

PREVALENCE OF HEPATITIS A VIRUS AMONG SAUDI ARABIAN CHILDREN: A COMMUNITY-BASED STUDY

Rashed S. Al Rashed, FRCPC

HAV is endemic in Saudi Arabia, with about 90% of the adult population having positive anti-HAV. A population-based survey of hepatitis B virus markers provided an opportunity to determine the age-related prevalence of anti-HAV among Saudi children and examine some of the factors that influence its transmission in the community. The overall prevalence of anti-HAV is 52.4% of 4375 children tested. There was no significant difference in HAV prevalence between males and females (51.3% vs 53.5%). The age-specific rates, which were similar in both sexes, indicated the lowest rate in infants with a steady increase in the older age group. There was a marked regional variation in anti-HAV prevalence, the Eastern region showing the lowest prevalence (38.4%), while the Northwestern region showed the highest prevalence (67%). In nearly all the regions, rural inhabitants had a higher prevalence than urban residents. Socioeconomic factors had a significant correlation with the prevalence of anti-HAV, with the level of education of parents having the strongest influence on HAV prevalence. The high overall HAV prevalence in children confirms that Saudi Arabia is endemic for HAV infection, despite the recent improvement in the socioeconomic standards of its population. The pattern of HAV may be changing in Saudi Arabia as the prevalence has dropped in the Central province compared to previous reports. The need for the introduction of hepatitis A vaccination will be determined in the future definition of HAV epidemiology in Saudi Arabia. *Ann Saudi Med* 1997;17(2):200-03.

Hepatitis A virus (HAV) has a worldwide distribution. The prevalence varies from one population to another and is related to socioeconomic factors and living standards of the population.^{1,2} In the developing countries, HAV is acquired very early in life and nearly 100% of adults have detectable levels of antibody to HAV (anti-HAV). In such countries, epidemics of HAV are uncommon.^{2,3} In contrast, the epidemiology of HAV in the developed countries is characterized by a low prevalence among children and a large susceptible pool of adults being negative for anti-HAV. This pattern is associated with high standard of hygiene and sanitation.^{4,5} In countries which dramatically improved their socioeconomic status and standards of living, the susceptible pool may increase rapidly to such an extent that HAV becomes a major public health problem.⁶ Earlier surveys in Saudi Arabia indicated that HAV is endemic in Saudi Arabia, with approximately 90% of the adult population having positive anti-HAV.⁷⁻¹⁰

In the last 10 years, a major socioeconomic development has taken place in Saudi Arabia. There has been dramatic improvement in the levels of personal and

public hygiene and in the proportions of the Saudi population, and the impact of these changes on the prevalence of HAV infection has yet to be determined.

A population-based survey of hepatitis B virus markers, undertaken in 1989 as a baseline for a mass hepatitis B vaccination program,¹¹ provided an opportunity to determine the age-related prevalence of anti-HAV among Saudi children and to examine some of the factors that may influence its transmission in this community.

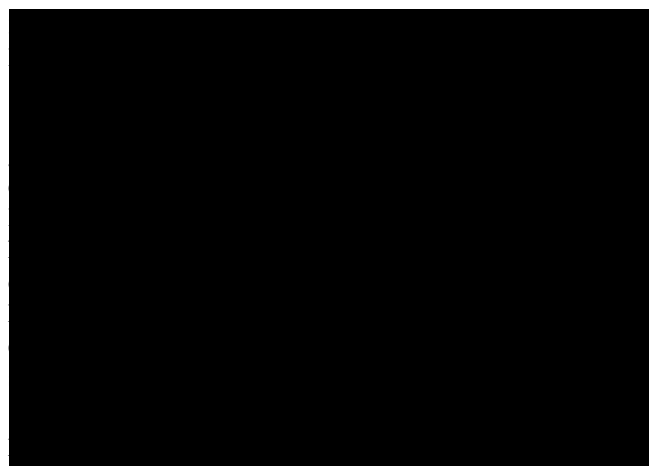
Methods and Population

Covering about 2.2 million square kilometers, and located in the Arabian Peninsula, Saudi Arabia had an estimated population of 10 million people in 1981,¹² almost equally distributed in the urban and rural areas. The significant improvement in the socioeconomic status within the last two decades is demonstrated by a well-developed road network, communication, water supply, distribution of electricity, as well as a comprehensive health care delivery system in the country, which has lessened the differences between the rural (village or town of less than 30,000 people) and urban populations. In some villages, the water supply is obtained from deep wells within compounds or from distribution by water tankers. There is no difference between rural and urban population with regard to ethnicity or to cultural and religious practices. In many of the areas, about 20% to

From the Department of Medicine, College of Medicine and KCUH, King Saud University, Riyadh, Saudi Arabia.

