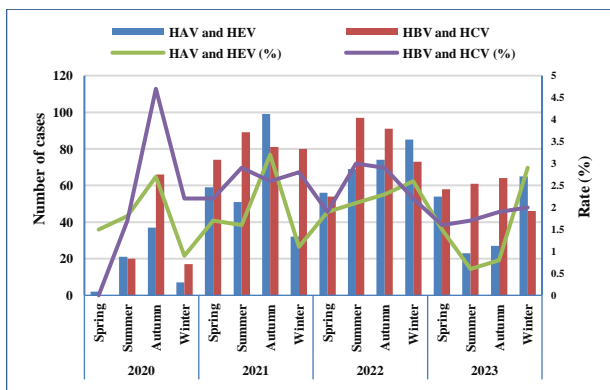


Fig. 5. Season trends of hepatitis viruses in Hajjah

Discussion

The present results revealed that the prevalence of HAV and HEV was 761 (1.85%). The seroprevalence of both HAV and HEV in patients with acute viral hepatitis is 11.5% [17]. The prevalence of HAV and HEV was 15.4% and 29.7%, respectively [18]. The prevalence of HAV and HEV in India is 6.7% and 8.5%, respectively [19]. In Sana'a city, the seroprevalence of HAV was recorded at 2.7% among schoolchildren [20] and 1% among orphanage children [21]. In Aden, Yemen, HAV and HEV were recorded at 86.6% and 10.7%, respectively, among participants [22].

The prevalence of both HBV and HCV was reported in this study to be 2.36% among the Hajjah governorate between 2020 and 2023. This finding is similar with previous report [16] showed that the prevalence HBV and HCV in Hajja was recorded among blood donors. The endemicity of infection is considered high in Yemen, where prevalence of positive HBsAg ranges from 8 % to 20 %, and up to 50 % of the populations generally have serological evidence of previous HBV infection [23].

In Sana'a city, it was observed that 10.8%; and 8.5%, respectively, of pregnant women showed positive for HBsAg and anti-HCV [24]. Similarly, the prevalence rate of was recorded at 0.20% of university students were seropositivity for HBsAg [25], while 9.17% and 5.0% of medical waste handlers were positive for the HBV and HCV, respectively [26]. A report revealed that the prevalence rates of HBsAg and HCV antibodies are 10.5 % and 2.3 % in Sana'a, 4.75 % and 0.6 % in Aden, 5.6 % and 0.8 % in Hajjah, 26.3 % and 5.1 % in Soqatra, respectively, [27].

In Ibb governorate, the prevalence of HBV and HCV were 1.81 % and 1.99%, respectively [28]. In addition, it was documented that the overall prevalence of HBV, HCV, and co-infection was 3%, 21%, and 2%, respectively, recorded among hemodialysis patients [29]. In Amran governorate, it was found that about of 2.4% of blood donors and 3.3% of clinical visitors had HCV infection [30]. In 2022, it was found that HBsAg (5.98%) and anti-HCV (0.42%) were reported in blood donors [9].

The global pooled prevalence was 5.8% for HBsAg and 10.3% for HCV. The pooled prevalence was highest in the WHO African Region for HBV (7.8 %) and in the WHO European Region (17.5 %) [31]. Egypt also has a high prevalence of 20% owing to iatrogenic contamination [32]. The overall prevalence of HBsAg and HCV were 2.5% and 4.8%, respectively, in Pakistan [33].

According to the OCHA, 71% of households in Hajjah did not have access to potable water in 2016/2017. Water and sanitation services are still functioning in the city of Hajjah, but at a bare minimum, largely thanks to external support [34].

This finding showed that a higher rate of hepatitis A and E was detected among individuals who came from the Al Miftah district (7.5%). In addition, a higher rate of hepatitis B and C was observed in Hajjah City at 22.9%. Open ponds and basins used for swimming are widespread in the Al Miftah District, which may have contributed significantly to the spread of these two types of liver viruses.

