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Original Research Article

**Jaundice Outbreak in Biratnagar Municipality of Eastern Nepal: A Microbiological perspective**Poudyal N<sup>\*1</sup>, Shrestha LB<sup>1</sup>, Pandit T<sup>1</sup>, Tamrakar D<sup>2</sup>, Yadav DK<sup>2</sup>, Lamsal M<sup>3</sup> and Khanal B<sup>1</sup><sup>1</sup>Department of Microbiology & Infectious Diseases, BPKIHS, Dharan, Nepal<sup>2</sup>School of Public Health and Community Medicine, BPKIHS, Dharan, Nepal<sup>3</sup>Department of Biochemistry, BPKIHS, Dharan, Nepal

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**\*Correspondence Info:**Dr. Nimesh Poudyal,  
Department of Microbiology & Infectious Diseases,  
BPKIHS, Dharan, Nepal**\*Article History:****Received:** 26/09/2017**Revised:** 16/11/2017**Accepted:** 16/11/2017**DOI:** <https://doi.org/10.7439/ijbr.v8i11.4401>**Abstract****Background and Objectives:** Hepatitis is a common cause of jaundice. Hepatitis A and Hepatitis E are enterically transmitted viral diseases. This study investigated an outbreak of viral hepatitis at Biratnagar, Morang district, Nepal, during April 2014.**Materials & Methods:** An expert team from Microbiology and Public health of BPKIHS inspected the area and blood samples from 90 suspected cases of jaundice were obtained and subjected for IgM and IgG antibody detection against HAV and HEV. Water samples from 10 different areas of affected region were also collected and checked for presence of coliform by membrane filtration method to confirm the suspicion of fecal contamination of water supply.**Results:** An outbreak Hepatitis E and Hepatitis A occurred in Biratnagar. Out of 90 blood samples, 45 were reactive for hepatitis E IgM, nine were reactive for Hepatitis A IgM. Three samples among these were reactive for both Hepatitis A and Hepatitis E. The liver function tests of the positive cases were deranged while the negative cases had normal LFT. Among the 10 water samples, five of them grew coliforms which confirmed the fecal contamination of drinking water supply.**Conclusion:** A large outbreak of Hepatitis A and Hepatitis E occurred in a Biratnagar which had spread through the drinking of contaminated water. The outbreak was confirmed both by Epidemiology and Disease Control Division of Nepal government and BPKIHS which led to the identification of source and control of the outbreak.**Keywords:** Jaundice, HAV, HEV.**1. Introduction**

Jaundice, also known as icterus, is defined as the yellowish discoloration of tissue that results from the deposition of bilirubin. Viral hepatitis (primarily caused by hepatitis viruses), alcohol, drugs, environmental toxins, autoimmune hepatitis, Wilson's disease are the most common causes of hepatocellular jaundice.[1]

Viral hepatitis caused by A and E viruses is the major public health problem in developing countries. Hepatitis E is the most common agent responsible for hepatitis outbreak as well as sporadic cases in developing countries.[2,3] Both Hepatitis A and Hepatitis E are transmitted by contaminated water or food. The resistance of HEV to environmental conditions, poor sanitation in large areas of the world, and viral shedding in feces are the major risk factors for HAV and HEV infections.[4]

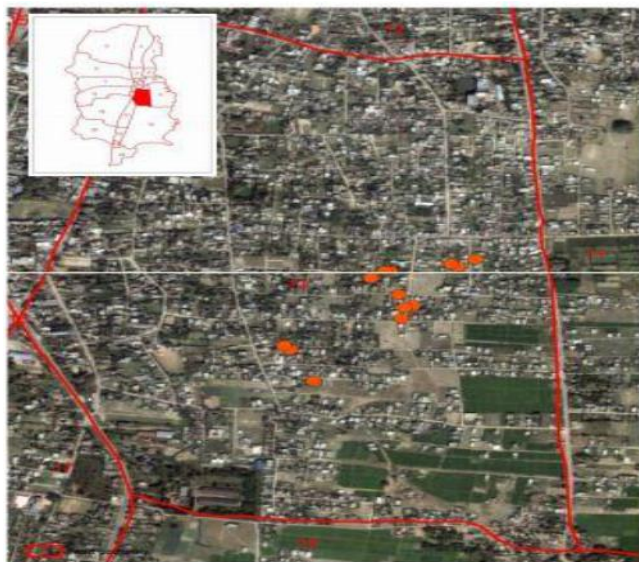
Hepatitis A is an acute, self-limiting infection of the liver which occurs mostly in children younger than 5 years of age. 20-80% of patients with hepatitis A presents with jaundice.[5] Hepatitis E is clinically indistinguishable from other forms of acute viral hepatitis with nonspecific, flulike prodromal symptoms that last from 1 to 10 days and consist of fatigue, malaise, anorexia, nausea, and vomiting.[6]

Morang district has about 1 million populations and Biratnagar city has 200,000 populations. During the third week of April 2014, a total of 11 patients with acute jaundice came to hospitals in Biratnagar. During the next 7 weeks, 1,861 patients with acute jaundice came to the outpatient departments of 2 of 5 large hospitals in Biratnagar; 123 patients were admitted to these 2 hospitals.

