CLINICAL AND EPIDEMIOLOGICAL FINDINGS OF HEPATITIS-A OUTBREAK IN DHOKE KANETY, ISLAMBAD


1 National Institute of Health Islamabad, 2 Field Epidemiology & Laboratory Training Program. Corresponding Author: Mumtaz Ali Khan, Medical Officer, National Institute of Health, Islamabad, Email: drmomi74@hotmail.com

Abstract

Background: Hepatitis-A has an estimated global disease burden of 1.4 million/ year. Poor sanitation leads to children getting infected before the age of 10. A cluster of 10 Hepatitis-A patients was reported from Dhok-Kanety, Islamabad (approx. population 225) and an outbreak investigation was conducted from February 09 –15, 2014.

Methods: A case control study was conducted during 9-10 February 2014 in Dhoke Kanety, District Islamabad, Pakistan. A total of 24 cases and 72 Age and gender matched controls were selected from the study area. A case definition for Hepatitis A developed by World Health Organization was used to identify the suspected and confirmed cases. The cases and controls were interviewed and information was collected using a questionnaire including basic epidemiologic information, symptoms, time of onset, medical care, previous history of Jaundice, drinking water sources, consumption of raw vegetables and salad, and sanitation facilities. Samples of blood and water collected for laboratory analysis. Blood samples were tested through 3rd generation ELISA technique and water samples were analyzed through Physiochemical and Microbiological techniques at National Institute of Health Islamabad. Descriptive and inferential methods were used including person chi square test of independence and odd ratios for association. Data was analyzed through Epi-info soft ware and SPSS.

Results: The average age of the respondents remained 8 years (range of 3-13 years). Half of the respondents were female. Overall attack rate was 27%. Among cases, 19 consumed well water (OR 14.4; 95% CI 7.5-18.7; p <0.05); 17 had open-drain toilets (OR 4.5.; 95% CI 2.2-6.2; p <0.05) and 17 had a contact with a case (OR 19; 95% CI 7-27; p <0.05). Moreover, boiling water (6/24; OR 0.1; 95% CI 0.04-0.3; p <0.05) and chlorination (5/24; OR 0.14; 95% CI 0.04-0.4; p <0.05) showed a protective effect. Results from water samples showed presence of fecal coliforms. Municipal water supply was disrupted due to civil works and a well was used as the source of water.

Conclusion: Contaminated well water was identified as the source of infection. Health education was imparted on hygiene/sanitation.

Key words: Hepatitis A, outbreak, Islamabad, risk factors

Introduction:

Hepatitis A virus (HAV), usually self-limiting disease, highly transmissible and one of the most frequent causes of food-borne infections, occurs worldwide, both sporadically and in the form of epidemics. Hepatitis-A has an estimated global disease burden of 1.4 million/ year. Poor sanitation leads to children getting infected before the age of 10. Acute viral Hepatitis A is a common infection among children in Pakistan and accounts for 50-60% of all cases of acute viral hepatitis in children. Almost 96% of the population is exposed to HAV by the age of 5 years and 98-100% at adulthood (18). Hepatitis A virus (HAV) first isolated in 1979, is primarily transmitted by the fecal-oral route. a non-enveloped RNA virus that is classified as a picornavirus. Humans are the only host and can be stable in the environment for months depending on conditions. The virus is relatively stable at low pH levels and moderate temperatures and can be inactivated by high temperature (185°F [85°C] or higher), formalin, and chlorine (1). After ingestion, reaches the liver, replicates and after 10–12 days, virus is present in blood and is excreted via the biliary system into the feces. The virus is can be found in stools during the 1-2 weeks before and for 1-3 weeks after onset of illness. Children and infants may excrete virus longer than adults (1). The average incubation period is 28 days (range: 15–50 days).1 In children younger than 6 years of age, most (70%) infections are asymptomatic. In older children and adults, infection is usually symptomatic, with jaundice occurring in more than 70% of patients. Approximately 33% of people with reported cases of hepatitis A are hospitalized; hospitalization rates increase with increasing age.3 Overall mortality among reported cases of hepatitis-A is approximately 0.3%-0.6%; however, among adults older than 50 years of age, mortality is 1.8%.1 The illness presentation varies widely: there may be flu-like symptoms, fever, malaise, anorexia, nausea, abdominal discomfort, dark urine and
jaundice. Clinical illness usually resolves within 2
months among about 65% of cases and within 6 months
for nearly all cases. There is no specific treatment for
hepatitis A virus infection. Disease is usually self-limiting
and treatment and management of HAV infection are
supportive; HAV infection does not result in chronic
infection or chronic liver disease. However, HAV
infection can complicate chronic liver disease among
persons infected with hepatitis C virus; thus, susceptible
persons should be vaccinated.(2). Rapid identification
and prompt reporting of hepatitis A cases are important
to take timely preventive measures and to enlist
contacts who can effectively be vaccinated.(19)

Methodology:
A case control study was conducted during 9-10
February 2014 in Dhoke Kanety, District Islamabad,
Pakistan. A total of 24 cases were enrolled with 72 Age
and gender matched controls from the study area. A
case definition for Hepatitis-A was developed based on
World Health Organization standard case definition, to
identify suspected and confirmed cases. The persons
reported with previous history of hepatitis-A or received
vaccination against hepatitis-A within last 3 months were
excluded. The cases and controls were interviewed and
information was collected using a questionnaire
including basic epidemiologic information, symptoms,
time of onset, medical care, previous history of
Jaundice, drinking water sources, consumption of raw
vegetables and salad, and sanitation facilities.

