Epidemiological Investigation of an Outbreak of Viral Hepatitis

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Abstract

Background : There was a rise in the number of viral hepatitis cases in a regimental training centre in Mar 2003 and an epidemic of viral hepatitis was suspected.

Methods : The clinical case sheets and preliminary investigations carried out in the local military hospital (MH) were reviewed. A cross sectional descriptive epidemiological study was undertaken with survey of the suspected sewage and water pipelines.

Results : A total of 36 cases occurred from Mar 2003 to Apr 2003. There was clustering in time and space suggesting common source epidemic. All the 36 serum samples tested for IgM anti HEV antibodies were positive. Exploration of the water pipelines revealed sewage contamination due to leakage in the pipeline passing close to the sewage line. The overall attack rate was 1.44%.

Conclusion : The outbreak of viral hepatitis in the regimental training centre occurred due to sewage contamination of drinking water pipeline.

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Key Words : Viral hepatitis; Epidemiological investigation

Introduction

Most outbreaks of faeco orally transmitted viral hepatitis in young adults occur due to infection with hepatitis E virus [1-8]. Formerly termed enterically transmitted hepatitis non-A, non-B (HNANB), hepatitis E virus (HEV) is a 29 nm to 32 nm RNA virus. Based on its genomic characteristics the hepatitis E virus has been classified in the family "*Caliciviridae*". The present study deals with an outbreak of faeco orally transmitted HEV in a regimental training centre in western India. This study comprises of 36 cases of viral hepatitis which occurred during March to April 2003. The methods of field investigation of the outbreak and the relevant findings are discussed.

Materials and Methods

Epidemiological investigation consisted of detailed information from each reported case such as date of joining the training centre, date of onset of symptoms, date of admission, history of movement, history of having worked as food handler in the cook house, personal hygiene and other relevant data. Active case finding by surveys among recruits and troops was also carried out from March 2003 to April 2003.

The case definitions for confirmed case of viral hepatitis was any individual presenting with fever, anorexia, pain abdomen, vomiting, yellowish discolouration of the eyes,

passage of high coloured urine, hepatomegaly and icterus on clinical examination and having deranged liver functions on laboratory investigations viz. serum bilirubin, aspartate aminotransferase and alanine aminotransferase. While the case definition for presumptive case of viral hepatitis was any individual presenting with fever, anorexia, pain abdomen, vomiting, yellowish discolouration of the eyes, passage of deep yellow coloured urine and having hepatomegaly and icterus on clinical examination.

The outbreak was described in terms of time, person and place. A sanitary survey carried out to detect the likely sources of contamination of water and to study the methods of sewage disposal. The blue print of the water supply pipelines and the sewage system was obtained. Place distribution of the cases with relation to the water distribution line was mapped out and the attack rates in each of these subunits was calculated. The record of bacteriological examination of water for coliforms was also reviewed.

Serum samples of all the 36 cases of viral hepatitis were transported in cold chain from the regimental training centre to Department of Microbiology, Armed Forces Medical College (AFMC), Pune. The samples were tested for the IgM antibodies against Hepatitis E Virus by micro capture enzyme-linked immunosorbent assay (ELISA) and for antibodies against hepatitis A virus (HAV) and hepatitis B virus (HBV). Biochemical parameters such as serum bilirubin, alanine aminotransferase (ALT) aspartate aminotransferase (AST), urine for urobilinogen and bilirubin were also assessed.

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Results

Clinical profile consisted of fever (100%), anorexia (97.22%), pain abdomen (52.77%), icterus (100%) and yellow discolouration of urine (100%). Five (13.89%) cases gave history of not washing their hands with soap and water after defecation. On examination 11 (30.56%) cases did not have their nails trimmed. Most of the patients were discharged without complications after 3-4 weeks of hospitalisation.

The relevant laboratory findings included raised serum bilirubin and positive IgM antibodies for Hepatitis E virus in all cases. None of the samples demonstrated IgM antibodies against Hepatitis A and Hepatitis B viruses. AST and ALT was carried out in 21 (58.33%) cases and it was raised in all. Total proteins, albumin, globulin and A : G ratio done in 10 (27.78%) cases was within normal limits.

