

## Original Research Article

# Seroprevalence of hepatitis a virus antibody in 11-15 years old children in Vijayawada and age-related incidence of hepatitis a virus in GGH, Vijayawada

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**Received:** 01 February 2021

**Revised:** 16 February 2021

**Accepted:** 17 February 2021

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## ABSTRACT

**Background:** To estimate seropositivity of hepatitis A virus Ig G antibody (HAV Ig G antibody) in 11 to 15 years aged children in Vijayawada.

**Methods:** The study group includes 265 consecutive children aged 11 to 15 years attending GGH, Vijayawada and had a blood sample taken for any reason. The serum samples collected were screened for Anti HAV IgG antibody using commercially available Elisa kit (WANTAI). Information related to various socio demographic factors also were elicited by interview method. All the Anti-Hepatitis A virus IgM antibody positive individuals list are collected from 1st July 2015 to 1st August 2017 and were categorized based on age and analysed.

**Results:** The total seropositivity against Hepatitis A virus is 71%. The number of children in the urban population showing IgG antibodies is lower compared to that of rural population (p value-0.028). The highest number of Hepatitis A virus infected population (positive IgM) is between 10-14 years (50), followed by 15-19 years (45) and 5-9 years (43). This shows that there is increased risk of infection in the older age group and there is a shift to 2nd and 3rd decade (p value – 0.045).

**Conclusions:** The seropositivity of HAV IgG antibody in children aged 11-15 years is 71% in Vijayawada. Seroprevalence in the nearby area, Chennai, ten years back was found to be 95% by 12 years of age. This indicates there is a shift from high to intermediate endemicity in Vijayawada. There is need for vaccination in the susceptible individuals.

**Keywords:** Seroprevalence, Hepatitis-A, Anti HAV Ig G, Hepatitis-A vaccine

## INTRODUCTION

In India, hepatitis-A is an endemic infection with most of the population infected in early childhood. In children it is usually an uncomplicated infection requiring only supportive management. The severity of infection increases with age

There is some evidence that improvement in economic and living standards and better hygiene conditions has led to shift of Hepatitis A infection from first decade of life

to second and third decades.<sup>1</sup> This shift is termed as epidemiological shift. This epidemiological shift leads to increased incidence of Hepatitis A infection in adolescents and young adults which results in high risk of liver failure.<sup>2</sup>

To reduce the mortality and morbidity caused by Hepatitis A infection in young adults led to development of several vaccines. The first vaccine for Hepatitis A was developed in 1995. This is an inactivated whole virus vaccine and is costly. At present Hepatitis A vaccine is

recommended as universal vaccination in developed countries. But in developing countries like India, it is recommended only in high-risk groups as an additional vaccine. Some studies done previously in India showed that there is an epidemiological shift in acquiring Hepatitis A infection that is the adolescents and young adults are susceptible and hence there is a need for including Hepatitis A in National immunization schedule. There is necessity to broadly assess the seroprevalence of HAV infection in India, make cost profit analysis of HAV vaccine and institute guidelines for HAV vaccination to reduce the morbidity and mortality caused due to the shift. Vijayawada is the largest city in Andhra Pradesh state and is endemic for hepatitis-A infection.

### Objective of the study

The present study is conducted to estimate the seroprevalence of hepatitis-A virus Ig G antibody in Vijayawada and this study helps us to take a decision regarding hepatitis-A vaccination. Secondary objective is to study age related incidence of hepatitis-A infection at GGH Vijayawada.

### METHODS

The cross-sectional study is done in Government general hospital, Vijayawada from 1st July 2015 to 30<sup>th</sup> June 2017. Study includes Two hundred and sixty-five consecutive children aged 11 to 15 years attending paediatric OPD or admitted in GGH, Vijayawada who fulfilled the inclusion criteria and had a blood sample taken for any reason. Children who were vaccinated with hepatitis A vaccination and known case of liver and biliary disease were excluded from the study. 2ml of blood was collected and stored at -20°C. The serum samples collected from them were screened for Anti HAV Immunoglobulin G antibody using commercially available Elisa kit for Ig G antibody to hepatitis A virus (WANTAI). The sensitivity and specificity as stated by the manufacturer of the kit is 100% and >99% respectively.

