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Research Article

Seroprevalence of Hepatitis A Virus Infection in Children

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Abstract: Hepatitis A is one of the most common cause of hepatitis in paediatric age group and the most common cause of Fulminant Hepatic Failure (FHF) in children in India. Hepatitis A is a water born disease and its seroprevalence reflect the status of water sanitation & hygiene. High endemicity obviates the need for vaccine in the community but it is required as individual immunization. We studied 116 children in Outdoor Patient Department to know the seroprevalence of Hepatitis A Virus (HAV) total Antibodies and effect of various demographic and water sanitation variables on it. Study includes children attending Pediatric outpatient department with minor problems in medical college hospital. It is a descriptive, cross-sectional, sero-epidemiologic investigational study. Blood sample of randomly selected children was collected and Competitive ELISA test was done for detection of total (both IgM and IgG) anti HAV antibody using commercial available ELISA kit. The statistical analysis was performed by chi-squared test using Epi Info software 3.5.4.Version 2012. Seroprevalence in Children from upper social class was 54.5% Vs 87.2% in lower social class (p=0.00075). Among children from rural background 90.9% were seropositive Vs 77.1 % among urban children. Mother's education above and below secondary level had a seropositivity for HAV in children up to 69.23% and 87.1% respectively. Method of water treatment using Boiled water, Mechanical filtration, filtration plus UV treatment and no treatment had a seropositivity of 50.0% , 83.33% , 37.5% and 84 % respectively(p= 0.0036). Seropositivity was highest in water source using Municipal bore well pipeline88.88% followed by municipal dam water through pipeline79.16% and personal bore well 68.16% (p= 0.026). In conclusion, children of this geographical area have high seroprevalence for HAV antibodies at younger age with a significant difference between social classes and water source and treatment methods. Very high seroprevalence at a younger age is observed. Water sanitation needs to be improved and immunization in low seroprevalence group children should be recommended.
Keywords: Hepatitis A virus, Seroprevalence, Water sanitation

INTRODUCTION

Hepatitis A virus (HAV) is a major cause of disease throughout the world, with an estimated 1.5 million cases annually [1]. Hepatitis A virus (HAV) is endemic in many developing countries, where prevalence can approach 100% in children by 5 years of age [2].

The hepatitis A virus is an enterically transmitted virus and is the major cause of acute viral hepatitis in children. Water source has a very important effect on seroprevalence [9]. In areas of high endemicity most of the children are exposed to the virus and the consequent acquisition of antibodies against the virus confer lifelong immunity. Most infections in children of younger age are asymptomatic or have mild, nonspecific manifestation (e.g. fever) that is indistinguishable from other viral infection. With increasing age symptomatic acute infection is more common; chronic HAV infection does not occur [3].

In India limited epidemiology data are available on HAV infection, with a seroprevalence of antibody to HAV exceeding 90% in adults. However there have been recent reports of decreasing prevalence of HAV in this country suggesting that the seroprevalence of HAV antibodies is becoming similar to industrialized world [5]. Consequently HAV vaccination has been recommended for school children and adults. It appears from data that population is no longer homogenous in seroprevalence. Difference in exposure may be due to the levels of socio-economic status of the family and the place of residence [10, 11, 13]. Monitoring the population would also provide information on enlarging cluster of susceptible older children and adults.

Hepatitis A is a major cause of fulminant hepatic failure (FHF) in children. In india it contributes to

approximately 50- 60% of the cases of FHF in children in contrast to <10 % in developed world [7, 8].

Clearly seroprevalence data relating to healthy pediatric population are necessary in order to assess the need for routine or mass vaccination [6]. Moreover in India the indication for HAV vaccination are not clear due to contradictory seroepidemiology data in children [12].

Data collected from India suggested that there are some pockets which show evidence of epidemiological shift from high hepatitis A IgG prevalence to a low prevalence. Further, epidemic outbreak in Kerala state compels us to identify other geographical regions which have potential for epidemic outbreaks through cyclical epidemiological survey [4-6].