Epidemiologically, a total of 36 cases of viral hepatitis occurred among recruits and troops in the regimental training centre within a short span of one month, thus giving an incidence of 14.4 per 1000. The water pipelines were very old and corroded. A water pipeline was leaking at a distance of about 3 feet horizontally from a sewage pipe line which was also leaking at the same depth.

Serial water samples from points of suspected contamination were having very high presumptive coliform count of upto 180 per 100 ml of water. Prior to this, the bacteriological examination reports of water samples from source as well as consumer end were satisfactory. Results of water samples taken from other cook houses were satisfactory at all times. There were no case of viral hepatitis among the

Table 1
Coywise/cookhouse wise distribution of 36 cases of viral hepatitis

Coy(s)	No. of	Strength cases	Attack rate (%)	Remarks
A, B and C	27	750	3.6	Directly exposed to leaking drinking water pipeline
D, E and other troops	09	1750	0.51	Not directly exposed to leaking drinking water pipeline
Total	36	2500	1.44	

Table 2
Attack rates in recruits/troops consuming water from the leaking water pipeline as compared to those not consuming water from the leaking water pipeline

Source of water	No: affected (%)	No: not affected (%)	Total (%)
Leaking water pipeline	27 (3.6)	723 (96.4)	750 (100)
Normal pipeline	09 (0.51)	1741 (99.49)	1750 (100)
Total	36 (1.44)	2464 (98.56)	2500 (100)

RR=7.0 (95% CI of 3.31 < RR < 14.81);

Chi square (Yates Corrected) = 35.08

df = 1, p < 0.0001

troops and families residing outside the regimental centre in the station. From the records it was seen that only one case of viral hepatitis occurred in the station in the month of Mar 2002 and four cases occurred in the month of Feb 2003.

Table 1 shows the attack rates in recruits and troops who were directly exposed to the leaking water pipeline as compared to those not directly exposed. The relative risk for those directly exposed as compared to those not exposed was 7.0 (95% CI of RR 3.31, 14.81). The difference in attack rates (Table 2) between the two groups was statistically significant (p < 0.0001).

Most of the cases occurred among young adults and recruits who were admitted to the local service hospital between Mar 2003 and Apr 2003 (Fig. 1). During the follow up period of nine weeks, no case of viral hepatitis occurred among the troops/recruits of the centre. Spot map of distribution of cases is given in Fig. 2.

Discussion

In the present outbreak, all 36 serum samples examined revealed the presence of IgM antibodies against HEV thus establishing HEV as the cause of the outbreak [9]. The higher attack rates of viral hepatitis was found in those, consuming water supplied from the leaking water pipelines passing adjacent to sewage pipeline, than in those who consumed water supplied from other pipelines indicating that the present outbreak was due to sewage contamination of drinking water supply. This finding is also confirmed by the presence of high coliform counts in drinking water at the consumer end just after the onset of the outbreak.

In the present outbreak the overall attack rate in the regimental training centre was 1.44% (Table 1). Hepatitis E epidemics are frequently unimodal and short-lasting. Some have been multimodal, but even in such epidemics,

Fig. 1 : Time distribution of admission of viral hepatitis cases

Fig. 2 : Spot map of distribution of viral hepatitis cases

new cases stopped appearing soon after water contamination was controlled [10]. Hepatitis E outbreaks are caused by massive contamination of water supply systems [4-7,10]. Young adults in the age group of 15-40 years are commonly affected by Hepatitis E [11].

The attack rates of viral hepatitis E in previous outbreaks varied between 1.9-17% [4,7]. The first major epidemic was reported in Delhi in 1955-56 [1]. HEV infection has been demonstrated in children in many studies [12]. The seroprevalence of HEV infection is low until the third decade of life [13-16]. Epidemics of Hepatitis E have been reported from India, Pakistan, Burma, Nepal, Somalia, Sudan, Algeria and Mexico [17,18]. In the last few years, some HEV strains associated with sporadic attacks have been detected in North America and Europe [19]. Hepatitis E occurs sporadically in developed nations and is generally traced to travel to an endemic area. In the United States less than half a dozen cases have been found that are not associated with travel to endemic areas [20].

The present outbreak was due to faecal contamination of drinking water supplied to the regimental centre, which occurred due to old and corroded leaking pipelines passing close to old leaking sewage lines.

