PREVALENCE OF HEPATITIS A ANTIBODIES IN WESTERN INDIAN POPULATION : CHANGING PATTERN

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Abstract. This report pertains to a retrospective study conducted between 1983 and 1995 at three time points to evaluate the prevalence of hepatitis A virus (HAV) infection in the population of Bhor Taluk, situated in western India. Serum samples from children and adults were tested for anti-HAV antibodies using blocking ELISA test. There was a significant decrease in anti-HAV prevalence among children aged 5-10 years in 1995 (87.36%) as compared to that of 1983 (97.58%) and 1987 (96.48%). All individuals >11 years of age were seropositive for anti-HAV antibodies. Anti-HAV prevalence was similar in the users of well water, but was significantly reduced in individuals supplied with piped water in 1995 (88.61%) campared with that in 1983 (98.77%). A significant decrease in anti-HAV positivity was noted in children from Bhor Taluk as compared to children from Pune bled in 1992. These results underline the need for periodic surveillance of seroepidemiology of hepatitis A to determine the measures for prevention and control of the disease.

INTRODUCTION

Hepatitis A virus (HAV) infection is most common cause of viral hepatitis in developing countries (Szmuness *et al,* 1977; Hawkes *et al,* 1981; Prince *et al,* 1985; Shrestha, 1986). In India, age related surveys for seroprevalence of antibody to HAV have demonstrated almost universal infection in early childhood and generation of life long immunity (Tandon *et al,* 1984; Arankalle *et al,* 1995; Thapa *et al,* 1995). The populations involved in these studies were from low, middle and high socioeconomic classes of multiple communities, mainly from urban areas. Though a very large proportion of India's population lives in rural and semi-urban areas, populations from such areas were rarely screened for exposure to HAV (Gandhi *et al,* 1981).

We conducted the present study to evaluate the prevalence of HAV infection in the population of Bhor Taluk, western India over a period of twelve years. The results represent retrospective analysis of the serum samples obtained during age stratified serosurveys in the years 1983, 1987 and 1995. The corresponding data was also compared with the prevalence in an urban population as reported in an earlier study (Arankalle *et al,* 1995).

MATERIALS AND METHODS

Study area and population

The population under study included both males and females residing in a Bhor town (1991 Census, 15,065) and 2 villages (populations 250 and 1,017) of Bhor Taluk located 65 km south-west of Pune. Primarily, school children and staff members were bled following informed consent of parents and school authorities. The test specimens consisted of blood samples from (i) children, aged 5-15 years bled in 1983 (n=188), 1987 (n=259) and 1995 (n=334) and (ii) adults, 16-74 years (n=64, 1983), 16-50 years (n=68, 1987) and 16-57 years (n=68, 1995). The steady increase in the number of school children bled reflected population rise and awareness among parents regarding education as almost 100% children were bled each time. All subjects in this study belonged to lower socio-economic class.

Anti-HAV testing

All serum specimens were stored at 20°C until tested. Anti-HAV was detected by a blocking ELISA test (Chitambar *et al,* 1996). Anti-HAV positive sera from 5-10 year old children were also tested for anti-HAV IgM (Chitambar *et al,* 1994).

Data analysis

The chi-square test and Fisher's exact test (for small size of samples) were used for statistical analysis.

RESULTS

Anti-HAV prevalence among population of Bhor Taluk in 1983, 1987 and 1995

As shown in Fig 1, the prevalence of anti-HAV among children aged 5-10 years was similar in 1983 (97.58%) and 1987 (96.48%) ($p > 0.05$). However,

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in this age group a highly significant decrease in the anti-HAV prevalence was noted in 1995 (1983 *vs* 1995, $p < 0.01$; 1987 *vs* 1995, $p < 0.01$). Anti-HAV seropositivity was seen in 100% individuals >11 years of age bled in 1983, 1987 and 1995.

Anti-HAV prevalence among populations of Bhor Taluk and sources of water supply

The data on anti-HAV prevalence among village and town populations supplied respectively with well water (villages) and piped water (town) was analysed statistically (Table 1). Anti-HAV seropositivity was similar in the users of well water in 1983 (98.88%) and 1995 (97.52%) ($p > 0.05$). On the other hand, individuals availing piped water supply showed a highly significant decline in overall prevalence of anti-HAV in 1995 (88.61%) as compared to that of 1983 (98.77%) ($p < 0.01$) (Table 1A). This reduction could again be attributed to a significant decrease in anti-HAV positivity in the age group of 5-10 years ($p < 0.05$) (Table 1B).

Anti-HAV IgM testing in children

A test for detection of anti-HAV IgM was performed on serum samples from 548 anti-HAV positive children aged 5-10 years. Absence of anti-HAV IgM in 99.45% samples demonstrated that exposure to HAV was not recent.

Anti-HAV status among Bhor and Pune children

In order to differentiate the extent of exposure to HAV in children (aged 5-10 years) from Bhor town (present study) and Pune city (Arankalle *et al*, 1995) the anti-HAV prevalences were compared at different time points. Anti-HAV positivity was found to be similar in 1982-83 (93.07% of 101 *vs* 96.72% of 61). However, a significant decrease in anti-HAV positivity was noted for children from Bhor town in 1995 (85.09%) as compared to children from Pune bled in 1992 (94.4%) ($p < 0.05$) (Fig 2). The highest reduction in anti-HAV positivity was identified in 5-6 years old children. The antibody prevalence in this group was 91.67% in 1992 and 78.7% in 1995 ($p < 0.05$).

