

OUTBREAK OF JAUNDICE IN RURAL SCHOOL CHILDREN: AN EPIDEMIOLOGICAL INVESTIGATION

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ABSTRACT

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Background:

Viral hepatitis is a major public health problem in India and epidemiology of viral hepatitis is going to changing as outbreaks of hepatitis A are being reported with increased frequency, in the pediatric age group as well.

Objective:

To study the time, place, and person distribution of hepatitis A infection in rural school population & to find the source of infection in the study area.

Methodology:

Community based survey was conducted among the school population of village Kalawade district Satara of state Maharashtra during July-August 2011 by interview and clinical examination utilizing pre-designed semi-structured proforma. Data collected by investigation team was compiled and presented into frequency, percentage & chi-square test was applied to know the statistical association.

Results:

Out of 400 school children, 32 suffered from Hepatitis A viral infection with overall attack rate 8% involving 25 males & 7 females showed statistical significant association ($p < 0.05$). Index case was detected on 20th July 2011 while maximum no. of cases i.e. 11 cases were detected during 3rd week of outbreak with a median incubation period 21 days. Majority of patients, 96.8% & 81.2% were presented with dark yellow colored urine and yellowish discoloration of sclera. Out of 32 patients, 68.5% cases were from private high school with water supply from bore well while 31.5% cases from anganwadies & primary school with a water supply from gram panchayat well. However, water supply source to private high school was found contaminated.

Conclusion:

An outbreak of Hepatitis A reported in school children mainly due to consumption of contaminated bore well water.

Keywords: Hepatitis A, outbreaks, incidence, sanitation.

"Prevention is better than cure"

INTRODUCTION

Although the HAV infection is a worldwide public health predicament, the problem is more prominent in developing countries, in areas where they are changing from hyperendemic to hypoendemic pattern. Acquisition in early childhood is the norm in these nations and is usually asymptomatic. Factors predisposing humans to early acquisition include overcrowding, poor sanitation, unsafe water sources and certain social practices. Hepatitis A is an acute, usually self-limiting disease of the liver caused by hepatitis A virus (HAV), a genus of picorna virus family. Improvements in hygienic conditions and effective health education results in increased number of susceptibles which may lead to an outbreak and become a problem in many developed countries especially in schools, day care centers and among high risk groups while a recent report from South Korea showed that outbreaks of Hepatitis A has shift from childhood to adolescents and young adults¹ Similarly reports from Shiraz city in south of Iran, indicated the rate of sero-prevalence was 68% among 15-year olds². In another report from Tehran, the capital of Iran, the rate of exposure was 22.3% among school children³ while a study from Delhi reported it 93.2%⁴. HAV is transmitted from person to person, primarily by the fecal-oral route. Though the socioeconomic development of different parts of the world affects the incidence of hepatitis A. Age of exposure determines the presentation of the disease i.e. subclinical or asymptomatic disease usually occurs in young children whereas symptomatic disease occurs more commonly among adults^{5,6}.

Viral hepatitis continues to be a major public health problem in India and many outbreaks of hepatitis reported from different parts of the country. In India, (HAV) is still a major cause of sporadic acute hepatitis in children and HEV is the major agent for epidemics in adults⁷. Most of the outbreaks of waterborne hepatitis in India have been attributed

HEV, but the epidemiology of viral hepatitis is changing as outbreaks of hepatitis A are being reported with increased frequency, in the pediatric age group as well^{8,9,10}. In recent years children and adults with acute viral hepatitis A have been reported to have more relapses and a protracted course. The first recorded outbreak of HAV in Indian adults was from Kottayam, Kerala, and the infection was traced to the presence of a sewage treatment plant which was overflowing and getting mixed with canal water¹¹. Another study from Delhi over a 5 year period showed an increased incidence of symptomatic HAV among children (10.6 to 22.0%)¹². In absence of formal school health programme in India, school medical inspection started where primary health centres held responsible to look after primary school children annually under their jurisdiction heading to additional burden on primary health centre¹³. School health services not only include clinical examination of pupils but also school environment, school sanitation etc. which was totally neglected in current school health services. In addition school health services are not extended to secondary schools located in various parts of country. Hence wheather school facilities are adequate from health point of view are questionable.

