

ORIGINAL ARTICLE

Investigation of an Outbreak of Hepatitis'E' in a Rural Area of Dhule District in Maharashtra

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Abstract:

Background: There were many cases with symptoms, suggestive of hepatitis in Ner village of Dhule district during 2012. **Aims:** To investigate and control the outbreak of hepatitis in a village community. **Material and Methods:** The cases were identified by a survey in the community. The suspected cases were interviewed by a pre-defined & structured schedule. Those identified cases were clinically examined and confirmed by serological & biochemical laboratory tests. An environmental study of the drinking water supply system including testing of water samples from different points in the distribution system was also conducted in the area. The outbreak control measures such as IEC drive, chlorination of drinking water and repair of the water supply lines were initiated. **Results:** The outbreak gave rise to a total of 180 cases in the community. Predominantly adolescents & young adults were affected with almost equal proportions in males & females. No mortality was observed. The outbreak was due to contamination of drinking water pipeline with faecal matter. **Conclusion:** A large outbreak of Hepatitis E involving 180 cases occurred in a rural community which subsided after initiating the control measures.

Keywords: Hepatitis E, outbreak, attack rate, control measures

Introduction:

Acute Viral Hepatitis is caused by six distinct types of viruses A, B, C, D, E and G. Hepatitis E virus (HEV) infection was recognised in Asia almost three decades back as the main cause of non-A, non-B enterically transmitted hepatitis [1-3].

Hepatitis E virus (HEV) is now acknowledged to have worldwide distribution. In countries with poor sanitation, HEV is endemic and on many occasions given rise to typically explosive outbreaks of acute hepatitis, usually by faecal contamination of the water supply. The disease is generally mild, yet pregnant women suffer significant morbidity and mortality [4-7].

Hepatitis E is widespread in developing countries, accounting for upto 60-70% of all sporadic cases of acute viral hepatitis [8, 9]. Hepatitis E virus (HEV) is the most common cause of acute viral hepatitis in the adult population in India [8]. HEV causes high mortality in pregnant women, 20-30% as compared to 0.2-1% in general population [10, 11]. Hepatitis E is usually a self-limiting infection and resolves within 4-6 weeks.

Ner is a big village situated on the banks of Panjhara River near the district place Dhule in Maharashtra state, India. It is inhabited by 15,724 populations (8200 males and 7524 females) in 3489 households with 40% of its population comprising of Bhil community and other tribes.

Main source of drinking water is from a well which is situated on the banks of the river three kms away from the village. Water from this well is drawn and stored in the two overhead tanks (one is situated at Primary Health Centre and One in 'Raiwat' area) which supply drinking water to households through the distribution pipes. The water distribution pipeline had become old and there were reports of many incidences of frequent leakages in the past.

On 27th August 2012, two cases of confirmed Hepatitis 'E' positive were reported from a private hospital in Dhule city. These patients belonged to Ner village. Since there were many complaints of similar illnesses in the population, the district health authorities approached Shri Bhausahab Hire Government Medical College and Hospital, Dhule for expert opinion and management.

Methodology:

A Rapid Response Team (RRT) was formed comprising of experts from Preventive and Social Medicine, Microbiology, Pathology, General Medicine, Biochemistry, Pediatrics and Obstetrics and Gynecology along with laboratory technicians and social worker. A house to house survey and case interviews were conducted by administering a predefined, pre-structured closed-ended questionnaire after taking informed consent. Regarding the locked houses, the information about the well being of its inhabitants was collected from the neighbours. Only those houses with such suspected ill persons were visited again. An environmental survey of drinking water distribution and drainage system was also taken up.

Eight survey teams were formed for house to house survey, each team having two medical students and one health worker from primary health center. A suspected case HEV was defined as a person of any age ordinarily residing in Ner village with clinical signs and symptoms suggestive of HEV such as fatigue or weakness, loss of appetite, fever, yellow sclera, dark urine, abdominal discomfort, and yellow skin either on the day of survey or in the preceding one month of the survey. A confirmed HEV infection was taken as any suspected case of HEV with a positive ELISA test for HEV antibodies.

Those persons having suggestive symptoms of hepatitis identified during house-to-house survey

were interviewed in detail. They were brought to health center and clinically examined and their blood samples were collected for ELISA testing for confirmation of HEV. The samples were transported by proper cold-chain maintenance to the microbiology laboratory of Shri Bhausahab Hire Government Medical College and Hospital, Dhule.

