

Investigation of Hepatitis A virus outbreak in Aligarh and its peripheral areas, Uttar Pradesh, India

Abstract

Background: Hepatitis A is an enterically transmitted viral disease that can lead to serious morbidity and occasional mortality. This study investigated an outbreak of viral hepatitis and its epidemiological features in Aligarh region of Uttar Pradesh, India, during June-Aug 2019.

Materials and methods: One hundred and eighty three (Male: Female-110:73) blood samples were collected from the various OPDs and Wards like Pediatrics, Medicine, PICU, etc. from patients from Aligarh and adjoining areas presenting with signs and symptoms of hepatitis in JNMCH, AMU, Aligarh. The cases included covered area of about 30 km including city and villages that have deranged LFT reports and jaundice with some cases of raised PT-INR. Serum samples were tested for IgM anti HAV, HBsAg, IgM anti HCV and IgM anti HEV antibodies by ELISA test.

Results: A total of 183 cases of suspected hepatitis were observed during the outbreak. Anti HAV IgM positivity was 56.8% (104/183) in tested samples. The hepatitis cases were mainly seen among children and young adolescent. Apart from HAV, 8.2% (15/183) were positive for HBsAg, 2.2 % (04/183) were positive for anti-HCV, 8.7% (16/183) were positive for anti-HEV, 1.1% (02/183) were positive for both anti-HAV IgM and anti-HEV IgM and 0.5% (01/183) were positive for both anti-HCV IgM and HBsAg antigen.

Conclusion: The aetiological agent of the present investigation was hepatitis A virus which is emerging in an outbreak form in India. The best way to prevent hepatitis A is through vaccination and washing hands with soaps and sanitizers. Considering increasing HAV naive population in UP, there is a need to introduce HAV vaccination in High risk group.

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Introduction

Hepatitis A is an enterically transmitted, widespread viral disease caused by the hepatitis A virus (HAV) and is only member of the family Picornaviridae in genus Hepatovirus.^{1,2} Disease transmission occurs primarily via the faeco-oral route, either through ingestion of contaminated food and water or through direct contact with the infectious person.^{1,3}

The onset of hepatitis A is often sudden and characteristic symptoms are followed, within a few days to a week, by yellowish discoloration of eyes, fever, nausea, vomiting dark urine and jaundice. Serum alanine and aspartate levels of aminotransferase normally all rise rapidly during the prodromal cycle, reach peak rates and then decrease by 75 per cent per week. Serum total bilirubin concentrations reach peak levels later and decline slowly than serum aminotransferases. The period of jaundice persists for <3 weeks in 80% of cases. Nearly all adult patients with clinically evident disease undergo complete clinical restoration with a 5-month.⁴

Hepatitis A virus (HAV) infection occurs sporadically and epidemically and every year there are about 1.4 million cases of hepatitis A occurring worldwide.⁵ In developing countries, a majority of children (>90%) are exposed to HAV during early childhood and develop lifelong immunity.⁶ India is endemic for the hepatitis A virus, with improvement in economic and living conditions, HAV exposure of children is decreasing.⁷ India has seen increase in both sporadic cases as well as outbreaks of hepatitis A among young adults in the recent past.^{8,9} This virus can be deactivated in one minute by heating at 85°C. Proper and effective water chlorination can kill hepatitis A

virus. If people are going to travel to an endemic area, they should peel and wash all fresh fruits, wash and disinfect vegetables, avoid raw, under cooked meat and even fish and drink bottled or boiled water.^{10,11}

Effective vaccines to prevent HAV infection have been available in the United States, increasing the chances of eliminating transmission.¹¹ In 1996, the Advisory Committee on Immunization Practices (ACIP) of the CDC proposed the delivery of hepatitis A vaccine to individuals at increased risk for the disease, such as international travelers, adolescents living in high disease incidence populations, etc.¹² This study investigated an outbreak of viral hepatitis and its epidemiological features in Aligarh region of Uttar Pradesh, India, during June-Aug 2019.

Materials and methods

Study design

One hundred and eighty three (Male: Female-110:73) blood samples were collected from the various OPDs and Wards like Pediatrics, Medicine, PICU, etc. from patients from Aligarh and adjoining areas presenting with signs and symptoms of hepatitis in JNMCH, AMU, Aligarh. The cases included covered area of about 30 km including city and villages that have deranged LFT reports and jaundice with some cases of raised PT-INR.