Blood and water samples were collected for laboratory
analysis. Serum from both case and controls were
tested using 3rd generation ELISA technique for specific
anti-hepatitis-A and Hepatitis-E IgM antibodies. Risk
factors were assessed through the questionnaire. Blood
samples were also tested for Viral Hepatitis B & C. Water
samples were analyzed in Environmental Laboratory of
the National Institute of Health (NIH) for chemical as well
as microbiological parameters.

Descriptive and inferential methods were used including
pearson-chi square test of independence and odds
ratios for association. Data was analyzed through Epi-
info software and SPSS.

Results:
Blood tests:
A total of 10 blood samples were analyzed as
representative samples for confirmation of the outbreak
at NIH for Hepatitis A & E and were found positive for
Hepatitis-Algm while negative for HEV, Hepatitis B & C.

Environmental investigation:
Four water samples from different sources including well
were taken and analyzed in Environmental Laboratory of
the National Institute of Health (NIH) where the all
samples were declared unfit for drinking with heavy
growth of indicator organisms (feacal coliforms). While
checking the water sources, it was found that the main
water supply pipelines were disrupted due to new
township construction work beside the village and the
only source of drinking water was an old large well in the

village. The well was not well covered and possibility of
contamination with rain water and sewerage water was
there. Around the well, there were animal’s sheds and
sewerage water having animal excreta. The water was
supplied through temporary pipelines to most of the
houses in the village. The water was being used without
any treatment and the well water was never chlorinated
in near past. In most of the houses, washrooms were
without proper drainage system and the sewerage was
directly drained to nearby open fields. Most children
affected had contacts with other ill children and none of
the ill individuals in this outbreak had received hepatitis-
A vaccine as vaccines are difficult to afford in the region.

Epidemiological findings:
Twenty Four cases were identified with the average age
of 8 years (range of 3-13 years). Overall attack rate was
27%. Among the study subjects 58% were female. The
findings from this outbreak investigation suggest that a
4yrs old female child, developed symptoms in the last
week of December, 2013, being the index case,
transmitted HAV to other children in the family and
resulted in subsequent transmission of infection among
other children in the village.

Clinical findings:
Clinical symptoms reported were Jaundice 100%(24),
Anorexia 100%(24), Lethargy 100%(24), Nausea 85%
(20), Vomiting 67% (16), abdominal pain 58%(14),
Fever 37% (9) and Loose stools 42%(10).

Significant Risk factors: An old uncovered well in the
village used for drinking water source was significantly
related to Hepatitis-A and 40% of the respondents
exposed to well water got infected (p<0.05). The persons
consumed well have 14.4 times more chances to get
infected as compared with those not consumed well
water (OR 14.4 95%CI 7.5-18.7). 52% respondents got
infection out of the total respondents who used water
without water treatment options (Boiling, Filter,
Chlorination) and remained significantly associated
with Hepatitis A (p<0.00). Boiling of the water remained
protective for the Hepatitis-A infection (OR 0.1 95% CI
0.04-0.3). Similarly chlorination also remained
protective OR 0.14; 95% CI 0.04-0.4; p <0.05).48% of
positive cases have washroom with open drain and
remained significant risk factor (p=0.03). The respondents
having open drain washroom have 4.5
times more chances to get infected with Hepatitis-A
(OR 4.5 95% CI 2.2-6.2). Among positive cases, 70% (17/24)
have contact with jaundice patient and contact history
remained significantly associated with Hepatitis-A. The
respondents having contact with a jaundice patients
have 19 times more chances to get infected with
Hepatitis-A(OR 21 with 95% CI6-77). (Table 1)
Table 1: Potential Risk Factors associated with Hepatitis-A (n=96)