Address reprint requests and correspondence to Dr. Rashed S. Al Rashed, Division of Gastroenterology (59), P.O. Box 2925, Riyadh 11461, Saudi Arabia.

Accepted for publication 28 September 1996. Received 14 April 1996.



and that proportions of males and females are approximately equal. Assuming that the prevalence of HBsAg might be about 10%-20% in Saudi children and a standard error of 0.005, the sample size required was calculated to be 3600. To accommodate the proportion of tent dwellers (Bedouins), 20% was added, giving a projected total of 4320. It was decided to survey 10% of the estimated total households (1816), recruiting not more than two children from each household. The sampling method used for this has been described in detail previously.¹¹

Within each area, clusters defined by the boundaries of the catchment of the respective PHCC and households within these clusters were randomly selected and visited by well-trained survey teams, who carried an introductory letter from the Ministry of Health encouraging cooperation from parents. In each household visited, one or two children aged 1 to 10 years were recruited into the study. No eligible children refused to participate.

The field work was undertaken in December 1989, and January 1990. After informed consent, details relating to age, sex and educational status of each of the recruited children were recorded. In addition, information was obtained with regard to the number of children in the family, the position of the participant, the occupation and the educational qualification of the father or guardian. The investigators noted the type of house. Thereafter, about 5 to 10 cc of blood was obtained by venesection from the child. Serum samples were separated by centrifugation coded and stored at -70 C until needed for testing. Antibody to hepatitis A virus (anti-HAV) was detected using the ELISA kits from Abbott Laboratory (Chicago, Illinois).

The socioeconomic status of the child was taken as that of the father or guardian and classified from the "socio-economic score" derived from the type of house (mud- built or tent=1, apartment or ordinary house=2, villa=3); the father's education (primary or grade school or less=1, secondary/high school=2, university or professional qualification=3); father's occupation (from 1 to 6) on the nature of work, e.g., labourer=1, and trader=2, etc. A score

of less than 4 from a maximum score of 12 was classified as low socioeconomic status, 5-8 as middle and above 9 as upper class.

Chi-squared and Fisher's exact test were used for comparison of proportions.

Results

Anti-HAV was positive in 52.4% of the 4375 children tested in the survey (Table 1). The prevalence rates of anti-HAV in males (51.3% of 2358) and in females (53.5% of 2017) were not significantly different. As shown in Figure 1, the age-specific rates were similar in both sexes, with the lowest rate in infants with a steady increase in the older age groups.

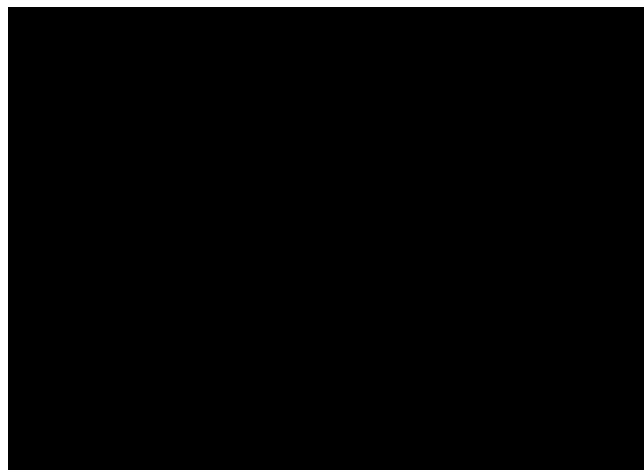
There was a marked regional variation in the anti-HAV prevalence (Table 1). Anti-HAV was lowest (38.4%) in the Eastern and highest (67%) in the Northwestern regions. In nearly all the regions, rural inhabitants had a higher prevalence than urban residents (Figure 2).

The prevalence of HAV infection in high socioeconomic class was 35%, middle class 48.5% and in low class 59%. Thus, socioeconomic factors had a

TABLE 1. Prevalence of anti-HAV according to sex and regions.

Province	Male		Female		Total	
	No.	%	No.	%	No.	%
Central						
Riyadh	452	38.3	348	39.9	800	39.0
Qassim	99	60.6	102	64.7	201	62.7
Hail	106	63.2	103	48.5	209	56.0
Total	657	54.0	553	51.0	1210	52.6
Eastern						
Al Hafouf/ Dammam	315	34.9	258	42.6	573	38.4
Northwestern						
Qarayyat	92	58.7	85	70.6	177	64.7
Tabouk	86	70.9	64	82.8	150	76.9
Madina	192	55.7	158	63.9	350	59.7
Total	370	61.7	307	72.4	677	67
Southwestern						
Makkah	129	55.8	111	54.1	240	54.95
Jeddah	238	51.7	218	50.5	456	51.1
Taif	100	19.0	100	19.0	200	19.0
Total	467	42.16	429	41.2	896	41.6
Southern						
Asir	265	45.7	211	43.1	476	44.4
Al-Baha	75	49.3	70	37.1	145	43.2
Gizan	158	81.0	125	82.4	283	81.7
Najran	51	78.4	64	79.7	115	79.1
Total	549	63.6	470	60.57	1019	62.1
Total	2358	51.32	2017	53.5	4375	52.4