Conflicts of Interest

None identified

References

1. Park JE, Park K, editors. Textbook of preventive and social medicine. 16th ed. Jabalpur: M/s Banarsidas Bhanot 2000.
2. NICD Outbreaks of viral hepatitis E : public health system needs to be alert CD Alert 2000; 4 : 1-7.
3. Singh J, Aggarwal NR, Bhattacharjee J, et al. An outbreak of viral hepatitis E : role of community practices. J Commun Dis 1995; 27 : 92-6.
4. Bandhopadhyay S, Khera AK, Banerjee K, Kar NJ, Sharma RS. An investigation of an outbreak of viral hepatitis in a residential area of Delhi. J Commun Dis 1993; 25 : 67-70.
5. Skidmore SJ, Yarborough PO, Gabor KA, Reyes GR. Hepatitis E virus : the cause of a waterborne hepatitis outbreak. Jour of Med Virol 1992; 37 : 58-60.
6. Arankalle VA, Chadha MS, Tsarev SA, et al. Seroepidemiology of water borne India and evidence for a third enterically transmitted hepatitis agent. Proc Natl Acad Sci USA 1994; 91 : 3428-32.
7. Singh V, Raje M, Nain CK, Singh K. Routes of transmission in the hepatitis E epidemic of Saharanpur. Trop Gastroenterol 1998; 19 : 107-9.
8. Dilawari JB, Singh K, Chawla YK, et al. Hepatitis E virus : epidemiological, clinical and serological studies of North Indian epidemic. Indian J Gastroenterol 1994; 13 : 44-8.
9. NICD Investigation and Control of Outbreaks: Viral Hepatitis National Institute of Communicable Diseases, Delhi 2001; 1-20.
10. Somani SK, Aggarwal R, Naik SR, Srivastava S, Naik S. A Serological Study of Intrafamilial Spread From Patients With Sporadic Hepatitis E Virus. Infection J Viral Hepat (serial on the internet) 2003 (Cited 2004 Jun 29); 10 (6) : 446-9; [about 4 p]. Available from : URL: <http://www.medscape.com/viewarticle/463670?src=search>.
11. WHO The World Health Report, Fighting disease Fostering development : Report of the Director General 1996.
12. Goldsmith R, Yarbough PO, Reyes GR, et al. Enzyme linked immunosorbent assay for diagnosis of acute sporadic hepatitis E in Egyptian children. Lancet 1992; 339 : 328-31.
13. Thomas DL, Mahley RW, Badur S, Palaoglu KE, Quinn TQ. Epidemiology of hepatitis E virus infection in Turkey. Lancet 1993; 341 : 1562.
14. Lee SD, Wang YJ, Lu RH, Chan CY, Lo KJ, Moeckli R. Seroprevalence of antibody in hepatitis E virus among Chinese subjects in Taiwan. Hepatology 1994; 19 : 866-70.
15. Arankalle VA, Tsarev SA, Chadha MS, et al. Age specific prevalence of antibodies to hepatitis A and E viruses in Pune, India, 1982 and 1992. J Infect Dis 1995; 171 : 447-50.
16. Clayton ET, Shrestha MP, Vaughn DW, et al. Rates of hepatitis E virus infection and disease among adolescents and adults in Kathmandu, Nepal. J Infect Dis 1997; 176 : 763-6.
17. Margolis HS. Viral Hepatitis. In : Last JM, Wallace RB, editors. Public Health and Preventive Medicine. 13th ed. New Jersey: Prentice Hall International Inc, 1996; 138.
18. Bradley DW. Enterically transmitted non-A, non-B hepatitis. Br Med Bull 1990; 46 : 442- 61.
19. Pilar Clemente-Casares, Sonia Pina, Maria Buti, Rosend Jordi, Margarita Martín, Sílvia Bofill – Mas, Rosina Girones. Hepatitis E Virus Epidemiology in Industrialized Countries. Emerging Infectious Diseases (serial on the internet) 2003 (Cited 2004 Jun 29); 9(4): (about 5 p). Available from : URL: <http://www.medscape.com/viewarticle/452582?src=search>.
20. Vogin GD. Hepatitis E Linked to 3 Deaths in Medscape Medical News (serial on the internet). 2002 (Cited 2004 Jun 29); [about 7 p]. Available from <http://www.medscape.com/viewarticle/439256?src=search>.