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Research Article

HEPATITIS-E OUTBREAK IN RURAL AREA OF HIMACHAL PRADESH, INDIA

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ABSTRACT

Hepatitis E virus (HEV) infection is an important public health problem, causing outbreaks in India and many other developing countries. In May, 2012, there was a sudden rise in the number of jaundice cases reporting to community health center (CHC) Anni, District Kullu of Himachal Pradesh. We investigated this outbreak to study the epidemiology as well as reasons for this outbreak and then suggest various prevention and control measures to prevent its occurrence in future. **Material and Methods:** Extensive house-to-house search of case defined clinical jaundice cases and serum samples of 131 cases were collected. Out of the confirmed jaundice cases 25 random samples were tested for IgM antibodies against HEV and hepatitis A virus (HAV). Bacteriological investigation of two water samples, one each from the two nearby streams, whose water was supplied for drinking, was also done. **Results:** A total 81cases of jaundice were confirmed from April to July 2012. 20 serum samples were positive for HEV IgM antibody. One of the water samples contained more than 100 coliforms in 100 ml of water. **Conclusion:** It was a confirmed outbreak of hepatitis E in rural area of Kullu. Fecal contamination of water due to open defecation was the reason for occurrence and spread of this outbreak.

INTRODUCTION

Hepatitis E virus (HEV) infection causes inflammation of liver and is an important public health problem. It causes non-A non-B hepatitis outbreaks in India [1] and many other countries of Asia. Faeco-oral route is its primary mode of transmission [2] and the outbreaks occur mostly in areas with limited access to essential water, sanitation, hygiene and health services. These risk factors allow virus excreted in the faeces of infected people to reach drinking water supplies. The virus causes an estimated 20 million infections annually across the globe, leading to over 3 million symptomatic cases. As per the World Health Organization (WHO) estimates, there were approximately 44,000 hepatitis E related deaths reported in 2015[3].

Hepatitis E has so far been observed almost exclusively in the less developed parts of the world and predominantly in the 15-40-year age group. Subclinical infection may be the rule in children, with icteric infection being mainly confined to young adults. Clinically, the illness closely resembles hepatitis A infection. But, here the bilirubin levels tend to be higher, and jaundice deeper and more prolonged. The case fatality rate is 0.5-3%. However, the most striking feature of hepatitis E is its extraordinarily high case fatality rate of about 10-20% in pregnant women, particularly in 3rd trimester [4]. Secondary attack rates range from 0.7% to 2.2% among susceptible household contacts of the patients[5]. The incubation period of hepatitis E in humans ranges from 2 to 8 weeks, with an average of 5-6 weeks, somewhat longer than hepatitis A[4].

In May, 2012, there was a sudden rise in the number of jaundice cases reporting to community health center (CHC) Anni, district Kullu of Himachal Pradesh. We investigated this outbreak to find out the factors as well as the causative agent that led to increased number of jaundice cases in this rural area. Further, we had to suggest various prevention and control measures to prevent its occurrence in future.

MATERIAL AND METHODS

Strategy: Kungash Panchyat, in Block Anni of District Kullu, Himachal Pradesh, having a population of 2743(Census 2011) is situated about 110 Km from the State headquarters at Shimla. In May 2012, there was a sudden increase in jaundice cases from the said panchayat which were being reported to CHC Anni. Under the directions of the state health authorities, the Chief Medical Officer, District Kullu, constituted a team for investigating the outbreak. The team was led by the District Program Officer Kullu and consisted of the Block Medical

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Officer Anni, a local medical officer, health worker and two paramedical staff. The team visited the Panchayat in second and third week of May 2012 to investigate the outbreak.

Case Definition: A jaundice case patient was defined as "any case with acute onset of any of the following clinical features: high coloured urine, anorexia, vomiting, malaise, yellowish discoloration of the sclera, right upper quadrant pain or fever after 1st April 2012 residing in any of the households of Panchayat Kungash".

Data Collection: During the second and third week of May 2012, an exhaustive house-to-house search of cases was undertaken to prepare the line listing of cases according to age, sex, onset of symptoms, village, lab investigations etc. done (including the convalescent/recovered cases from 1st April 2012 onwards). Even after the return of the team from the Panchayat, the local health worker of the nearby health sub centre was instructed to continue the investigation and line listing of cases till the frequency of cases came down to nil for two continuous weeks. All these cases were also included in the final line listing and analysis.

Environmental Investigation: The drinking water sources from where the water supply was being supplied to the Panchayat as well as their catchment areas were also inspected by the team. Two water samples (one each from the natural springs named *Thatoo* and *Paloti*) were also collected and sent to IGMC Shimla in cold chain under all aseptic condition for further analysis. We also enquired upon any mass social gatherings like local mela, feast, party or weddings in the community during this survey period. We also made a point to note about the sanitary practices of the local villagers.