FIGURE 1. Anti-HAV in Saudi children. Prevalence according to age and sex.



residents.

significant correlation with the prevalence of anti-HAV ($P < 0.001$). The level of education of parents had the strongest influence on HAV prevalence, where university-educated parents had a prevalence of 34%, secondary had 47.7% and primary or less educated parents had 57.3% ($P = 0.001$).

Discussion

There are only a few community-based surveys on HAV infection and to the best of our knowledge, this is the first such study in the Middle East on children. The overall HAV prevalence of 52.4% in children confirms that Saudi Arabia is endemic for HAV infection despite the recent improvement in socioeconomic standards. Although much higher than the reported rates (0-20%) in Western Europe and North American children,¹³ the prevalence of anti-HAV in Saudi Arabia is considerably less than the rate of 96% reported from Algeria,¹⁴ or 50%-100%^{3,15,16} among African children.

Intraethnic and regional variations have been noted to occur in the prevalence of hepatitis B virus (HBV), hepatitis D virus (HDV), and recently hepatitis C virus (HCV) infections.^{12,17,19} It is therefore not surprising that the prevalence of anti-HAV varied markedly from one region of Saudi Arabia to another. This variation may be explained in part by the diversity in socioeconomic standards despite the homogeneity of the population in cultural practices and habits. The "border" regions, e.g., the Northwestern and Southern provinces, have the highest prevalence, suggesting the influence of the interaction of the population with those of neighbouring countries with endemic HAV. The roles of geographic location and socioeconomic factors have been emphasized by different studies.^{1,2,13}

As has been documented in earlier studies from different populations, we found no relationship between anti-HAV and gender difference.^{3,6,20} An age-related increase of prevalence was apparent. The prevalence of 36% in children under three years of age rose to 63.8% in those above seven years of age. This is in agreement with earlier observations regarding the epidemiology of HAV in the developing world, which is characterized by acquisition of infection early in childhood.^{3,15,16} The higher HAV prevalence among rural dwellers in Saudi Arabia is partly explained by the difference in the nature of water supply. While nearly all urban areas are supplied by water pipes from a central reservoir, many villages depend on wells and tankers delivering water supplies. Similar urban-rural differences have been reported previously.^{3,13}

Three main epidemiologic patterns of HAV exist worldwide.² The first pattern is exemplified by the high endemicity in the developing world where by adult age, 90% to 100% are anti-HAV positive and, therefore, immune to infection. A second pattern occurs in countries such as in Scandinavia, where, because of high standards of hygiene and sanitation, HAV has been almost eradicated from both the young and adult population. Consequently, in the young a low prevalence and a relatively high susceptibility to infection is characteristic and the chances of HAV epidemics are relatively high. The third pattern occurs in countries such as in Europe and North America, where hygiene and sanitation have steadily improved over the years and, therefore, the prevalence of HAV in the population is less than 10%. In such circumstances, the incidence of HAV infection declines and when infection occurs, it affects adolescents and adults in whom there is associated clinical illness. Such a pattern has been observed in countries such as China, Cuba and Chile, in which major economic and social changes have occurred in recent years. It is apparent that Saudi Arabia may be entering this transitional pattern.

There has been no national, community-based survey in Saudi Arabia with which our findings could be compared to define the trend of HAV infection in this population. However, a study of children carried out in 1986¹⁰ reported a prevalence of 56% among Saudi children recruited from the Central Province. Our study indicates that the rate in the same population had dropped to 39% five years later. This suggests that the pattern of HAV may be changing in Saudi Arabia. Such noticeable changes have been noted in some countries.^{6,21,22}

The recent epidemic outbreak of hepatitis A virus among Saudi children indicates an emergency for a highly susceptible proportion of the population in parts of this country.²³ Effective surveillance is mandatory in order to prevent further reoccurrences. But since the majority of the population is immune against hepatitis A due to mainly subclinical childhood infection, a national vaccination program is not a priority now, although the HAV vaccine has been proven to be immunogenic and safe in preventing HAV infection in susceptible individuals.²⁴ The need for the introduction of a hepatitis A vaccination will be determined in the future definition of HAV epidemiology in Saudi Arabia.

Acknowledgements

The author wishes to thank Prof. Faleh Al Faleh and Prof. Banji Ayoola for their assistance and Rajasingh Samuel for his secretarial assistance.

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