Laboratory Diagnosis:

Diagnosis of HEV was made by noting the level of anti- HEV antibodies in the serum. These tests are based on synthetic immunodominant antigens derived from conservative regions of the virus. Tests for IgM are used to determine the nature of the infective agent in patients showing symptoms of hepatitis, in order to rule out the possibility of other most severe viral infections (HBV, HDV, and HCV). The assay is based on the principle of "IgM capture" where IgM class antibodies in the sample are first captured by the solid phase coated with anti hIgM antibody. After washing out all the other components of the sample and in particular IgG antibodies the specific IgM captured on the solid phase are detected by the addition of a purified preparation of HEV Ag conjugated with peroxidase (HRP). After incubation, microwells are washed to remove unbound conjugate and then the chromogen /substrate is added. In the presence of peroxidase the colourless substrate is hydrolysed to a coloured end product, whose optical density is detected and is proportional to the amount of IgM antibodies to HEV present in the sample. Serum bilirubin, S.G.O.T., S.G.P.T. and serum alkaline phosphatase were estimated biochemically. Samples of drinking water were collected by Public Health Department for testing of free residual chlorine in water at various points in the distribution system i.e., storage reservoir, supply pipe lines and households.

Data entry was done in MS excel format and analyzed using SPSS Version-16 software.

Results:

Out of the total 3489 households, 2283 households could be surveyed and 180 patients with signs and symptoms suggestive of hepatitis were detected. Out of these 180 patients, 88(48.9%) were females and 92(51.1%) males. Majority of the patients were above 15 years of age (72.2%). The youngest patient in our study was a child of 2 years age and the oldest patient was a 70-year-old male. Out of 88 female patients, 14 were pregnant and out of them two women had complications of pregnancy and were referred to higher centre. They recovered later.

It is observed from (Table 1) that the most common symptoms among the HEV patients was fatigue -150(82.8%) followed by loss of appetite-144(80%), fever-134(74.4%), yellowish discoloration of eye -132(73.3%),dark urine-127(70.6) and abdominal discomfort. Clinically icterus was detectable in 130(72.2%) patients; 53(29.4%) had tenderness over right hypochondriac region & 39(21.7) had hepatomegaly.

Table 1: Distribution of Hepatitis 'E' Patients According to Presence of Clinical Symptoms (N=180)

Symptoms	Frequency	%
Fatigue or weakness	150	82.8
Loss of appetite	144	80
Fever	134	74.4
Yellowish discolouration of eye	132	73.3
Dark urine	127	70.6
Abdominal discomfort	109	60.6
Yellow skin	87	48.3

At the time of house to house survey, 108(60 %) patients were still suffering with hepatitis E infection while 72(40 %) were cured from the disease. Out of 180 patients, majority i.e., 162(90%) received treatment. For those treated patients, primary health centre was the main source of treatment i.e., (51.1%) followed by private doctors i.e., 68(37.8%) and remaining from other sources while 18(10%) patients did not receive any treatment. The epidemic curve of daily incidence of hepatitis cases (Fig.1) showed that the outbreak started on 18th July 2012 and reached its peak during the last week of August 2012 to 3rd September 2012 and gave rise to last case in the first week of October 2012. It may be noted here that the outbreak investigations were initiated during the last week of August 2012.

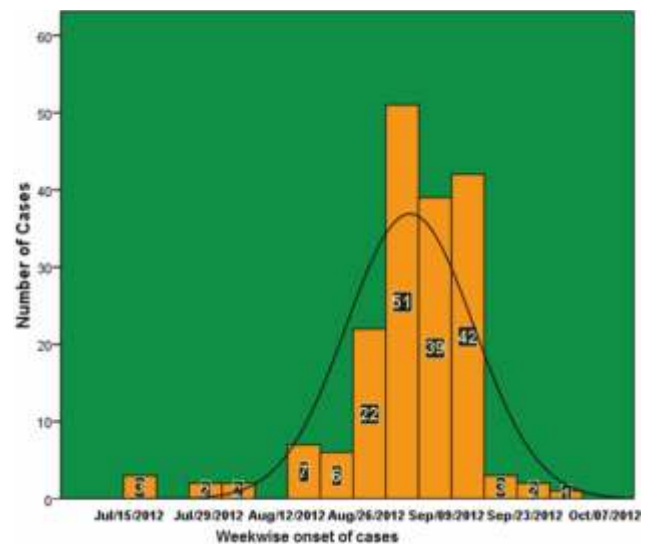


Fig.1: Epidemic Curve of Hepatitis E Outbreak

It was observed in the present outbreak the students were mainly affected i.e. 47(26.1%) followed by housewives 38(21.1%), farmers 23(12.8%), labourers 18(10%), unemployed 7(3.9%) and other occupations 46(25.6%).

Table 2 reveals that home was the main place of contact i.e 40(22.22%) followed by school 20(11.2%), workplace 3(1.7%) while no h/o contact was available in majority of the patients 116(64.4%).