Regarding the month of the incident, the highest rates of HAV and HEV were recorded in September at 2.6%, whereas the lowest was recorded in April (1.3%). A similar study noticed that the infection was more

prevalent from June to October, that is, during the monsoon and post-monsoon seasons [19]. In addition, both HAV and HEV cases were observed throughout the study period, with peaks in June, July, and August, that is, during monsoons [18]. The number of confirmed HAV patients peaked between May and July 2016 [35].

During the first half of the study period (2011–2014), the number of cases peaked during the monsoon season (June–October) and persisted until early winters/December [36].

Similarly, Kumar *et al.* [2] in viral hepatitis Surveillance-India (2011–2013) observed 17% increase in the total number of reported hepatitis cases during June–September. Joon *et al.*, [17] reported that HAV and HEV both were seen to be prevalent all around the year with predominance seen towards the end of monsoons and beginning of winters. Seasonal variation in the transmission of acute viral hepatitis is possibly related to the mixing of contaminated soil into wells and rivers during periods of heavy rain or floods [18].

In the current study, a high rate of hepatitis A and B, and hepatitis B and C viruses was observed in autumn at 2.2% and 2.6%, respectively. HAV and HEV infections are transmitted via the feco-oral route, shortage of drinking water supply in summer, and cross-contamination of drinking water with sewage during monsoons. This leads to an increased chance of acquiring these infections [19].

Limitations of this study

The limitations of this study are that variables for age, sex, and risk factors were not available. In addition, data in the database were classified based on the requirements of the Early Warning, Alert and Response System (EWARS), which led to the merging of results of hepatitis A and E viruses together as well as results of hepatitis B and C viruses. Furthermore, this study is limited by a lack of data documentation and recording practices in health services.

Conclusion

The study concluded that the prevalence of HAV, HEV, HBV, and HCV in the study area was within the global range. Despite the low rate of hepatitis viruses observed in this study, it remains a life-threatening health condition in the community. Based on this study, it is crucial for authorities to actively enhance public awareness to promptly develop and organize effective measures to address outbreaks or epidemics. This will help decrease illness, death, and economic impacts. Further investigation is required to screen for hepatitis genotypes in the study area.

Conflict of Interest

The authors declare that they have no competing interests.

