

## Hepatitis A virus infections in Vojvodina

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### SUMMARY

Sera of 1000 persons in Vojvodina were tested with radioimmunoassay for antibodies against hepatitis A virus (HAV).

The morbidity and age incidence of positive findings have been analysed and compared with relevant findings in other countries. Below the age of 19 years the morbidity rates are higher (0.138 to 0.595 per mill) and the prevalences of seropositives are lower (17.1–64.0%) than the respective frequencies above that age (0.011 to 0.052 per mill and 85.7–98.7% respectively). Below the first year of life seropositivity is more frequent than in 1- to 14-year old children. After the first year until the age of 30–39 years the frequency of seropositives increases with increasing age up to a maximum of about 90%.

### INTRODUCTION

By means of sensitive serological tests (immune-adherence and radioimmune assay) it was established that actively acquired anti-HAV antibodies persist in the host for years or for life (Miller *et al.* 1975; Purcell *et al.* 1976).

Until now in Yugoslavia only adults have been tested for anti-HAV. Prevalences varying from 81 to 97% have been reported: from Bosnia and Hercegovina, 97 positives of 100 tested (Karlovac, Gaon & Szmunn, 1977); among blood donors in the Yugoslav Army, 92 positives of 114 tested (Mijušković *et al.* 1978) and from Croatia, 93 positives of 100 tested (Fišer-Herman, Jelić & Mihaljević, 1978).

This study shows the age-specific prevalence of anti-HAV in 1000 inhabitants (from 1 month to 87 years of age) of the province of Vojvodina (Serbia).

By the comparison of our results with relevant data from some other countries one can learn something about the dependence of the incidence of HAV antibodies on age, social hygiene, economic standards, geographic area and on other factors.

### MATERIALS AND METHODS

#### *Notification of HAV-morbidity*

The great majority of hepatitis A cases were reported from institutional or household outbreaks, with good epidemiological evidence for type A hepatitis.

Table 1. *Age distribution (%) of four parameters*

Age groups (years)	Population	Morbidity	Serologically tested positives	
- 4	129555 (6.6)	21 (8.3)	66 (6.6)	21 (2.7)
5- 9	137746 (7.0)	82 (32.3)	71 (7.1)	14 (1.8)
10-14	148943 (7.6)	85 (33.5)	76 (7.6)	32 (4.1)
15-19	174051 (8.9)	24 (9.4)	89 (8.9)	57 (7.2)
20-29	287052 (14.7)	15 (5.9)	147 (14.7)	126 (16.0)
30-39	310518 (15.9)	7 (2.8)	159 (15.9)	157 (19.9)
40-49	294128 (15.0)	11 (4.3)	150 (15.0)	148 (18.8)
50-59	181544 (9.3)	2 (0.8)	93 (9.3)	91 (11.5)
60-69	177493 (9.1)	7 (2.8)	91 (9.1)	87 (11.0)
70-	113646 (5.8)		58 (5.8)	56 (7.1)
Total	1954676 (100)	254 (100)	1000 (100)	789 (100)

### *Serum donors*

From January 1978 to March 1979 single samples of blood were drawn from 55 apparently healthy children and from 945 patients suffering mostly from pneumonia or from pyrexias of undetermined etiology. Before bleeding patients were examined clinically. None of them manifested symptoms or had a history of acute or chronic hepatitis.

The male to female ratio of serum donors was 684:316. According to urban-rural origin, socioeconomic status and standards of hygiene, the structure of the population sample tested matches the population of Vojvodina.

### *Serology*

The sera were kept frozen at  $-25^{\circ}\text{C}$  until examination.

The presence of anti-HAV was determined by the radioimmunoassay (RIA) described by Purcell *et al.* (1976). The reagents used and the working instructions followed were those supplied with the 'HAVAB' kit of Abbot Laboratories Ltd. The radioactivity was counted in a well-type gamma scintillation detector (Searle). Serum specimens having a count-rate smaller than the cut-off value were taken as positive.