Hence the need for a study in this region of India is required.

Subjects and Methods

This study was carried out in out-patient department (OPD), Department of Pediatrics of Medical College hospital over a period of one year from July 2011 – June 2012. It is a Descriptive, cross-sectional, sero-epidemiologic investigation study. Participants were Children belonging to same district from both urban and rural areas, between 1 to 15 years, attending Pediatric outpatient department with minor problems. Children who received HAV vaccination were excluded from study. Clearance and approval was obtained by ethical committee of the institution.

A total 116 children, fulfilling inclusion criteria were recruited in the study after taking written informed consent from parents or guardians of children.

Competitive ELISA test was done for detection of total (both IgM and IgG) anti HAV antibody using commercial available ELISA kit "DIA.PRO" (Diagnostic Bioprobes Srl Via Columella n 31 20128 Millano-Italy). The statistical analysis was performed by chi-squared test using Epi Info software 3.5.4.Version 2012. Differences were regarded as significant when $P < 0.05$.

RESULTS

A Total of 116 children were studied, divided into 3 age groups, 35 children were from 1-5 yr age group (30.17%), 39 children were from 6-10 yr of age group (33.62%) and 42 children came from age group 11-15 years (36.21%). Gender wise distribution consists of 72 male (53.45%) and 54 female (46.55%).

Study subjects were categorized into 5 groups according to their socioeconomic class by modified Kuppuswamy scale. Out of 116 subjects, 10 subjects were in upper (I) class, 12 subjects were in upper middle (II) class, 36 subjects were in lower middle (III) class, 32 subjects were in upper lower (IV) class and 26 subjects were in lower (V) class. Environmental distribution includes 33(28.44%) children from rural areas and 83(71.55%) subjects from urban areas. Seropositivity rises with advancement in age. Up to 5 years age almost half of the subjects were susceptible for HAV infection whereas in higher age group almost all children acquired anti HAV antibodies.

Table 1: **Age-wise distribution of seropositivity of Anti-HAV Antibodies**

Age in years	No. of cases tested 116 (100%)	Anti-HAV antibody positive No. 94 (100%)	% Positivity
1 – 2 yrs	5	1	20.00%
2 – 3 yrs	8	2	25.00%
3 – 4 yrs	7	5	71.42%
4 – 5 yrs	9	7	77.77%
5 – 6 yrs	6	4	66.67%
6 – 7 yrs	6	5	83.33%
7 – 8 yrs	9	9	100.00%
8 – 9 yrs	12	8	66.67%
9 – 10yrs	8	8	100.00%
10 – 11 yrs	4	4	100.00%
11 – 12 yrs	13	12	92.30%
12 – 13 yrs	10	10	100.00%
13 – 14 yrs	9	9	100.00%
14 – 15 yrs	10	10	100.00%

In this study difference of positivity for anti-HAV antibody among males and females was not statistically significant ($p= 0.362$).

Out of 33 children from rural background 30 (90.9%) were seropositive for HAV antibody compared to 64 (77.10%) out of 83 children from urban or semi-urban background. The difference of positivity for HAV

antibody among urban and rural children was statistically significant (p= 0.043).

Significantly lower seroprevalence 69.23% (27/39) was observed in children with maternal education up to secondary and higher level compared to 87.10% (67/77) in children with maternal education below secondary level or uneducated. Father's education was not significantly associated with seropositivity.

Table 2: **Correlation of parent's education with seropositivity**

Education of parent	Total no.	Anti-HAV positive		p value
		No.	%	
Mother's education				
Below secondary	77	67	87.10	0.013
Secondary and above	39	27	69.23	
Father's education				
Below secondary	79	66	83.54	0.164
Secondary and above	37	28	75.67	

Out of total positive cases majority (87.23%) belongs to modified Kuppuswamy scale class III, class IV and class V, suggesting a higher incidence of sub clinical infection among lower middle and lower socioeconomic strata group. Among a total of 22 children belonging to upper socioeconomic class 12 (54.50%) were seropositive for anti-HAV antibody compared to 82 (87.2%) out of 94 children belonging to lower socioeconomic class this difference was statistically significant with a P value of 0.00075 (Table 3).