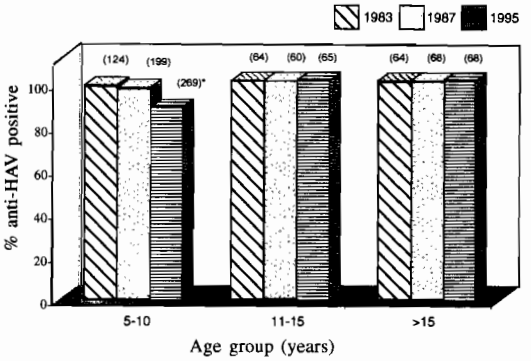
DISCUSSION

The present study compares the prevalence of anti-HAV in the Bhor Taluk of western India at three different points of time over a period of twelve years. It is evident from the results of serosurveillance that the frequency of seroconversions decreased during this period. This is the first report documenting reduction in the extent of exposure to hepatitis A virus in a small proportion of population of India. The spread of feco-oral/waterborne infections of hepatitis A is facilitated by crowded living and low hygienic and sanitary conditions resulting in exposure to HAV in early life (Brain *et al*, 1980). In India, wherein 100% exposure to HAV has been shown by the age of 10 years (Arankalle *et al*, 1995), any shift in exposure pattern is expected to be exhibited initially in the less than 10 year age group. Therefore, in the present study emphasis was given to this age group. Hepatitis A seroconversions detected in Bhor children aged 5-10 years were ~98% in 1983. These were closer to those observed for the other age groups of 1983 and paralleled with the contemporary seroprevalence of anti-HAV in the rural population of north India (Gandhi *et al*, 1981) and urban population of southwest India (Arankalle *et al*, 1995). The anti-HAV prevalence in the Bhor population

Table 1
Seropositivity to anti-HAV among well and piped water users in Bhor Taluk.

	Source	1983	1995
(A) Cumulated age groups			
Villages	Well water	88/89 (98.88)	118/121 (97.52)
Bhor town	Piped dam water	161/163 (98.77)	249/281 (88.61)[a]
(B) 5-10 year age group			
Villages	Well water	62/63 (98.41)	58/61 (95.08)
Bhor town	Piped dam water	59/61 (96.72)	177/208 (85.10)[b]

Note: Table represents data as no. positive/no. tested.
Figures in parentheses indicate percentages.
[a] $p < 0.01$; [b] $p < 0.05$.



Figures in paranthesis indicate no. of samples examined.
*p < 0.01 (1995 *vs* 1983 or 1987 in the same age group).

Fig 1–Age specific prevalence of anti-HAV in healthy population of Bhor Taluk, Western India.

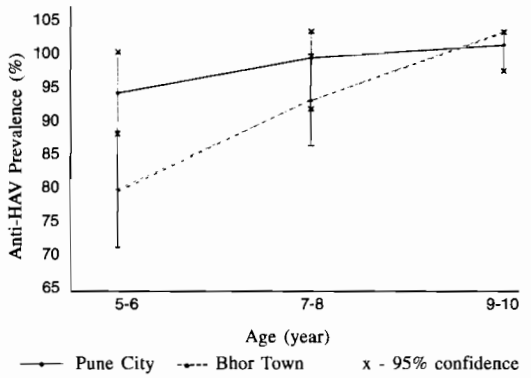


Fig 2–Comparison of age specific prevalence of anti-HAV (with 95% confidence intervals) among children from Pune city (1992) and Bhor town (1995).

continued to be the same in 1987. Reduction in antibody prevalence occurred among children aged 5-10 years in 1995 suggesting that there has been a decrease in hepatitis A transmission in Bhor town during the past few years. This reduced rate of hepatitis A infection showed no correlation with the seroprevalence recorded in urban (Pune) children in whom age specific antibody patterns were found unchanged over a decade (Arankalle *et al,* 1995). The differential anti-HAV prevalences may be related to population density, maintenance of water treatment plants and pipes supplying water in these areas.

The falling pattern of hepatitis A immunity in urban and/or rural children in Taiwan and Thailand was accompanied by progress in economic status and in health education leading to improvements in hygienic conditions, better water supply and public sanitation (Hsu *et al,* 1985; Innis *et al,* 1991, Poovorawan *et al,* 1997). The information available from Bhor Taluk indicated that there was increase in the population in this area by 20%. However, a decrease in the family size was also noted in 80% of families. In both the villages, the deep wells were the source of water. There was absence of closed drainage and sewage disposal facilities. In Bhor town, the water source was a dam. The water was supplied through pipes. There was usage of common toilets which were shared among the families. Sewage disposal facilities included underground septic tanks and open drainage for the removal of waste water. In Bhor town, wherein piped water supply was available, a first generation water treatment plant involving filtration and chlorination was installed in 1976. An improvement program was initiated in 1990 which resulted in replacement of galvanized iron pipes by new cement pipes and addition of alum treatment and aeration in water treatment plant. Simultaneously the drainage facilities were improved by cementation of channels to avoid spread of waste water. The population (children) from this area showed a reduction in anti-HAV prevalence in 1995. This reduced transmission of hepatitis A appeared to be the result of multiple factors such as improvement in the quality of piped water, decrease in family size, improvement in personal hygiene and increase in education level. No change in the transmission of hepatitis A was noted in the villagers who continued to receive well water supply from 1983 to 1995. Whether further improvement in drinking water supply and other facilities such as sewage disposal and toilets in villages and also in town would enhance the decrease in exposure to HAV needs to be monitored. Such studies would be useful in defining the immunization priorities among children at risk of contracting type A hepatitis.

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