Information related to various socio demographic factors also were elicited by interview method. The socio-demographic factors like educational status, occupation, monthly family income and place of residence were collected. The study population was categorized into urban and rural population based on the following criteria. Urban locality in India is defined as "Towns (places with Municipal Corporation, Town committee, Municipal area committee, Cantonment board or Notified area committee) and all places having a density of not less than 1000 persons per square mile or 390 per square kilometre, 5000 or more population, and at least three fourths of adult male inhabitants are employed in livelihood other than agriculture.<sup>47</sup> Socio economic status has been demarcated as the place that an individual or family resides in with orientation to the fundamental average principles of culture, substantial possession,

revenue and involvement in group activity of the community. The Kuppuswamy scale in India is primed based on monthly family income, education and occupation which are the three most important variables relevant to socio economic status.<sup>49</sup> In this study, we used Kuppuswamy scale to categorise study population into lower, middle and upper class.

For the study of age-related incidence of hepatitis-A infection at GGH Vijayawada, all the Anti-Hepatitis A virus Ig M antibody positive individuals list are collected from 1<sup>st</sup> July 2015 to 1<sup>st</sup> August 2017 and were categorized based on age. Ethics approval for the study was given by institutional ethics committee, Siddhartha medical college, Vijayawada. Statistical analysis was done using SPSS 16 software.

### Sample size

A total 211 and above. Expecting a prevalence of 95% as in previous study in Chennai the sample size was estimated using the formulae  $4pq / (\text{error})^2 = 211$ . p- prevalence, q- (1-p), allowable error is taken as 3%.

### RESULTS

The study population includes 265 children between 11 and 15 years. All the sera of 265 children were tested for Hepatitis A virus Ig G antibody using ELISA technique. The total seropositivity against Hepatitis A virus is 71% (Table 1). Among the sera tested, positive prevalence is almost same between males (71%) and females (72%). There is no difference in the seroprevalence of Hepatitis A virus antibody between gender groups. The seroprevalence of Hepatitis A virus Ig G antibody when analyzed according to age did not show any significance. The seropositivity in 11 years old children is 78% and in other age groups it ranges from 66-74%.

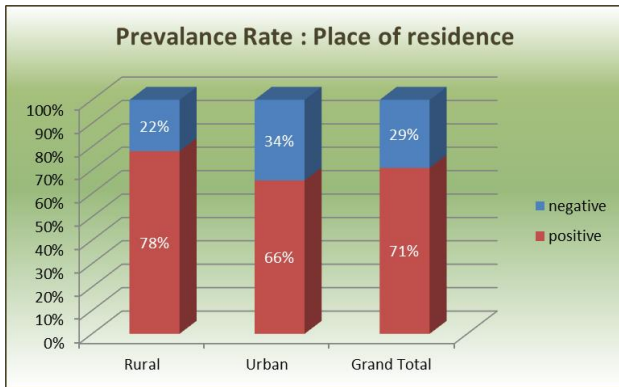
**Table 1: Seroprevalence of hepatitis-A virus Ig G antibody in 11 to 15 years old children in Vijayawada.**

Hepatitis-A virus IgG antibody	Number of people	Prevalence rate (%)
<b>Tested negative</b>	76	29
<b>Tested positive</b>	189	71
<b>Grand total</b>	265	100

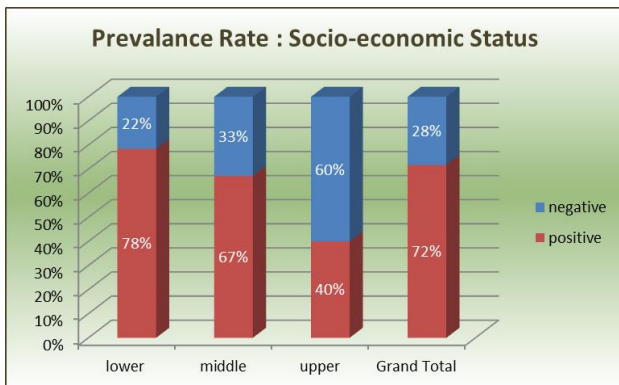
The number of children in the urban population showing Ig G antibodies is lower compared to that of rural population. Seroprevalence of Hepatitis A virus Ig G in 11-15 years old children from urban population is 66% and that of rural population is 78%. The p value being 0.028 shows significant association between hepatitis A virus infection and place of residence (Figure 1).