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References

- [1] World Health Organization (WHO). "Hepatitis B". Retrieved 5 October 2021.
- [2] M. Kumar, R. Kumar, A. K. Sharma, S. Kumari, "Prevalence of hepatitis A virus (HAV) and hepatitis E virus (HEV) in the patients presenting with acute viral hepatitis (AVH) in a Tertiary Care Hospital," *Int J Med Res Prof*, no. 3, vol. 1: 297-301, 2017.
- [3] N. Gotlieb, D. Moradpour, and D. Shouval, "Hepatitis A and E – Differences and commonalities," *Journal of Hepatology*, vol. 72, no. 3, pp. 578–580, Mar. 2020, <https://doi.org/10.1016/j.jhep.2019.05.011>
- [4] World Health Organization (WHO). Hepatitis A. 20 July 2023. Available at: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-a>
- [5] World Health Organization (WHO). Hepatitis E. 20 July 2023. Available at: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-e>
- [6] World Health Organization (WHO). Hepatitis B. 9 April, 2024. Available at: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-b#:~:text=Overview,from%20cirrhosis%20and%20liver%20cancer>.
- [7] World Health Organization (WHO). Hepatitis C. 9 April, 2024. Available at: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-c#:~:text=Overview,through%20contact%20with%20infected%20blood>.
- [8] A. A. Almahbashi, "Hepatitis C virus epidemiology in Yemen: Systematic review," *The Turkish Journal of Academic Gastroenterology*, 20:49-58; 2021.
- [9] A. A. Al-Hadheq et al., "The Incidence of Viral Hepatitis B and Hepatitis C Infections and Associated Risk Factors among Blood Donors in Amran Governorate, Yemen," *Al-Razi Univ J Med Sci*, no. 6, vol. 2, 22-28. Dec, 2022.
- [10] M. Al-Munkari, et al., "Hepatitis B, hepatitis C, and HIV infection: Prevalence, knowledge, practice, and attitude among medical waste handlers working in some hospitals at Sana'a City-Yemen," Bachelor Thesis, Medical Laboratory Dep. Queen Arwa University, Pp; 25-67, 2022.
- [11] M. Banafa, W. H. Edrees, G. H. Al-Falahi, and W. A. Al-Shehari, "Prevalence of Hepatitis B Surface Antigen among Orphans Children Living in Orphanage in Sana'a City, Yemen," Mar. 31, 2022.
- [12] W. H. Edrees, "Antibacterial susceptibility and Sider honey activity against isolated bacteria from wound patients attending at Al-Gmohori hospital in Hajja City, Yemen," *Al-Razi Univ J Med Sci*, 5, 2:1–8, Juan, 30, 2021.
- [13] N. M. Mogalli, et al., "Prevalence of intestinal parasitic infections among primary schoolchildren in Kohlan district at Hajjah governorate, Yemen," *Al-Razi Univ J Med Sci*, 4, 2: 34-39; Juan, 30,
- [14] W. H. Edrees, N. M. Mogalli, and K. W. Alabdaly, "Assessment of some clinical and laboratory profiles among dengue fever patients in Hajjah Government, Yemen," *Universal Journal of Pharmaceutical Research*, no. 6, vo;2. pp; 38-41, May 2021, <https://doi.org/10.22270/ujpr.v6i2.571>
- [15] W. H. Edrees, et al., "Prevalence and antifungal susceptibility of Candida species causing vaginitis among pregnant women in Hajjah Governorate, Yemen," *Al-Razi Univ J Med Sci*, 5, 2:1–8, Dec, 30, 2021.
- [16] N. A. Haidar, "Prevalence of hepatitis B and hepatitis C in blood donors and high risk groups in Hajjah, Yemen Republic.," *PubMed*, vol. 23, no. 9, pp. 1090–4, Sep. 2002, [Online]. Available: <https://pubmed.ncbi.nlm.nih.gov/12370719>
- [17] A. Joon, P. Rao, S. Shenoy, and S. Baliga, "Prevalence of Hepatitis A virus (HAV) and Hepatitis E virus (HEV) in the patients presenting with acute viral hepatitis," *Indian Journal of Medical Microbiology*, vol. 33, pp. S102–S105, Feb. 2015, <https://doi.org/10.4103/0255-0857.150908>
- [18] D. Chandni, et al., "Prevalence of hepatitis A and E in the patients presenting with acute viral hepatitis in a tertiary care Hospital. *International Journal of Science and Research (IJSR)* ," no. 9, vol. 2, 1494-1497, 2020.