Study area

Aligarh is a district in the state of Uttar Pradesh, India with a population of 36,73,889 of which male and female were 19,51,996

and 17,21,893 respectively. That gives it a 76th ranking in India (out of 640 in total). The district has a population density of 1,007 per square kilometre.¹³ The Aligarh is divided into 70 wards. For the outbreak investigation, the study population included persons living in the Aligarh city and adjoining areas (Khair, Atrauli, Iglas, Gabhana, Hathras, Khurja).¹³

Clinical investigations

A suspected case of viral hepatitis was defined as the person presenting with fever, icterus, darkcolored urine along with one or more symptoms such as vomiting, abdomen pain, and loss of appetite, fatigue and right upper quadrant tenderness. Clinical and epidemiological details of each suspected case were collected in the predesigned Performa. History of travel and consumption of food and water from outside sources were noted. A line list of suspected hepatitis cases was prepared. Patients from pediatric and Medicine OPDs and Wards, Cases registered with the primary health centre (PHC), private practitioners and traditional healers practicing in the affected area during the investigation period (Jun- Aug-2019) were also considered for inclusion in the line list. Examination and interviews of representative suspected cases were carried out in the VRDL collection center of department of Microbiology, JNMCH, AMU, Aligarh.

Specimen collection and serological tests

Blood samples (2–5 ml) were collected in a plane vial from suspected hepatitis cases from the pediatric OPD, Wards and central laboratory, JNMCH,AMU, Aligarh and adjoining areas by the health centre and sent to the our VRDL laboratory, Department of Microbiology. We tested, samples collected by us and samples stored

in the public health laboratory, Aligarh for anti-HAV immunoglobulin (IgM) (anti-HAV IgM ELISA kit, Dia Pro Diagnostic Bioprobes, Italy) and anti-hepatitis E virus (HEV) IgM antibodies ((anti-HEV IgM ELISA kit, Dia Pro Diagnostic Bioprobes, Italy), anti-hepatitis C virus (HCV) IgM antibodies (anti-HCV IgM ELISA kit, Qualpro Diagnostic, Goa, India) and antigen HBsAg (HBsAg antigen, ELISA kit, Qualpro Diagnostic, Goa, India). Some of the representative samples were sent to KGMU for confirmation and they were in 100% concordance with our results.

Water samples

Drinking water samples were collected from the affected area and were assessed for coliform count to assess for any faecal contamination and assessed according to MacCready's table.¹⁴

Results

Among 183 suspected samples of hepatitis with deranged LFTs, 56.83 % (104/183) were found positive for anti-HAV IgM antibody, 8.19 % (15/183) were positive for HBsAg, 2.18 % (04/183) were positive for anti-HCV, 8.74 % (16/183) were positive for anti-HEV, 1.09 % (02/183) were positive for both anti-HAV IgM and anti-HEV IgM and 0.54 % (01/183) were positive for both anti-HCV IgM and HBsAg antigen by ELISA (Figure 1, Table 1). HAV positive cases had a male to female ratio of 1.6:1 (64/40) (Figure 3) and the age varied from 18month -32 years.

Most of the HAV cases were children and young adults. Majority 74.04%, (77/104) of these was children of 0 to 9 years group; 15.38% (16/104) were adolescents (10–19 years) and 07.69% (8/ 104) were young adult (20-29 years) (Figure 2, Table 2).

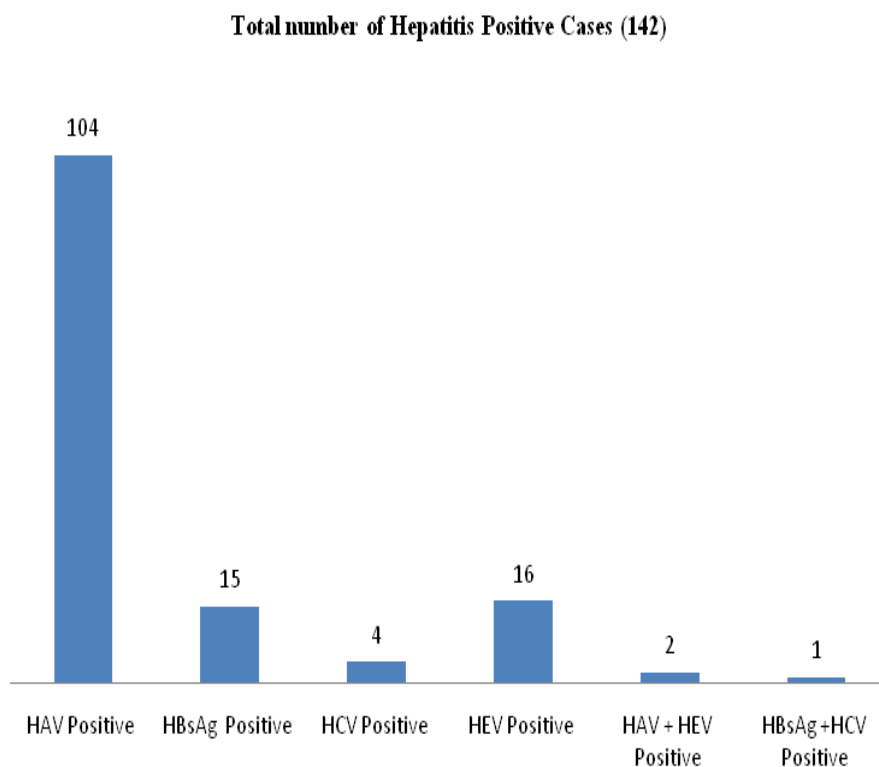


Figure 1 Etiology of various hepatitis cases (142/183).