The antibody response is showing an inverse relation with the living standards of the population under study. The seroprevalence of Hepatitis A virus Ig G antibody is 40% in upper class, 67% in middle class and 78% in

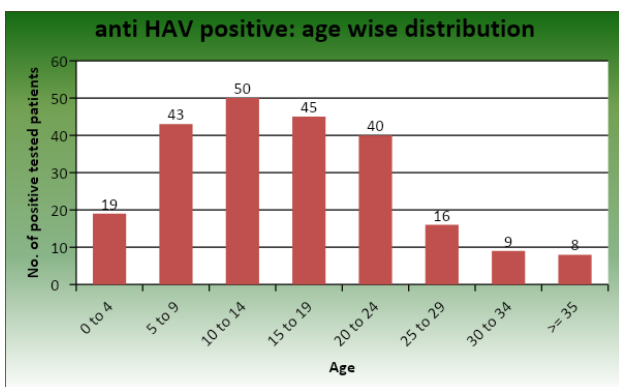
lower class. This is statistically significant with a p value of 0.044 (Figure 2).



**Figure 1: Association of hepatitis-A virus infection with place of residence.**



**Figure 2: Association of hepatitis-A virus infection with socio-economic status.**



**Figure 3: Incidence of hepatitis-A virus (ANTI HAV Ig M positive) infection in different age groups.**

The total samples sent for processing Hepatitis A virus Ig M antibody during two years period (1<sup>st</sup> July 2011 to 1<sup>st</sup> August 2013) in PSG Hospital is 1227. The number of samples positive for Hepatitis A virus Ig M antibody is 230. The Incidence of Hepatitis A virus infection is 18.7%. The age range of hepatitis A virus infection is 1 to 50yrs. lowest age noted is 1 year and highest age is 50

years. The incidence of hepatitis A infection is more among  $\geq 15$  year age group. This shows there is an epidemiological shift of Hepatitis A infection from younger to older age group. The highest number of Hepatitis A virus infected population is between 10 – 14 years (50), followed by 15-19 years (45) and 5-9 years (43). This shows that there is increased risk of infection in the older age group and there is a shift to 2<sup>nd</sup> and 3<sup>rd</sup> decades (Figure 3).

## DISCUSSION

Analysis of current and historical information about hepatitis-A infection patterns shows that there is a decline in hepatitis-A seroprevalence in younger age group and there is a shift of infection to 2<sup>nd</sup> and 3<sup>rd</sup> decades. Studies also show that there is a strong association between socioeconomic improvements, place of residence, improving water coverage with decreasing Hepatitis A virus infection. But in India there is a necessity to identify these susceptible pockets and decide on vaccination based on cost benefit analysis. A study done in 2000 by Das et al at Delhi showed the seropositivity of hepatitis A to be 71%.<sup>3</sup> But at the same time studies done in South by Mohanavalli et al in Chennai showed that 95% of children are affected by 12yrs of age.<sup>4</sup> Mathew et al study in 1998 done in Kerala showed a seroprevalence of 48.3% in <15yrs.<sup>5</sup> This study has reported the lowest seroprevalence rates of 4.5% and 10.3% below 5 year. This study is a contrast amidst other studies from across the country which has shown the seroprevalence between 60-80% in children below 5 years. India being a highly endemic country till date, epidemics are uncommon because most adults have acquired immunity. Several outbreaks of Hepatitis A have been recorded in past decade in various parts of India. The outbreaks were reported in children from rural and semi-urban areas of Maharashtra (2002-2004), among adults in Kerala (2004), and in children and adults in Shimla (2007).<sup>5</sup> As the area moves from high to intermediate endemicity, more adults remain susceptible to Hepatitis A infection. This led to opinion that there is need to identify the susceptible pockets of Hepatitis A infection and provide vaccination in that societies. The present study shows a seropositivity of 71% against Hepatitis A virus. There was no difference in the seroprevalence between males and females. Among the 11 to 15 years old children, they are further subdivided into 11yr, 12yr, 13yr, 14yr and 15yrs age groups and their seropositivity is 78%, 66%, 70%, 74%, 66% and 71% respectively. The range of seropositivity is between 66% - 78%. The epidemiology of Hepatitis A was classified in high, intermediate, low and very low endemicity. In areas of high endemicity, infection generally occurs in early childhood. The seroprevalence pattern in India during 1984 was 90% by 10 years of age and the newborn cord blood antibody levels were 100%, this shows that India was a highly endemic area. The declining levels of seropositivity against Hepatitis A virus indicate that there is change in the endemicity pattern. This indicates that

there are more susceptible individuals at older age groups. The child immunity rate is used as an indicator; declining seroprevalence against Hepatitis A virus in 10-14 year age group indicates that there is higher exposure rate in older age groups and increased risk of severity of the disease. According to this using the child immunity rate in the present study, it falls under medium endemicity group indicating that there is a shift from high to medium. Large outbreaks occur because of high rates of virus transmission and large number of susceptible pockets. According to Mathur et al article which recommends consideration of cost of vaccinating a group of people must be equal to or less than the cost of testing the entire group plus the cost of vaccinating the non-immune.<sup>6</sup> At the current prices estimated prevalence of HAV antibody in a particular age group >50% it is worthwhile to screen the individuals before recommending HAV vaccine. Based on this recommendation as the seropositivity according to this study is >50%, it is better to do a pre vaccination test before vaccinating for Hepatitis A.