Laboratory Investigation: Serum samples of 131 suspect cases were collected and sent to Community Health Centre Anni, for doing the serum bilirubin assays. Also 25 random serum samples (from the confirmed jaundice cases i.e. serum bilirubin >2.5gm/dl) were sent to the department of Microbiology IGMC Shimla for immunoglobulin essays for confirmation of hepatitis A & E. All the 25 serum samples were tested by rapid immune chromatic assay (Tulip Diagnostics (P) LTD) for detection of IgM antibodies to HAV and HEV. Water samples were tested by multiple tube tests (presumptive coliform count) in double strength and single strength Mac Conkey broth (Hi-Media Laboratories Pvt. Ltd:) for 48 hrs at 37^0C temperature [6,7].

Data analysis

The data was entered and analyzed in Microsoft Excel 2010. Time, place, and person analysis were performed for all the case patients. Continuous variables and categorical data were summarized as mean and standard deviation, and using proportions, respectively. Attack rates were calculated using the standard definitions using the 2011 census population of Panchayat Kungash as the denominator. Epidemic curve was drawn to find out the time distribution of cases.

Ethical issues: We carried out this investigation as a public health containment measure on the direction of the state health authorities. Hence it was deemed as a non-research and no ethical permission was obtained, but we conformed to all the other guidelines mentioned in the Declaration of Helsinki. Informed consent was obtained from all the subjects before the interview and examination and confidentiality of the data of all the cases was maintained.

Observations

No case of Hepatitis was reported in the panchayat as per the previous year (2011) data of Integrated Diseases Surveillance Project (IDSP). A line listing of 131 clinically suspect cases of jaundice was obtained from 1st April 2012 through July 2012. Most common symptoms were Jaundice (100%), High coloured urine (94%), loss of appetite (71%), fever (58%), nausea/vomiting (48%) and pain abdomen (43%) (Figure 1).

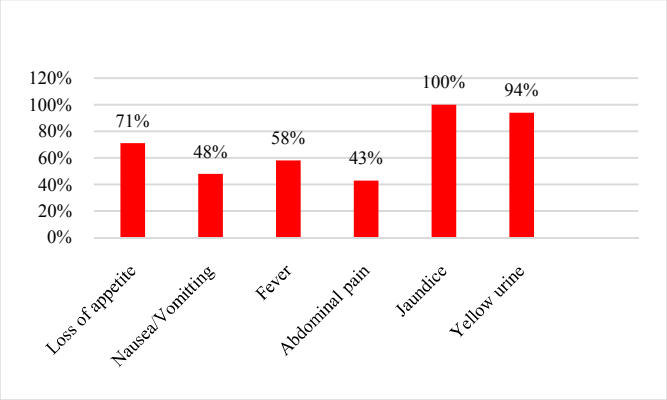

Figure 1 Clinical Profile of confirmed Jaundice cases (n=81)

Out of these clinical suspects, 81 cases of jaundice were confirmed (Serum biliruin level of >2.5gm/dl).These cases ranged from 1 year to 40 years with a mean age of 25 years. A majority of these cases were males i.e. 54(66%). The mean incubation period was 38±17 days.

Twenty (80%) of the 25 random samples (from the 81 confirmed jaundice cases), tested positive for Immunoglobulin M (IgM) HEV antibodies while all the serum samples were negative for IgM antibodies to Hepatitis A virus (Table 1).

Table 1 Age distribution of cases with acute hepatitis (n=81)

S.No.	Age group	No. of cases	Population	Attack rate per 1000	No of random samples for IgM Hepatitis A & E	No. of samples positive for IgM Hepatitis E
1.	0 to 10 years	5	576	8.7	1	1
2.	11 to 20 years	17	548	31.0	5	4
3.	21 to 30 years	37	438	84.5	13	10
4.	31 to 40 years	22	384	57.2	6	5
	Total	81	2743	29.5	25	20

There was no death from the disease. After 48 hours of incubation of the two water samples, the one from "*Thatoo spring*" showed growth with the production of acid as well as gas in the multiple tube tests. The growth was compared with McCardy table and presumptive coliform counts were calculated and probable coliform count was more than 100 coliform/100 ml of water[7]. Hence, water sample was highly contaminated. Result of these tests were immediately conveyed to the Block Medical Officer and Health Officer of Kullu District.

The overall attack rate was 29.5 per thousand population. There was also a statistically significant (z=2.8, p=0.005) difference

between the attack rates of males (38.5 per 1000) and females (20.2 per 1000).

