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# Prevalence of hepatitis A virus antibodies in Central-Eastern Poland – a comparative study (1990-2012)

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### ABSTRACT

Hepatitis A virus (HAV) is an hepatotropic human picornavirus that is associated only with acute infection of liver. This pathogen is mainly transmitted through the faecal-oral route, by person-to-person contact, and also contaminated drinking water and food. This research presenting the comparative seroepidemiological study (1990/1999/2012) on HAV infection was carried out in population from south-eastern Poland. Anti-HAV was tested in 613 subjects from 0 to over 60 years of age and the results were compared with those observed in 1990 and 1989/99. We also analyzed the number of vaccinations in the past decade and their role in preventing disease.

### INTRODUCTION

Hepatitis A is a vaccine-preventable infectious disease, which is caused by the hepatitis A virus (HAV), the icosahedral-shaped, non-enveloped positive-sense RNA virus of the genus *Hepatitisvirus*, family *Picornaviridae* [8]. HAV is transmitted through the fecal-oral route by person-to-person contact or by consumption of contaminated food and/or water [2].

The incidence and age-adjusted prevalence of HAV differs geographically. Most developing countries show high endemicity rates [5]. However in developed countries declining incidence rates have been observed.

The aim of this study was to evaluate the prevalence of antibodies against hepatitis virus in the population of South-Eastern Poland in 2012 and comparison with earlier situation (1990 and 1998/99).

### MATERIAL AND METHODS

A total of 613 serum samples from patients at the age 0-60+ years were included in this study. All patients were hospitalized for various reasons (without infectious diseases) in hospitals in Lublin district. These sera were collected initially for viral diagnostic in our laboratory. The sera were tested for detection of anti-HAV antibodies. Antibody detection was performed using a commercially available test kit Hepavase A-96 (General Biologicals Corporation,

Taiwan; Germany) according to the manufacturer's instructions. The sera with a positive or borderline result were tested for a second time. This test is a quantitative enzyme-linked immunosorbent assay (ELISA), which does not differentiate between anti-HAV IgG and IgM. According to the manufacturer's information, the Hepavase A-96 assay has a diagnostic sensitivity of 99.8% and the diagnostic specificity of 99.5%.

The results were compared with earlier studies in 1990 and 1998/1999 [13]. The relationship between analyzed variables was calculated by chi-squared test ( $p$  values  $<0.005$  were considered statistically significant).

### RESULTS

A comparative seroepidemiological study shows that overall anti-HAV prevalence was 35.4% (ranging from 8.1% to 72.2%) vs. 30.6% in 1998/99 (ranging from 11.8% to 75.8%) and 58.4% in 1990 (ranging from 10.4% to 93.8%). The trends in age-adjusted rates of prevalence of anti-HAV are presented in Figure 1. In the period 1990-98/99-2012, the age specific prevalence of anti-HAV was decreased in all age groups (Tab. 1). The seroprevalence of anti-HAV is higher in older age. The lowest prevalence of anti-HAV was in the youngest age group – 8.2% in 1989/99, in children between 0-9 years of age, and 10.7% in 2012 (Tab. 2). We observed that a higher prevalence of antibody to HAV was in subjects older than 60 years of age (72.2%). Anti-HAV antibodies were more frequently detected in women than men (54% vs 42.6%). This difference was statistically significant ( $p < 0.05$ ). In adults antibodies were detected about 4.5 times more frequently than in children ( $p < 0.001$ ).

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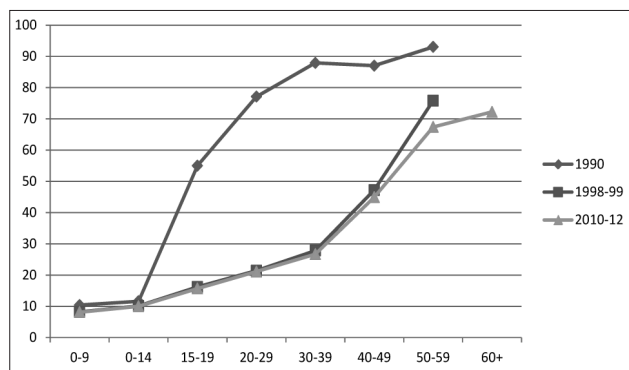


Figure 1. The age-adjusted prevalence of anti-HAV in the population of Central-Eastern Poland

Table 1. Prevalence of antibodies against hepatitis A virus

Age group in years	Male No positive/total number	Female No positive/total number	Total No positive/total number
0-9	3/35 (8.5%)	3/39 (7.6%)	6/74 (8.1%)
10-14	3/30 (10%)	4/40 (10%)	7/70 (10%)
15-19	6/40 (15%)	5/30 (16.7%)	11/70 (15.6%)
20-29	6/32 (18.7%)	9/38 (23.6%)	15/70 (21.1%)
30-39	8/35 (22.3%)	12/40 (30%)	20/75 (26.7%)
40-49	16/40 (40%)	19/38 (50%)	35/78 (44.9%)
50-59	30/46 (65.2%)	28/40 (70%)	58/86 (67.4%)
60+	30/44 (68.2%)	35/46 (76.1%)	65/90 (72.2%)

Table 2. Changing seroepidemiology of hepatitis A virus in Central-Eastern Poland in period 1990-2012(%)

Age Groups	Anti-HAV (%)		
	1990	1998-99	2010-12
0-9	10.4	8.2	8.1
10-14	11.6	10.1	10.0
15-19	55.0	16.2	15.7
20-29	77.1	21.4	21.1
30-39	87.9	27.8	26.7
40-49	87.0	47.2	44.9
50-59	93.8	75.8	67.4
60+	-	-	72.2

## DISCUSSION

In the past decade, our knowledge of the epidemiology of hepatitis A was expanded by many seroprevalence studies. In Europe and North America a continuous decline in frequency of hepatitis infection has been reported. The low endemicity of hepatitis A in Poland has been observed since 1997 and very low endemicity since 2002. Only 36 hepatitis A cases were reported in 2007. The morbidity was 0.09 per 100,000 inhabitants. In 2012 – 71 new cases and 1.18 – morbidity (Tab. 3).