Table 3: Correlation of Seropositivity of anti-HAV antibodies with Socio-economic class (SEC)

SEC according to modified kuppuswamy's scale	Total no. of cases 116 (100%)	Total Anti-HAV antibody test positive 94 (100%)
I (Upper)	10 (8.62%)	4 (40.00%)
II (Upper Middle)	12 (10.34%)	8 (66.67%)
III (Lower Middle)	36 (31.03%)	30(83.33%)
IV (Upper Lower)	32 (27.58%)	27(84.37%)
V (Lower)	26(22.41%)	25(96.15%)

Children who had a water source with pipeline supply had a higher seropositivity in comparison to personal bore well in their own household (Table 4).

Study of water treatment methods reveals that seropositivity was 50.0% when children had boiling of water at home, 83.33% when children had mechanical filtration of water at home and 37.5% when children were using filtration combined with UV treatment of water. Majority were not using any method of water treatment and 85.71% of them were seropositive for HAV antibodies (Table 5).

Table 4: Correlation of source of water supply with seropositivity of anti-HAV antibodies

Source of water supply	Total no.	Anti-HAV positive		p value
		No.	%	
Municipal bore well with pipeline	54	49	88.88	0.026
Dam water with pipeline supply	24	19	79.16	
Personal bore well in home	38	26	68.16	

Table 5: Correlation of seropositivity with method of water treatment at home

Method of water treatment	No. of cases 116 (100%)	Anti HAV Ab +ve No. (%)	p value
No treatment at home	98 (84.48%)	84 (85.71%)	0.0036
Boiling	04 (3.44%)	02(50.00%)	
Chlorine treatment	00 (00%)	00 (00%)	
Mechanical filtration	06 (5.17%)	05 (83.33%)	
Filtration + UV treatment	08 (6.89%)	03 (37.50%)	

DISCUSSION

Prevalence of positivity for HAV antibody increases with age and majority of subjects above age of 5 years were positive for HAV antibodies is because of subclinical infections in early age. Seroprevalence in all age groups were relatively high in this study compared to other studies except the study by Rakesh *et al*. [5] from northen India who showed high endemicity in Northen India. Improvement of hygiene and socioeconomic conditions has undoubtedly contributed to intermediate endemicity in our population. In contrast to present study finding in a recent study done by C P Rath *et al*. [10] showed low seroprevalence in all age groups which reflects the impact of living standards and environmental hygiene on prevalence of infection. This study also showed a significant transition of positivity for anti HAV IgG in age group 3 to 4 years in similar to our study in which significant transition of seropositivity observed in age group 3 to 5 years.

In this study difference between urban and rural areas was statistically significant, the finding suggests an improved hygiene, sanitation and socioeconomic condition of the urban children who are more prone to the clinical disease of hepatitis A. Findings on Parents education reflects the higher educated mother has more impacts on the prevention of infection in her child as compared to father because mothers are more involved with food hygiene and water sanitation of children.

Statistically lower seroprevalence in higher socioeconomic class is similar to those reported by CP Rath *et al*. [10] and M Ahmad *et al*. [14] is the reflection of the fact that higher socio-economic groups have better access and affordability to food hygiene and water sanitation. This finding emphasizes the fact that food and water sanitation is still very far in lower social class.

Finding higher seroprevalence in children receiving pipeline supply of water suggest probably a contamination while carrying water from outside source to the house.

We recommend that looking at the vast variation over different parts of the country HAV seroprevalence of every small geographical area should be assessed in order to evaluate the need for mass immunisation.

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