The purpose of this article is to provide the microbiological and epidemiological prospects of jaundice outbreak in Biratnagar which was occurred during April-July 2014.

## 2. Materials and Methods

According to WHO, in jaundice outbreak, the main tasks are to determine the mode of transmission, to find the exposed population with increased risk of infection, to investigate and eliminate a common source of infection and improve the sanitary and hygienic practices.[7] District Public Office Morang formed a rapid response team and collected data from hospitals, private clinics, and primary health care center. DPHO suspected an outbreak of hepatitis after consultation with doctors, experts and WHO guidelines. National Public Health Laboratory (NPHL) and B. P. Koirala Institute of Health Sciences, Dharan was also requested by DPHO to help them confirm the hepatitis outbreak and manage the outbreak. A rapid response team comprising of experts from Microbiology and Public health of BPKIHS joined the RRT formed by the DPHO Morang. As soon as outbreak was confirmed, a rapid response team from Microbiology and community medicine of BPKIHS joined the RRT. We monitored the situation, collected data from all OPDs, emergencies, and laboratories in hospitals regularly. The outbreak surveillance continued until July 2014. GPS mapping of the cluster of cases in Biratnagar municipality was done.



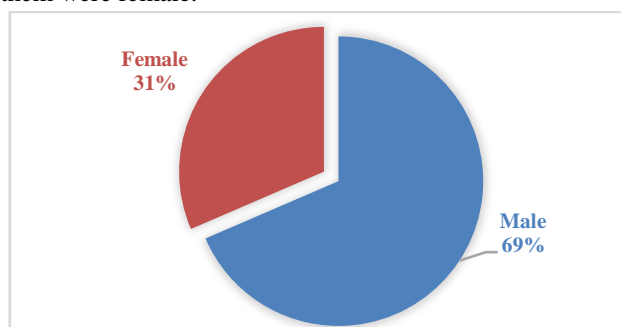
**Figure 1: GPS Mapping of Biratnagar**

Blood samples from 90 suspected cases of jaundice was collected and brought to BPKIHS for laboratory investigation. Then we collected the sample from the water reservoir as well randomly selected point of distribution of family/ institution having jaundice. The blood samples were subjected to IgM and IgG antibody detection against HAV and HEV. Biochemical tests were

also performed in those samples. Water samples obtained from 10 different areas of affected region were brought to the microbiology department and studied for the presence of coliform by membrane filtration method. Fecal contamination of water was interpreted by following WHO guidelines for drinking water.

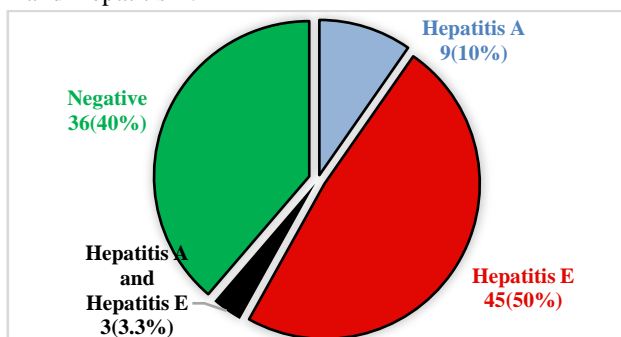
## 3. Results

During the third week of April 2014, a total of 11 patients with acute jaundice came to hospitals in Biratnagar. IgM against hepatitis E virus (HEV) was detected in serum samples from all 11 patients. During the next 7 weeks, 1,861 patients with acute jaundice came to the outpatient departments of 2 of 5 large hospitals in Biratnagar; 123 patients were admitted to these 2 hospitals. The Private and Boarding Schools’ Organization of Nepal closed 80 schools in Biratnagar and surrounding areas during the second week of May 2014 because of risk for disease transmission. After the outbreak was confirmed by DPHO, we collected 90 blood samples and 10 water samples were collected from the region. Out of 90 blood samples, 54 were reactive for hepatitis. 37 (69%) of them were male while 17 (31%) of them were female.