There are many studies showing the association of rising socioeconomic status, place of residence, improvements in water resources and development of a vaccine with Hepatitis A seroprevalence rates. A study done at Pune considering the socioeconomic status and place of residence which showed a decline in the seropositivity in the higher income class in urban areas between the periods of 1982 and 1998 respectively.<sup>7</sup> The present study shows a significant decline in the antibodies in the urban population compared to the rural population. This was explained to be due to improved water resources, sanity and socioeconomic status in urban locality as Hepatitis A is an infection which spreads through fecal-oral route. The higher levels of Hepatitis A virus seropositivity in rural area have been strongly related to water supply differences. Seropositivity against Hepatitis A virus in 11 to 15 years old children from urban population is 66% and that of rural population is 78%. The P value being 0.028 shows significant association between Hepatitis A virus infection and place of residence. The association of Hepatitis A virus infection with socioeconomic status was also found to be significant with p value of 0.044. Seropositivity against Hepatitis A virus is 40% in upper class, 67% in middle class and 78% in lower class. This tells us the susceptible pockets are mainly urban population and upper socioeconomic strata.

The list of individuals positive for Hepatitis A virus IgM were collected at GGH, Vijayawada and they were categorized based on age. The total number of Hepatitis A infection positive cases is 230. The lowest age of presentation of Hepatitis A infection is 1 year and highest age is 50 years. The cases were further categorized based on age into 0-4 years, 5-9 years, 10-14 years, 15-19 years, 20-24 years, 25-29 years, 30-34 years and >35 years which included 19, 43, 50, 45, 40, 16, 9 and 8 respectively. The incidence rate in >15 years is 51%. This shows that there

is higher risk of infection in older age group and epidemiological shift of infection to 2<sup>nd</sup> and 3<sup>rd</sup> decades.

Limitations of the study include, ideally sera samples should have been collected in all age groups from 1-40 years for comparison which could not be done due to financial constraints. The follow up of all the patients who were diagnosed to have Hepatitis A infection should have been studied to compare the variations of severity of disease in younger and older age groups. The information regarding education and occupation could not be collected in twenty-one individuals.

Currently Hepatitis A vaccination in our country is advised only in high-risk groups.<sup>10</sup> It is an inactivated whole virus vaccine and is highly immunogenic. Cost benefit analysis shows that targeted vaccination is more economical than mass vaccination, particularly in high anti HAV prevalence. It is better to identify the susceptible individuals and vaccinate them. Based on the present study as the older age groups are susceptible to Hepatitis A virus infection, and studies show that Hepatitis A virus in older age group causes significant morbidity it is advisable to immunize children at adolescent age group after pre vaccination serological testing. This helps us to prevent the morbidity due to Hepatitis A infection in older age group.

## CONCLUSION

The seropositivity of Hepatitis A virus Ig G antibody is 71% in Vijayawada. There is a shift from high to intermediate endemicity. There is a shift of hepatitis A virus infection from 1<sup>st</sup> decade to 2<sup>nd</sup> and 3<sup>rd</sup> decades. This can be explained by the incidence rate of hepatitis A infection being 51% in >15 years. There is a need for vaccination in the susceptible individuals, which can be done by pre vaccination screening for Hepatitis-A Ig G antibodies. We can recommend Hepatitis A vaccination in the individuals who are negative for Hepatitis A virus Ig G antibody. There is no indication for including Hepatitis A in Universal immunization schedule. Improvement in socioeconomic status and place of residence showed decline in Hepatitis A seroprevalence.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee, Siddhartha Medical College, Vijayawada*

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**Cite this article as:** Anumolu S, Jarjapu K, Rahman MA. Seroprevalence of hepatitis a virus antibody in 11-15 years old children in Vijayawada and age-related incidence of hepatitis a virus in GGH, Vijayawada. *Int J Contemp Pediatr* 2021;8:440-4.