Table 2: Distribution of Hepatitis 'E' Patients According to History of Contact (N=180)

Places of contact with similar patients	Frequency	%
Home	40	22.2
School / College	20	11.2
Work place	3	1.7
Neighbourhood	1	0.6
No h/o contact	116	64.4

From Table 3 it is seen that majority of the patients were using the public piped drinking water supply 159(88.3%) followed by public well 13(7.2%) and other sources. Out of the 159 patients who were using piped water supply, 65% of their households had water supply from Raiwat water tank while the remaining 35% of their households were receiving water supply from 'Primary health centre elevated storage reservoir'(PHC ESR). It may be noted that the Raiwat water tank was drawing its water supply from the well situated on

Table 3: Distribution of Hepatitis 'E' Patients According to Main Source of Drinking Water

Main Source of Water	Frequency	%
Piped	159	88.3
Public well	13	7.2
Bore well	3	1.7
Others	5	2.8
Total	180	100

the banks of the river while the PHC ESR received its water supply from a well situated away from the river. The well supplying water to Raiwat storage tank was subjected to flooding during the rainy season.

Table 4 reveals that out of 6344 population that received drinking water supply from Raiwat water storage tank, 117 (1.8%) persons had developed hepatitis E infection while 63 persons out of 4896 i.e. 1.3% population receiving drinking water from PHC- ESR water storage tank had developed hepatitis E infection. This difference was statistically significant ($p < 0.05$).

Table 4: Attack Rate of HEV and Source of Water Supply

Source of water supply	Population surveyed	Number of fell ill	Attack rate in %
Raiwat	6344	117	1.8
PHC - ESR	4896	63	1.3

Pearson Chi-Square Test=5.450, df=1, P value=0.020

On interview of the patients it was found out that a majority of them i.e., 157(87.2%) followed open air defecation practices. Only 22(12.2%) patients were using sanitary latrine at home. Although majority of hepatitis 'E' patients were washing their hands with soap and water after defaecation, a substantial proportion i.e., 49(27.2%) patients did not use soap.

Laboratory findings:

Out of 180 clinically suspected patients, showed positive anti-HEV IgM antibodies 103(57.2%). No dual infection with HBV/HAV was seen in the epidemic. Serum bilirubin levels of 54 patients showed raised levels of $>2\text{mg/dl}$; and 30 patients had serum bilirubin levels $>6\text{mg/dl}$. Mean serum bilirubin was 4.1mg/dl , mean S.G.O.T. was 248.5 IU, mean S.G.P.T. was 304.8 IU and mean serum alkaline phosphatase was 216.6 IU. The water

samples collected from different points in the supply system showed satisfactory levels of residual chlorine above 0.5 ppm. It may be noted that by the time the water samples were collected the public water works department had already put heavy chlorine in the well and water tanks. Repairing of valve leakages in the water distribution system was undertaken by public health engineering department.

Discussion:

In the developing world, HEV infection represents the most common aetiological agent of outbreaks of acute hepatitis [11-14]. Epidemics are most frequent during the monsoon season when flooding causes faecal contamination of drinking water [15].

Earlier epidemiological studies have convincingly demonstrated that HEV is an important cause of non-A, non-B viral hepatitis [1]. Our data correspond with the existing epidemiological features of HEV. Clinically the symptoms like dark urine, abdominal discomfort, fatigue, fever, loss of appetite and signs like icterus, hepatomegaly. Serological and biochemical laboratory tests are suggestive of HEV infection. History of contact with a family member was present in only about 22% of patients while in majority of the patients no h/o contact could be elicited as has been observed in the previous studies [11, 14, 16].

There was hardly any difference in the sex wise distribution of the proportion of affected (male: 51.1% and females: 48.9%). There was no relation with the occupation of the patients. Majority of the affected were adults. Analysis of clinical profile showed that uncomplicated acute hepatitis accounted for majority of cases. Resolution occurred in all survivors by eight weeks.

Majority of the patient defaecated in open irrespective of their age groups, near water pipelines and intake well which could be the primary source of infection. It may also be noted

that a substantial proportion of the patients did not use soap to wash their hands after defaecation. This calls for an intensified health education drive for a population behavioural change.

The environmental study revealed that the water supply pipeline system to the Raiwat overhead water tank had become old and there were reports of leakage of valves in the past giving rise to seepage of flood water during the rains causing contamination of water with faecal matter. From the known incubation period of HEV and the epidemic curve, the period of two months between the heavy rains and the onset of the outbreak we can deduce that open air defecation practices near the water source, leaking water supply lines combined with flooding of the intake well lead to the outbreak.

It may be noted that the present study was conducted during the middle of the outbreak when most of the cases had already occurred. Termination of the outbreak appeared to be due to the vigorous IEC (Information, Education, and Communication) activities undertaken, supply of safe drinking water by super chlorination methods and improving environmental sanitation.

Conclusion:

This study confirms that there was an outbreak of Hepatitis E in Ner village, of Dhule district in the months of July-October, 2012. ELISA test detecting Ig M antibodies confirmed Hepatitis E virus infection. A total 180 cases were detected. There was no mortality. The outbreak subsided after control measures were initiated.

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