**Figure 1: Sex wise distribution of Hepatitis positive patients**

Among the 54 patients, 45 were reactive for hepatitis E IgM, nine were reactive for Hepatitis A IgM. Three samples among these were reactive for both Hepatitis A and Hepatitis E.



**Figure 2: Hepatitis positivity of the total 90 samples**

The liver function tests of the positive cases were deranged while the negative cases had normal LFT. The following bar graph shows the average liver function tests of hepatitis positive patients and the negative ones.

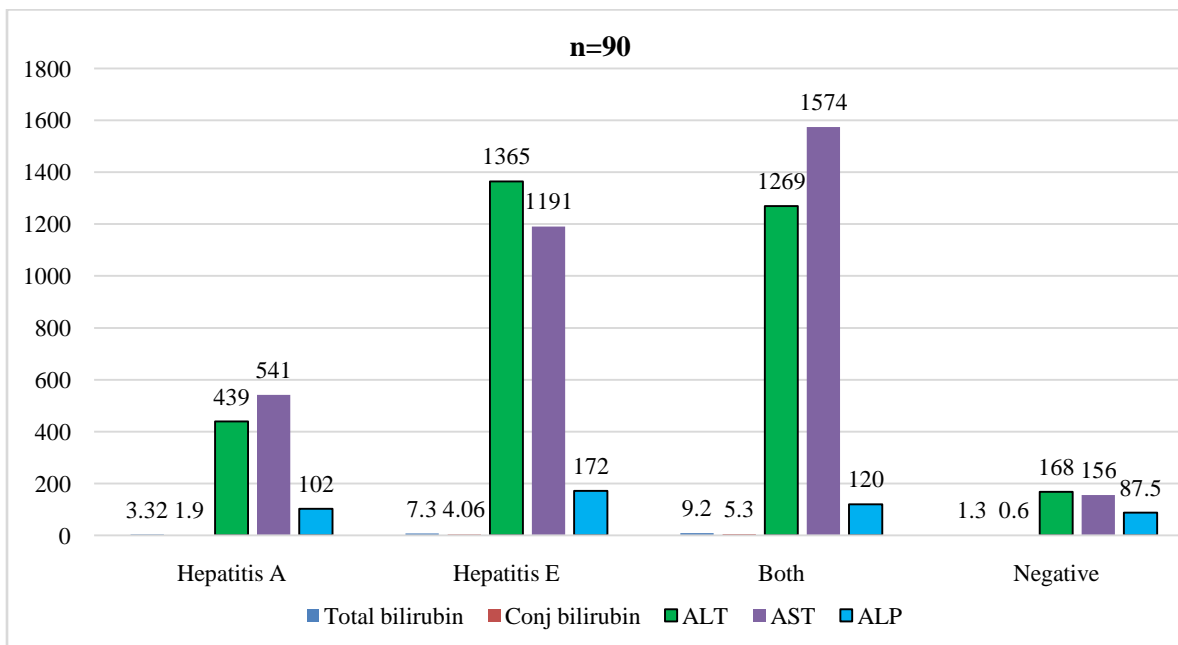


Figure 3: Liver function tests of the 90 samples

Among the 10 water samples, five of them grew coliforms which confirmed the fecal contamination of drinking water supply.

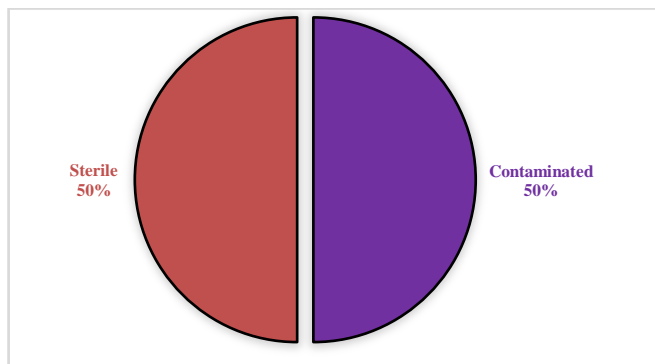


Figure 3: Sterile vs. contaminated water source

Since Hepatitis A and hepatitis E both are transmitted by consumption of contaminated food and water, the presence of fecal flora in water is an indirect evidence of transmission of these diseases through contaminated drinking water source.

#### 4. Discussion

The results of this investigation indicated that the outbreak was caused by the hepatitis E virus and Hepatitis A virus. 0.6% population of Biratnagar sub-metropolitan been affected by hepatitis E and hepatitis A outbreak. The ratio of infection in Biratnagar was 1:165 in the outbreak.