The epidemic curve had a single peak in the third week of May and then there was a gradual decline of cases. There were no secondary peaks (Figure 2).

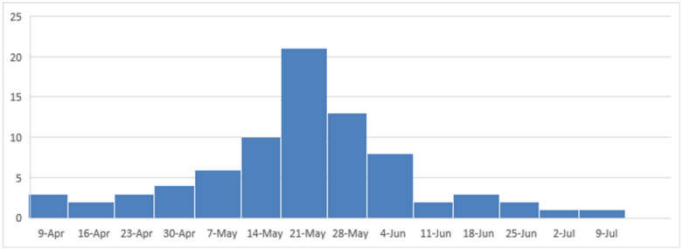

Figure 2 Epidemic curve of confirmed cases of Jaundice (n=81)

DISCUSSION

Hepatitis E is a leading cause of enterically transmitted viral hepatitis in India and affects hundreds of patients. Most Hepatitis E outbreaks in India have been reported in large cities [8,9]. This outbreak occurred in the rural area of the Anni Block, District Kullu, of Himachal Pradesh and no mortality was reported from the village. The attack rate in our investigation was 2.95%, which is similar to the study done by R Aggarwal in India[10]. The attack rate was significantly higher in males than in females, and again it is similar to the outbreak in rural area of Bhavnagar, India [11]. As reported by Sarguna P *et al*,[12]we also found maximum number of cases in the age group of 21-30 years. Probably in this outbreak also, either the children were asymptomatic, or HEV infection doesn't provide lifelong immunity and the anti HEV levels might have diminished[12].

The first major epidemic was reported in New Delhi in the winter of 1995-1996. After the flooding of Yamuna River, 30,000 case of jaundice were described, and retrospectively attributed to Hepatitis E.[13,14] Outbreak of hepatitis E were also reported from Dhola village in Bhavnagar (2010)[11], Maharashtra (2004),[15] and Uttarakhand in 2005 [16]. Outbreaks have been reported from China, Borneo, Indonesia, Nepal and Pakistan. [14] Contrary to our study, the outbreak or sporadic cases of hepatitis E are rarely reported from temperate climates.

Laboratory diagnosis of outbreak of viral hepatitis in the community level is made by detection of anti-HEV antibodies in the serum by enzyme linked immunosorbent assay (ELISA). In our study, we use rapid immunochromatic assay for detection of IgM antibodies against HEV and HAV. Two additional diagnostic tests, namely reverse transcriptase polymerase chain reaction (RT-PCR) and immune electro-microscopy are also available in specialized laboratory facilities, but we did not use these tests. As reported in other Indian studies [9,17], this outbreak was also due to the fecal contamination of water source.

The evidence from this investigation suggests that the source of this outbreak was the contaminated drinking water which was being supplied from the nearby "*Thatoo spring"*. The catchment area of the spring was also not protected. This water from spring was not treated and supplied as such for drinking purpose to the villagers. It is further supported by the fact that, the index case-patientas well as some other cases openly defecated in the catchment area of the spring which in all probabilities had contaminated the water source. Moreover, it is also published in literature, that in summers due to reduction in volume of water in springs and streams, there is consequent increase in the concentration fecal contaminants[18,19]. Moreover, there was no history suggestive of any mass gathering for mela, wedding or some local function. After taking, effective measures, no further case observed. There was no secondary peak of the outbreak. Similar finding was observed in other studies [9,20].

Prevention and control measures

Rapid response team from CHC Anni and District Headquarter, Kullu, visited the village during its peak and effective measures were taken timely. Intensive information, education and communication (IEC) activities were undertaken by the health department in the area. The team advised the villagers to properly roll boil the water (as per standard instructions) "before drinking". The importance of sanitary latrines was explained unequivocally. We told them that this was a water borne disease and they should stop defaecating openly in the catchment area of the spring. Personal hygiene and sanitary practices were also stressed upon. The Irrigation and Public Health (IPH) department, which is responsible to provide clean potable water to the public, was requested to protect the catchment area of the spring, install sand filters and ensure proper chlorination of the water supply. They were also advised to clean the water storage tank every six months and take water samples regularly for analysis. All these measures were successful and cases of hepatitis decreased to zero within eight weeks of the investigation.

CONCLUSION

This outbreak, affecting a rural area of Kullu in Himachal Pradesh, was due to hepatitis E virus spread by fecal contamination of the drinking water supply. The local authorities implemented the control measures suggested by the team, which helped in controlling the outbreak. Good personal hygiene, stopping of open defecation and proper sanitation coupled with supply of potable water will help in preventing of such outbreaks in future.

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