- [19] M. S. Palewar, S. Joshi, G. Choudhary, R. Das, A. Sadafale, and R. Karyakarte, "Prevalence of Hepatitis A virus (HAV) and Hepatitis E virus (HEV) in patients presenting with acute viral hepatitis: A 3-year retrospective study at a tertiary care Hospital in Western India," *Journal of Family Medicine and Primary Care*, vol. 11, no. 6, p. 2437, Jan. 2022.
- [20] W. H. Edrees et al., "Hepatitis A Virus and Helicobacter pylori among schoolchildren at Sana'a-Yemen: Seroprevalence and risk factors," *Al-Razi Univ J Med Sci*, no. 7, vol. 1, pp:34-45, Juan 2023. <https://doi.org/10.51610/rujms6.2.2022.135>
- [21] W. H. Edrees et al., "Seroprevalence of Helicobacter pylori and hepatitis A virus among orphanage children in Sana'a, Yemen," *Universal Journal of Pharmaceutical Research*, no. 8, vol. 2, pp; 53-60, May 2023, <https://doi.org/10.22270/ujpr.v8i2.927>
- [22] A. A. Bawazir, C. A. Hart, T. A. Sallam, C. M. Parry, N. J. Beeching, and L. E. Cuevas, "Seroepidemiology of hepatitis A and hepatitis E viruses in Aden, Yemen," *Transactions of the Royal Society of Tropical Medicine and Hygiene*, vol. 104, no. 12, pp. 801–805, Dec. 2010, <https://doi.org/10.1016/j.trstmh.2010.08.007>
- [23] H. A. Al-Shamahy, I. A. Rabbad, and A. Al-Hababy, "Hepatitis B Virus Serum Markers among Pregnant Women in Sana'a, Yemen," *Annals of Saudi Medicine/Annals of Saudi Medicine*, vol. 23, no. 1–2, pp. 87–89, Jan. 2003, DOI: [10.5144/0256-4947.2003.87](https://doi.org/10.5144/0256-4947.2003.87).
- [24] E. A. Murad, S. M. Babiker, G. I. Gasim, D. A. Rayis, and I. Adam, "Epidemiology of hepatitis B and hepatitis C virus infections in pregnant women in Sana'a, Yemen," *BMC Pregnancy and Childbirth*, vol. 13, no. 1, Jun. 2013, <https://doi.org/10.1186/1471-2393-13-127>
- [25] W. H. Edrees et al., "Risk factors and seroprevalence of hepatitis B virus antigen among university students in the Sana'a City, Yemen," *Al-Razi Univ J Med Sci*, no. 6, vol. 1, pp:8-16, Juan 2022.
- [26] W. H. Edrees et al., "Seroprevalence of the viral markers of hepatitis B, hepatitis C, and HIV among medical waste handlers in some hospitals in Sana'a city- Yemen," *Universal Journal of Pharmaceutical Research*, no. 7, vol. 3, pp; 12-19, Jul. 2022, <https://doi.org/10.22270/ujpr.v7i3.774>
- [27] M. A. Bajubair, A. A. Elrub, and G. Bather, "Hepatic viral infections in Yemen between 2000--2005.," *PubMed*, vol. 29, no. 6, pp. 871–4, Jun. 2008, [Online]. Available: <https://pubmed.ncbi.nlm.nih.gov/18521468>
- [28] R. N. Gacche and A. M. S. Kaid, "Epidemiology of viral hepatitis B and C infections in Ibb city, Yemen," *Hepatitis Monthly*, vol. 12, no. 7, pp. 460–462, Jul. 2012. <https://doi.org/10.5812/hepatmon.6140>
- [29] M. M. Almezgagi, et al, "Prevalence of hepatitis B virus and hepatitis C virus and associated risk factors among hemodialysis patients in Ibb City-Yemen," vol. 5, no. 2, pp. 32–40, Jun. 30, 2020. <https://psmjournals.org/index.php/microbiol/article/view/474>
- [30] A. Al-Hatheq, A. D. Abakar, B. Al-Ofairi, "Seroprevalence of hepatitis C virus infection among blood donors and clinical visitors in Amran Governorate, Yemen," *Int J Mol Microbiol*, no. 2, 25–33, 2019.
- [31] D. Oлару et al., "Global prevalence of hepatitis B or hepatitis C infection among patients with tuberculosis disease: systematic review and meta-analysis," *EClinicalMedicine*, vol. 58, p. 101938, Apr. 2023, <https://doi.org/10.1016/j.eclinm.2023.101938>
- [32] A. Rutherford, et al., "Viral hepatitis. Current diagnosis and treatment: gastroenterology, hepatology, and endoscopy," 3rd ed. New York, NY: McGraw-Hill; 2016.
- [33] H. Qureshi, K. M. Bile, R. Jooma, S. E. Alam, and H. U. R. Afrid, "Prevalence of hepatitis B and C viral infections in Pakistan: findings of a national survey appealing for effective prevention and control measures," *Eastern Mediterranean Health Journal/Eastern Mediterranean Health Journal*, vol. 16, no. Supp., pp. 15–23, Dec. 2010,
- [34] "Local Governance in Yemen: Resource Hub," *Local Governance in Yemen: Resource Hub*, Dec. 21, 2021. <https://yemenlg.org/>
- [35] W.-C. Chen et al., "Outbreak of hepatitis A virus infection in Taiwan, June 2015 to September 2017," *Euro Surveillance/Eurosurveillance*, vol. 24, no. 14, Apr. 2019,
- [36] N. Singla, Y. Bansal, K. Garg, G. Sharma, M. Gill, and J. Chander, "Seroprevalence of hepatitis A and hepatitis E in patients at a teaching hospital of northern India over a period of 8 years," *Journal of Family Medicine and Primary Care*, vol. 11, no. 2, p. 567, Jan. 2022