The result of serological survey that was carried out in 895 subjects of Warsaw population at age 1-54 years showed the high proportion of susceptible to hepatitis A infection [6]. There was shown about 90% susceptibility among children at age 1-4 years, and about 80% among older children and adolescents aged below 19 years.

The present study demonstrates that the overall seroprevalence in children is low (10.7%). This seroprevalence is comparable with that described by Krumbholz et al. [9] in Germany (10.8%). Low seroprevalences among children

have been reported in France (5%), United Kingdom (10-13%), Slovakia (13-16%), Czech Republic (14-16%); whereas higher seroprevalences in Malta (16-21%), Lithuania (18-30%) and Romania (45-62%) [4, 10]. In south-east Italy (region Puglia) high susceptibility to HAV in children and adults up to age 30 (65-70%) was observed[3].

Table 3. Hepatitis A in Poland in 1997-2012

Year	Number of cases	Incidence per 100,000 people
1997	4045	10.47
1998	2011	5.20
1999	1024	2.65
2000	262	0.68
201	738	1.91
2002	338	0.88
2003	150	0.39
2004	95	0.25
2005	54	0.18
2006	109	0.29
2007	36	0.09
2008	208	0.55
2009	652	1.71
2010	155	0.41
2011	65	0.17
2012	71	0.18

HAV is endemic in south-east Asia and many parts of the world. The seroprevalence of HAV infection in Singapore with a very low level of transmission is similar to that of Japan (<1% in ages 0 to 19 years; 4% in ages 20 to 29 years), Australia (40% overall), New Zealand (<20% in ages 30 to 55 years), Canada (<20% in children), the United States (30% overall) [11].

In USA during 1999-2006, the overall seroprevalence of anti-HAV was 34.9% [7]. During 1999-2006, U.S.-born children living in vaccinating states had a higher seroprevalence.

Large epidemiological risk is related to the development of tourism especially in areas where hepatitis A is very common. An example of such a place is Egypt, where the incidence rate is one of the highest in the world. From November 2012 to March 2013, in several European countries (Denmark, England, Germany, the Netherlands, Norway and Sweden) a significant increase in the incidence of HAV among tourists returning from Egypt was observed. A low level of hygiene promotes the spread of the virus in Africa. Europeans who have not encountered HAV in their environment, and have not developed antibodies, are particularly susceptible to infection [12].

Our present study indicated that the prevalence of antibody to hepatitis A virus increased with age, ranging from 10.7% in children < 9 to 72.2% in adolescents over 60 years old. In adults, antibodies were detected about 4.5 times more frequently than in children. Our results showed sex-related differences. Anti-HAV antibodies were more frequently detected in women than in men. These differences were also described in other studies [7, 9].

Similar analysis undertaken in the period 2006-2008 in Wielkopolska region shows that 29.9% of all tested persons were seropositive [1].

The vaccinations are the basic method of prevention against hepatitis A. In the world, there are available inactivated vaccines, as well as preparations containing live virus. Much more common is the first kind of vaccination, despite the fact that the effectiveness of immunization is comparable. It is estimated that a double dose vaccine regimen 0-6 months or 0-12 months provides protection for at least 15 years [14].

Since 1996, vaccination against hepatitis A by formalin-inactivated vaccine is recommended in Poland for travellers to regions that have high or intermediate endemicity of hepatitis A, for people whose employment includes production or distribution of food as well as for children and adolescents. Total number of vaccinated persons during 1999-2012 is presented in Table 4. Frequency of vaccination is very low, in 2012 – 1‰ of total population.

Our seroprevalence study showed about 90% susceptible among children under 9 years of age, and about 80% among older children. Prevalence in high proportion of susceptible subjects in the population suggests the need of verification of the present recommendations for hepatitis A vaccination. A low level of immunity to HAV should be an indication for vaccination against hepatitis A virus.

**Table 4.** Number of vaccinated persons against hepatitis A in Poland, 1999-2012

Year	Number of vaccinated persons
1999	16 288
2000	14 304
2001	13 007
2002	23 225
2003	23 431
2004	31 258
2005	40 417
2006	40 002
2007	42 336
2008	46 758
2009	54 750
2010	47 046
2011	45 490
2012	39 362

Recent studies also point to the potential benefits of anti-HAV vaccine for post-exposure prophylaxis. In people under 40 years, vaccination prevented the occurrence of the disease in same level as specific immunoglobulins [15]. The advantage of the use of this therapy is the occurrence of smaller side effects in comparison to immunoglobulin, and also naturally produced antibodies persist for many years.

## CONCLUSIONS

1. The overall prevalence of anti-HAV was decreased from 58.4% in 1990 to 30.6% in 1998/99 and 35.3% in 2012.
2. In 2012 the prevalence of antibody to hepatitis A virus increased with age, ranging from 10.7% in children < 9 to 72.2% % in adolescents over 60 years old. In adults antibodies were detected about 4,5 times more frequently than in children.

3. Anti-HAV antibodies were more frequently detected in women than in men.

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