Male to female ratio of HAV positive Patients

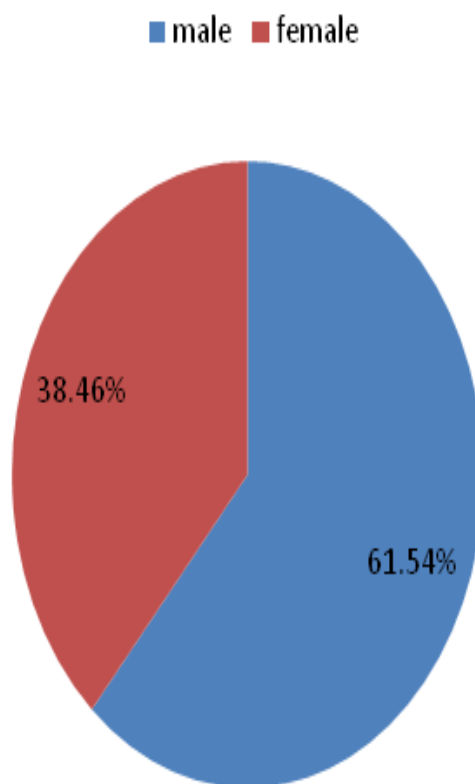


Figure 2 Male to female ratio of HAV positive cases (64/40).



Figure 3 Geographically Located areas of HAV positive cases at Aligarh and its associated areas.

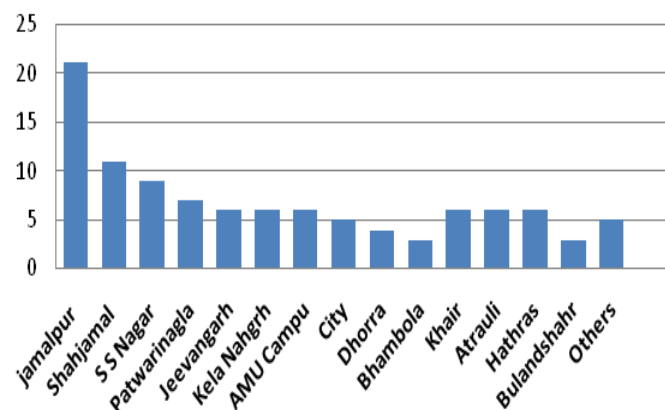
Table 1 Total number of Hepatitis suspected cases were 183 in which 142 were Positive by ELISA

S. no	Type of Hepatitis	No. of cases	%age (=183)
1	HAV	104	56.83
2	HBsAg	15	8.19
3	HCV	4	2.18
4	HEV	16	8.74
5	HAV+HEV	2	1.09
6	HBsAg + HCV	1	0.54

Table 2 Age (Group) wise distribution of HAV patients (=104)

S. No	Ages (Year)	No of patients (=104)	%age	Male	Female
1	0-09	77	74.04	49	28
2	19-Oct	16	15.38	11	5
3	20-29	8	7.69	5	3
4	30-39	2	1.92	2	0
5	>40	1	0.96	1	0

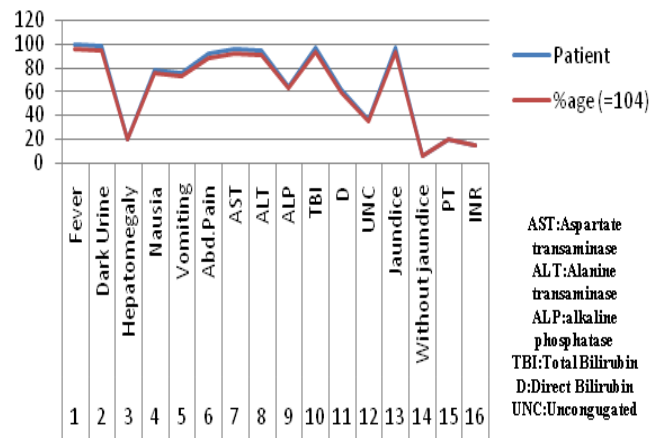
There was a wide geographic variability in rates of HAV cases at Aligarh (Jamalpur, Shahjamaal, S Snagar, Patwarikanagla, Jeevangarh, Kelanagar, AMU Campus, city, Dhorra, Bhambola) and its peripheral areas (Khair, Atrauli, Hathras, Bulandshahr and Other areas) (Figure 3,4).