The HBs antigen was determined by the reverse passive haemagglutination test (Schuurs & Kačaki, 1974).

## RESULTS

Table 1 shows age-specific distributions of the following parameters:

(1) the population of Vojvodina (census taken in 1971) and the serologically tested population sample (1000 persons) both had the same age distribution;

(2) morbidity rates for viral hepatitis A. The average morbidity amounted to 0.1299 per 1000 (through the official notification for 1978, a total of 254 cases being registered in Vojvodina);

(3) seropositiveness. A total of 789 positives were found among the 1000 persons tested.

Table 2. Age-specific frequency of seropositives and of reported morbidity rates

Age groups (years)	No. of positives per no. tested (%)	Morbidity rates per mill*
- 1	15/31 (48.3)	0.162
1- 4	6/35 (17.1)	
5- 9	14/71 (19.7)	0.595
10-14	32/76 (42.1)	0.571
15-19	57/89 (64.0)	0.138
20-29	126/147 (85.7)	0.052
30-39	157/159 (98.7)	0.023
40-49	148/150 (98.7)	0.037
50-59	91/93 (97.8)	0.011
60-69	87/91 (95.6)	0.024
70-	56/58 (96.5)	
Total	789/1000 (78.9)	0.130

\* Computed from data in Table 1.

The age distribution both of the morbidity and of the seropositives show a significant divergence from the age structure of the population in Vojvodina.

The morbidity rates below the age of 19 years are significantly higher than above that age.

In contrast to this, the distribution of seropositiveness below the age of 19 years proved to be significantly lower than the age-specific distribution of the population above that age.

Below the age of 19 years the age structure of morbidity is higher and that of seropositiveness is lower from the age structure of the population in Vojvodina. Above the age of 19 years the morbidity becomes lower and the seropositiveness higher than the age structure of the population.

The same findings are also well supported by the data shown in Table 2, which can be explained as follows.

During the first year of life, possibly due to the presence of passively transmitted maternal antibodies, the frequency of seropositives is higher than that found in children of 1 to 14 years old. Starting with the age of 1 year, up to the age of 30-39 the frequency of seropositives shows a significant correlation with the age of the serum donors.

After the age of 29 years the population of Vojvodina seems to have been maximally infected with hepatitis virus A. Under the 'critical age' of 19 years the frequency of seropositives is below the average frequency of positives in the total population (78.9%), while after the age of 19 years the frequency of seropositives is higher than 78.9%.

Data in Table 2 also show that the morbidity of the population below the age of 19 years is higher than the average morbidity of the whole population (0.13 per mill), while after the age of 19 years the morbidity rates are significantly lower than this.

All these findings, based on two independent sources of information (results of serological tests and reported morbidity rates), show a good agreement and make sound epidemiological sense.

## DISCUSSION

As expected, age groups showing low prevalence of seropositives (indicating a low level of cross-infection and high frequency of susceptibles) are associated with high morbidity rates, and vice versa. After the age of 29 years the population of Vojvodina becomes almost completely cross-infected and the morbidity rate falls below 0.05 per mill.

The age of maximal cross-infection is moving from childhood towards adulthood, depending on the geographic region (Szmuness *et al.* 1977), on the social hygiene, economic standards (Szmuness *et al.* 1976; Frösner *et al.* 1979) and on other epidemiologically relevant factors.

In Costa Rica (Villarejos *et al.* 1976) as well as in five Pacific Islands (Gust, Lehmann & Dimitrakakis, 1979) the maximal cross-infection is already reached by the tenth year of life. In several European countries, including Greece, as well as in the Melbourne area (Australia) maximal cross-infection is reached only after the 39th year (Gust, Lewis & Lehmann, 1978; Frösner *et al.* 1979), i.e. about 10 years later than in Vojvodina. According to the prevalence of seropositiveness (both age-specific and total), Yugoslavia seems to be in a situation similar to its neighbour Greece (Frösner *et al.* 1979).

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