وبائيات فيروسات التهاب الكبد في محافظة حجة، اليمن، بين 2020-2023م

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المُلخَص

أصبح من المسلم به حالياً أن التهاب الكبد الفيروسي يمثل تحديًا كبيرًا للصحة العامة ويتطلب استجابة عاجلة. كما أنهم مسؤولون عن قتل ما يقرب من 1.5 مليون شخص كل عام. نظام الرعاية الصحية في اليمن هش ولا يمكنه التعامل مع حالات الطوارئ المتعلقة بالصحة العامة. لذلك هدفت هذه الدراسة إلى تحديد انتشار فيروسات الكبد الفيروسي (أ) HAV، التهاب الكبد الفيروسي (ب) HBV، التهاب الكبد الفيروسي (سي) HCV، و التهاب الكبد الفيروسي (ي) HEV في محافظة حجة، اليمن، خلال الفترة 2020-2023. أجريت هذه الدراسة بأثر رجعي في محافظة حجة اليمنية لمدة أربع سنوات من عام 2020-2023م. وتم جمع حوالي 41162 حالة من السجلات السريرية للترصد الوبائي في مكتب الصحة العامة بمحافظة حجة والتي وثقت في الفترة ما بين 2020-2023. وتم جمع البيانات المطلوبة باستخدام وتحليلها باستخدام برنامج SPSS. من بين 41162 حالة، وجد بأن انتشار فيروس الكبد (أ) HAV و HEV في عدد 761 (1.85%)، بينما وجد انتشار فيروس (ب) HBV و HCV في 971 (2.36%). لوحظ بأن أعلى معدل الإصابة بفيروس (أ) HAV و HEV في عام 2022 بنسبة 2.3%، بينما أعلى نسبة انتشار لفيروس (ب) HBV و HCV كانت في عام 2020 بنسبة 2.9%. أظهرت النتائج بأن معدل الإصابة بفيروس التهاب الكبد (أ) HAV و HEV كان مرتفع بين الأفراد من مديرية المفتاح 116 (7.5%)، في شهر سبتمبر 85 (2.6%)، في حين كان فيروس التهاب الكبد (ب) HBV و HCV أعلى في مدينة حجة 579 (22.9%) وفي شهر أكتوبر ونوفمبر (2.8%). بالإضافة إلى ذلك، كانت جميع حالات التهاب الكبد الفيروسي أعلى في فصل الخريف. وخلصت الدراسة إلى أنه بالرغم من انخفاض معدل الإصابة بفيروسات التهاب الكبد التي لوحظت في هذه الدراسة، إلا أن هذه الأنواع من الفيروسات ستظل تمثل مشكلة صحية تهدد حياة المجتمع. ولذلك، فإن تعزيز ممارسات الصحة، وضمان سلامة الأغذية، وتعزيز التحصين هي الاستراتيجيات الأكثر فعالية للوقاية من فيروسات التهاب الكبد.

الكلمات المفتاحية: فيروس التهاب الكبد (أ)، فيروس الكبد (ب)، فيروس الكبد (سي)، فيروس الكبد (ي)، وبائيات، حجة، اليمن

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