HAV Positive Cases - Area Wise**Figure 4** Total number of HAV positive cases (104/183) at Aligarh and its associated areas.

Coliform Count in the drinking water samples collected from the houses of these HAV positive individuals were significant in majority (41.2%) of the cases.

Clinical features of HAV positive cases included fever in 100 (96.15%), jaundice 98 (94.23%) dark urine in 99 (95.19%), nausea in 79 (75.96%), Vomiting in 76 (73.07%), abdominal pain in 92 (88.46%), Hepatomegaly in 20 (19.23%). All the Patients have deranged liver function tests and majority of the patients had raised

AST 95 (91.34%), ALT 95 (91.34%) and alkaline phosphatase 65 (62.50%) (Figure 5).

**Figure 5** Clinical features of hepatitis A virus positive patients (104).

Discussion

In the present study, among 183 cases of suspected hepatitis, 56.8% were positive for HAV IgM. Apart from HAV HBsAg was positive in 8%, HCV in 2%, HEV in 8.7% respectively. Co-infection of HAV and HEV was observed in 1% cases and co-infection of HBV and HCV was observed in 0.54%. In a study from North India,¹⁵ the seroprevalence of various hepatitis in were HAV (12.3%), followed by HEV (4.97%), HBV (3.54%) and HCV (2.08%). Various other studies from North India have reported the prevalence of different hepatitis as HAV (1.7-67%), HBV (7.3-42%), HCV (1.16-10.6%) and HEV (16.3-66.3%).¹⁶⁻¹⁸ Our results are in concordance with them except the fact that HAV was in higher occurrence than what is normally expected. Co-infection of HAV-HEV and HBV-HCV as found in our study are also reported by other studies^{15,16} as both these groups have similar mode of transmission.

In recent past with the changing epidemiology of HAV, outbreaks of Hepatitis A have been reported from various parts of India.¹⁹⁻²¹ Some studies from North India also emphasise on HAV becoming a major cause of sporadic hepatitis in children.²² In our study, most of the HAV cases were children and young adults, age ranging from 18 months to 32 years. The age distribution signifies the spread of HAV in young adults and children as older persons are spared as they have protective antibodies. Nausea, vomiting, anorexia, fever, malaise, and abdominal pain are the common clinical presentations of HAV.²³ In our study the main presenting symptoms of the cases were fever, Nausea dark urine, pain abdomen, hepatomegaly, raised liver enzymes and jaundice.

The clustering of HAV in present study occurred in June to October which is a rainy season in this part of India. In earlier studies also HAV outbreaks are linked to rainy season as the virus persists for longer period in soil during this season and water logging during rainy season helps the virus to percolate with water to contaminate the underground water which may act as a source to contaminate water as the main source of drinking water in the areas involved is either underground water or hand pumps. We also attempted to detect coliform count in the drinking water samples from the houses of the cases involved and coliform count was positive in 41.2% cases signifying water as a source of infection. Various other studies in India

investigating HAV outbreaks in the past were able to link the outbreak either to a common source^{24,25} but no such common source or a single point source could be found in our study.

In relation to HAV, general hygiene, especially in relation to sanitation, water supply and food preparation reflects socio-economic status and living standards and has major influence on its endemicity.^{26,27} Though no community-based serological data are available, the eruption of an outbreak of hepatitis A in our region was mainly a result of contaminated drinking water as denoted by the coliform count in drinking water samples from our area. Although hepatitis A is a self-limiting disease but it can cause significant morbidity. Patients presenting with Hepatitis A feel sick for about 2 months and may need hospital care. People affected with HAV may take a few months to return to work, school, or daily life, and so, HAV infections can lead to economic losses and social consequences in the community.

The high incidence of HAV in children shows that there is a need for proper sanitation and including hygienic food habits. Health education of parents is also necessary to control these infections in children. WHO, CDC and Indian Academy of Paediatrics recommend routine vaccination of all children and vulnerable populations to protect against Hepatitis A.²⁸ Several studies have also demonstrated the immunological efficacy of HAV Vaccine.²⁹ There are also evidences that the vaccine imparts herd immunity.³⁰ Considering increasing HAV naive population in UP, there is a need to introduce HAV vaccination in high risk group.

Conclusion

The aetiological agent of the present investigation was hepatitis A virus which emerged as an outbreak form in our region. The best way to prevent hepatitis A is through safe drinking water, vaccination and washing hands with soaps and sanitizers.

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Conflicts of interest

There are no conflicts of interest.

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