Jaundice cases were reported from school population of village Kalawade dist. Satara during July end and middle of August 2011. In view of this epidemiological investigation was planned to study the epidemic of jaundice and it's correlates & suggest prevention and control measures.

MATERIALS AND METHODS

A community based survey was conducted during July-August 2011 in Kalawade village, a field practice area of Krishna Institute of Medical Sciences (KIMS) Karad, Satara. The study village has local gram panchayat as administrative

authority and public health care services are extended by primary health centre (PHC) Rethare BK. At the time of study total village population was 4356 and had 4 anganwadies, 1 primary public school and 1 private high school. 2 anganwadies are located in the middle of village while remaining anganwadies, primary and high school located 500 meters to the west of village which was actual study site and actual study population was 400 school children. On request of Medical Officer (MO) PHC Rethare BK, expert team from KIMS Karad including epidemiologist, physician, post graduates from dept. of community medicine, technician, pharmacist, sanitary inspectors, helpers and ambulance with adequate materials visited the place. After interrogation with private practitioner (PP), MO and members of gram panchayat, rapid clinical examination of school children revealed number of jaundice cases suggestive of outbreak and remaining whole village population was at the risk of epidemic. A pre-designed semi-structured proforma was used to collect the data included clinical manifestations suggestive of viral hepatitis, age, sex & sanitary conditions of village (sewage disposal and water supply system) etc. 3 teams were formulated from staff of KIMS, PHC and local gram panchayat to assess the health situation and data collection. Team 1 & 2 assigned clinical examination of school children and whole village population while team 3 assigned environmental sanitation and health education of the village people.

Clinical examination of school children was carried out in anganwadies, primary and high school and blood sample were collected from those with one sign/symptoms suggestive of viral hepatitis for biochemistry & 10% samples were collected for virology. Adequate medical treatment was given to cases of jaundice and health education was given to community for prevention and control so as to check the spread. Similarly house to house survey

was carried out by using pre-designed semi-structured proforma. Clinical examination of population at risk was carried out and suspected cases were referred to temporary health care centre established at gram panchayat for investigation, treatment and health education.

Potable safe drinking water was supplied by gram panchayat to whole village, primary public school and anganwadies twice a day. In the premises of primary school, water was stored in tank with taps. While Private deep well with electric pump was arranged in the field near primary public school. It was revealed that private bore well was the source of water supply to private high school and on inspection, the bore well was located 100 meter away from high school in a canal by the side of road in fields and open air defecations were practiced near and around it. Moreover, rain water was stagnated at the place and superstructure submerged in it. From this bore well water was lifted with plastic pipe and stored in water tank which was not cleaned and not disinfected even after long summer vacation. There were no leakages in pipe system. Separate toilet facilities were practiced for boys and girls in both schools. There was adequate drainage system and majority of households had sanitary latrines under the Nirmal Gram Yojana and no open air defecation practiced in village. However open air defecation was practiced by those without sanitary latrines and by few during agricultural activities and the place selected was the road sides in fields on the way of private high school. Data was collected by health teams under the supervision of epidemiologist from every individual of village by house to house survey, sanitary condition of village and school health survey. Data collected was compiled and presented into frequency, percentage and chi-square test was applied to know the statistical association between study variables.

Laboratory tests :

72 Blood samples of suspected cases & all pregnant mothers irrespective of sign/symptoms as high risk population were collected in plane bulbs and send to Biochemistry dept. of KIMS Karad to perform liver function tests. 10% blood samples were send to National Institute of Virology(NIV) Pune by strict maintenance of cold chain to detect anti body against hepatitis A,B,C and E virus . Seven water samples were collected from all sources of water into sterile water collecting bottles supplied by primary health centre (PHC) Rethare Bk and send to district public health laboratory for bacteriological examination.