In the developing world, HEV infection represents the most common etiological agent of outbreaks of acute hepatitis.[8] Our data correspond with the existing epidemiological features of HEV.A study done in IJBR (2017) 08 (11)

Kathmandu Nepal showed that 56% of acute hepatitis in the valley was caused by hepatitis E; and hepatitis A, hepatitis B and hepatitis C accounted for 3 % each only.[9] Another outbreak study conducted in Uttarakhand, India suggested Hepatitis E was responsible for 77% of total seropositive cases. [10]

Our study showed that the seropositive patients had abnormal liver function profile. ALT and AST were markedly raised in both the HAV and HEV patients. Literature suggests that increased ALT and AST can be used as a marker of hepatitis.[11]

Hepatitis E is essentially an ecologically determined disease of urban areas caused by fecal contamination of the drinking water. Poor sanitation and densely populated slum favor not only the hepatitis E outbreak but also typhoid and cholera outbreak.[2] During our study, we collected water samples from different areas of Biratnagar municipality. Half of the sample showed growth of coliforms which showed that the drinking water was contaminated with fecal matter. Fecal contamination of the source of drinking water was documented in many of the epidemics.[2, 12]

Though in the past outbreaks of HEV was reported only from Kathmandu valley, the Biratnagar outbreak that occurred in 2014 has sent a warning signal that outbreak of HE may occur in other towns in Nepal if proper attention is not paid to drinking water supply system and sewage disposal. Leakages in drinking water pipelines, overflowing drains, mixing of toilet drains with the drinking water supply contributed to this outbreak. After the identification and correction of these problems, the outbreak was subsided.

## 5. Conclusions

An outbreak of Hepatitis A and Hepatitis E occurred in Biratnagar which was due to drainage of fecal matters with the drinking water supply. The recognition of early warning signals, timely investigation, and application of specific control measures helped in control of the epidemic. Recommendations based on the outbreak investigation can also prevent future outbreaks.

## References

- [1]. John S, Pratt DS. Jaundice. In: Fauci As, Loscalzo J, Kasper DL, Hauser SL, Longo DL, Jameson JL, Editors. Harrison's Principles of Internal Medicine. 19<sup>th</sup> Ed. New York: Mcgraw Hill; 2015. 58:279-85.
- [2]. Sarguna P, Rao A, Sudha Ramana KN. Outbreak of Acute Viral Hepatitis due to Hepatitis E Virus in Hyderabad. *Indian Journal of Medical Microbiology*. 2007;25(4):378-82.
- [3]. Tandon BN, Gandhi BM, Joshi YK, Irshad M, Gupta H. Hepatitis Virus Non-A, Non-B: The cause of a major public health problem in India. *Bulletin of The World Health Organization*. 1985; 63(5): 931-4. [2536439].
- [4]. WHO. Hepatitis E. Department of Communicable Disease Surveillance And Response. 2001.
- [5]. Averhoff F, Khudyakov Y, Bell BP. Hepatitis A Virus. In: Benett JE, Dolin R, Blaser MJ. Editors. Mandell, Douglas and Bennett'S Principles and Practice of Infectious Disease. 8<sup>th</sup> Ed. Philadelphia, Pa: Elsevier Sanders; 2015; 176: 2801-24.
- [6]. Shrestha SM. Hepatitis E in Nepal. *Kathmandu University Medical Journal*. 2006; 4(4): 530-44.
- [7]. WHO. Hepatitis E. Fact Sheet N°280, Updated July 2015. Website Browsed on Sept. 23, 2015. [www.who.int](http://www.who.int).
- [8]. Shrestha Sm. Liver Diseases In Nepal. Liver Foundation Nepal. . *Kathmandu Univ Med J*. 2005; 3(2): 178-80.
- [9]. Shrestha Sm, Shrestha S, Tsuda F, Nishizawa T, Gotanda Y, Takeda N, et al. Molecular Investigation of Hepatitis E Virus Infection in Patients With Acute Hepatitis in Kathmandu, Nepal. *Journal of Medical Virology*. 2003;69(2): 207-14.
- [10]. Awsathi S, Rawat V, Rawat CM, Semwal V, Bartwal Sj. Epidemiological investigation of the jaundice outbreak in Lalkuan, Nainital District, Uttarakhand. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*. 2014; 39(2): 94-7.
- [11]. Xu B, Yu HB, Hui W, He JL, Wei LL, Wang Z, et al. Clinical Features and risk factors of acute Hepatitis E with Severe Jaundice. *World Journal of Gastroenterology*. 2012;18(48):7279-84. [3544030].
- [12]. Banerji A, Sahani A, Rajiva., Nagendra A, Saiprasad G. Outbreak of Viral Hepatitis E in A Regimental Training. *Med J Armed Forces India*. 2005;61:329-9.