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Positive</th>
<th>Negative</th>
<th>P-value</th>
<th>OR</th>
<th>(95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drinking water Source</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well</td>
<td>24 (39%)</td>
<td>37 (61%)</td>
<td>0.000</td>
<td>14.4</td>
<td>(7.5-18.7)</td>
</tr>
<tr>
<td>Pipeline</td>
<td>0 (0%)</td>
<td>30 (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Do you treat water</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2 (4%)</td>
<td>47 (96%)</td>
<td>.0000</td>
<td>0.1</td>
<td>(0.04-0.3)</td>
</tr>
<tr>
<td>No</td>
<td>22 (52%)</td>
<td>20 (48%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type of washroom used</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor Open</td>
<td>0</td>
<td>1 (100%)</td>
<td>0.03</td>
<td>4.5</td>
<td>(2.2-6.2)</td>
</tr>
<tr>
<td>Pit Type</td>
<td>4 (17%)</td>
<td>19 (83%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor closed drain</td>
<td>8 (20%)</td>
<td>32 (80%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor with open drain</td>
<td>12 (44%)</td>
<td>15 (56%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Contact with Hepatitis-A patient</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>17 (71%)</td>
<td>7 (29%)</td>
<td>0.02</td>
<td>19 (7-27)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>7 (10%)</td>
<td>60 (90%)</td>
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</tr>
</tbody>
</table>

Discussion:

This report describes an outbreak of hepatitis-A among children in a small village of Islamabad Capital Territory. A sharp increase the patients presented with acute Jaundice was noted by a General Practitioner of the area. The same was reported to District Health Department for exploring the cause and taking preventive measures. Twenty Four cases were identified including 14 active cases. Most of the affected individuals were children below 15 years with average age 8 years (3-13 years). In developing countries HAV cases occurs sporadically and children acquire the infection in early life making them immune to another attack (7).

Overall attack rate was 27%. Among the cases females were more frequent 58%. The present outbreak was waterborne as indicated by this study. Similar studies on investigation of acute viral hepatitis have been published supporting our findings (4-6).

All patients were treated on outdoor basis. This outbreak started in 1st week of January (week 1st) to 8th March 2014 (week 11) with peak from week 6 to 10 and then started declining. The disease is mostly self limiting and patients recover without any serious complication (1). No secondary peak was observed, similar finding was reported by varied studies (6,9,10,15).

Twenty four cases and 64 age-sex matched controls were enrolled in the study. Control subjects were similar to case patients with respect to age, race, and sex. Almost all case patients reported consumption of old well water located in the village. Other potential sources of infection identified were using raw vegetables, lack of proper sewerage system and sanitation, hand washing especially after attending washroom. Acute viral hepatitis (A&E) is responsible for the hepatitis outbreak as well as sporadic cases of hepatitis in developing countries (7).

Clinical symptoms reported were Jaundice 100% (24), Anorexia 100% (24), Lethargy 100% (24), Nausea 85% (20), Vomiting 67% (16), abdominal pain 58% (14), Fever 37% (9) and Loose stools 42% (10). A total of 67 age and gender matched controls were taken for identification of the potential risk factors related to this outbreak. A well in the village used for drinking water source was significantly related to Hepatitis-A 40% (24/61 p= 0.000) as compared to pipeline water supply 0% (0/30), Water treatment options (boiling, filter, chlorination) remained protective for Hepatitis-A (p=0.000), 48% of positive cases have washroom with open drain and remained significant risk factor (p=0.03). Among positive cases 70% (17/24) have contact with jaundice patient (OR 21 with 95% CI 6-77). The study findings are supported by other similar studies in India and other developing countries (13, 14, 17).

Among cases, 19 consumed well water (OR 14.4; 95% CI 7.5-18.7; p <0.05); 17 had open-drain toilets (OR 4.5; 95% CI 2.2-6.2; p <0.05) and 17 had a contact with a case (OR 19; 95% CI 7-27; p <0.05). Moreover, boiling water (6/24; OR 0.1; 95% CI 0.04-0.3; p <0.05) and chlorination (5/24; OR 0.14; 95% CI 0.04-0.4; p <0.05) showed a protective effect. A clear association was observed between contaminated water supply and occurrence of cases of hepatitis. Chlorination and boiling of water was also found protective. Drinking water was obtained from a nearby old well which was never treated and was located...
next to a vegetable field that was often fertilized by faeces, a possible source of contamination. It was found that the main water supply pipelines were disrupted due to new township construction work beside the village. The well was not well covered and possibility of contamination with rain water and sewerage water was there. Around the well, there were animal's sheds and sewerage water having animal excreta. The water was being used without any treatment and the well water was never chlorinated in near past. A similar observation was made by Banerjee et al. in their study (8). The termination of the outbreak following the chlorination of the water sources and adopting good hygienic practices further supported our hypothesis.

In most of the houses, washrooms were without proper drainage system and the sewerage was directly drained to nearby open fields which could possibly contaminated vegetables fields. Hand washing practices of the children in the village especially after attending washrooms were not found appropriate. Most children affected had contacts with other ill children. So poor sanitation and hygienic practices also played a role in the spread of the disease to other healthy non-immune children. These findings are supported by other similar studies (11, 12).

**Conclusion:**

Based on the above observations, it was concluded that, the present outbreak was due to fecal contamination of well water which was the only drinking water sources and were uncovered, exposed to heavy contamination. Poor hygienic conditions and using raw vegetables are among the other potential risks. Awareness about safe drinking water, treatment options and sanitation were negligible.

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