Blood sample report of NIV Pune revealed positive results for viral Hepatitis A (IgM anti – HAV) and negative for B ,C & E. Biochemistry report from KIMS Karad showed increased Liver function test parameters (Bilirubin , Serum Alkaline Phosphates) and rate was 44.44%. Water sample reports from district public health laboratory Satara showed water contamination from private high school bore-well & water tank where as negative for all other water sources. Blood Biochemistry among all pregnant mothers was within normal limit.

During outbreak of the onset, safe drinking water supply was made available to the school populations through movable water tanks and local people were requested to drink boiled water till further notice. The local self authorities as well as private school authority were requested to disinfect bore well water, protection of water source by pucca cement concrete construction, emptying and disinfection of water tank on regular basis, construct sanitary latrines & stop open field defecation as well as health education.

RESULTS

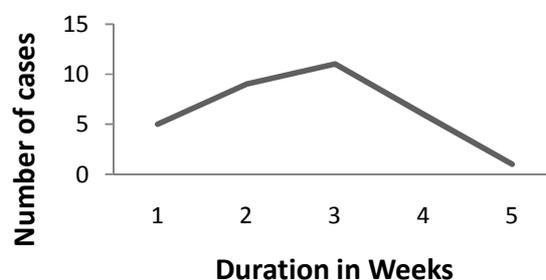
Out of 400 school children, 32 suffered from Hepatitis A viral infection with overall attack rate

from primary school,12 from pre-primary school & 10 from secondary school were attack rates 9.3%,5.7%,10.1% and 7.8% respectively. The overall attack rate among school children was 11.2% in males & 3.9% in females showed statistical significant association ($p < 0.05$).

Fig.1: Spot Map of study village, Kalawade



Fig.2: Epidemic Curve of the Outbreak



According to fig.2, Index case was detected on 20th July 2011 i.e. during 1st week of outbreak and last case on 23rd August 2011 i.e. during last ,5th week of outbreak. Maximum no. of cases i.e. 11 cases were detected during 3rd week of outbreak with a median incubation period 21 days.

Table 1: Distribution of study population by Age (schooling), Sex and Attack Rates

Age Group (years)	Male			Female			Total		
	Population	Cases	Attack Rate (%)	Population	Cases	Attack Rate (%)	Population	Cases	Attack Rate (%)
3-6 Anganwadi	20	3	15	12	0	0	32	3	9.3
7-10 Primary	63	5	7.9	59	2	3.3	122	7	5.7
11-13 Pre-secondary	67	9	13.4	51	3	5.8	118	12	10.1
14-16 Secondary	72	8	11.1	56	2	3.5	128	10	7.8
Total	222	25	11.2	178	7	3.9	400	32	8

Sex, $\chi^2 = 7.2, p = 0.007^*$ (* = very significant), Age (schooling), $\chi^2 = 4.7, p = 0.967$

Table 2: Clinical Manifestation of Cases

Signs/symptoms	Frequency(%)
Dark yellow urine	31 (96.8)
Yellow sclera	26 (81.2)
Anorexia	21(65.6)
Nausea/vomiting	11(34.3)
Pain in abdomen	5(15.6)
History of fever	9(28.1)

Table no 2 represents signs & symptoms in patients as dark yellow colored urine (96.8%), yellowish discoloration of sclera(81.2%), anorexia(65.6%), nausea/vomiting(34.3%), fever(28.1%) and abdominal pain (15.6%) respectively.

Table 3: Distribution of cases as per source of water supply

Source of water supply	No of cases	Total
Private Bore well	22	246
Gram Panchayat well	10	154

($\chi^2 = 0.77, p = 0.379, RR = 1.37$ at 95% CI.)

Table no 3 depicts, 68.5% patients were from private high school with water supply from bore well while 31.5% cases from anganwadies & primary school with a water supply from gram panchayat well. However the association between source of water supply and reporting of cases of Hepatitis A was not significant

DISCUSSIONS

Schools constitute an important source of transmission of enteric viruses especially in countries with poor socio-economic development as a result of lack/poor in public health measures, such as provision of clean water and sanitation (personal & environmental). From July 20 to August 23, 2011, 32 cases of viral hepatitis A were identified in school population of village Kalawade dist. Satara, Maharashtra, constituting 25 males and 7 females respectively. However, in school population of school situated in study village, not a single death reported due to HAV. No HAV case was reported from remaining villagers. It's a known thing that with improvements in provision of safe water supply, sanitary disposal of sewage leads to a reduction in childhood incidence of Hepatitis A virus, however with incidence reduction in children, adolescents and young adults become increasingly susceptible to Hepatitis A virus infection. Moreover, this new situation creates the potential for outbreaks like the one investigated and reported in this school as maximum no. of cases viz 68.7% in the age group 11-16 yrs. i.e. high school and remaining cases below 11 yrs. of age i.e. from anganwadi and

primary public school with overall attack rate 8%. Similar findings were also observed by Salas Daniela among the school children of Mayurbhanj, Orissa¹⁴ 119 cases less than 19 yrs. with overall attack rate 9% due to consumption of contaminated tamarind water served in a mobile food kiosk. Sinlaparatsamee S¹⁵, in Thailand observed 36 cases of HAV among school population age 7-12 yrs. with overall attack rate 13.38% due to consumption of contaminated water in school. Hepatitis A outbreak in a public school in Grajau Rio de Janeiro, Brazil¹⁶ involved 25 cases (10 males and 15 females) with overall attack rate 4.9% with significant association between age and incidence of HAV ($p < 0.001$). However in present study no statistical association existed between age and incidence of HAV ($p > 0.05$).

Our study revealed incidence of HAV among boys and girls as 11% & 7% respectively with significant statistical association ($p < 0.05$) and it may be due to majority girls brought potable water from their house supplied by gram panchayat. While study conducted by Livia Melo Villar in Brazil¹⁶ doesn't showed significant association between gender and incidence of HAV.

The most important source of infection was contaminated water from bore well stored in water tank situated in premises of private high school. After vacation with reopening of school water tank was not emptied, dried, disinfected. Though the water was contaminated in private school however cases were also reported from anganwadies as well as primary public school and it may be due to consumption of food and drinking of water in premises of private school with friends or elder brother /sister and it is nothing but person to person transmission of infection. There was no association observed between water supply and the incidence of HAV infection ($p > 0.05$) likely to be due to the fact that treated water was brought

from house with appropriate sewage system by majority of children. Similar observations were reported by Livia Melo Villar in Brazil¹⁶ i.e. no significant association between water supply and incidence of HAV ($p > 0.05$). However the study conducted by Salas Daniela among the school children of Mayurbhanj, Orissa¹⁴ observed significant association between consumption of contaminated tamarind water and incidence of HAV ($p < 0.05$).

In the present study amongst 32 cases, 81.2% were icteric, 65.6% had anorexia, 28.1% fever and 15.6% had abdominal pain respectively. Study conducted by Sowmyanarayanan TV¹⁷ from Vellore, Tamil Nadu showed almost similar features as 88.4% were icteric, 84.6% had malaise, anorexia, fever and 23% had abdominal pain due to consumption of contaminated water.

Present study revealed the decreased incidence of HAV in school children/village mainly due to through health education with continued consumption of boiled cool water, avoid open air defecation, proper disposal of excreta, personal hygiene, appropriate nutritional and medical advice etc. Not a single case of HAV was reported after 23rd August 2011 from study area. It indicates that health education is an appropriate intervention measure from control & prevention point of view and has important role in reducing the incidence of HAV in population at risk especially in poor socio-economic community/country.

CONCLUSION

An outbreak of Hepatitis A reported in school children mainly due to consumption of contaminated bore well water.

RECOMMENDATION

Young children frequently serve as a source of HAV infection for older children and young adults, suggesting that vaccination of young children might also decrease the incidence among older groups. In developing countries, the vaccine should play a vital role, especially during an epidemic. The use of immunoglobulin can't be discarded because this measure is important in some situations. Though the administration of vaccine offers a great number of benefits as no more cases were documented by any report however it is not a cost benefit intervention in developing countries like India. Therefore the government has to give stress and to invest in health education and information programs.

In the view of this, strengthening of school health services with permanent appointment of trained nurse who can look after the school children as well as sanitary conditions of school environment is essential to reduce the burden of diseases among school children and improve the health status of school children.

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