ARTIGO/ARTICLE

Prevalence of anti-hepatits A antibodies in children of different socioeconomic conditions in Vila Velha, ES

Prevalência de anticorpos anti-hepatite A em crianças de diferentes condições sócioeconômicas em Vila Velha, Estado do Espírito Santo

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ABSTRACT

This report describes the prevalence of anti-HAV antibodies in children from elementary school in the Municipality of Vila Velha, ES, Brazil. Anti-HAV antibodies were investigated by ELISA method in the serum of 606 children (four to fourteen years old) from three elementary schools, located in neighborhoods with varying household monthly income levels: São José School, 200 chidren, household income higher than US$700; São Torquato School, 273 children, US$200 to 300; and Cobi School, 133 children, less than US$200. From each children data on age, gender, skin color, sanitary conditions, frequency of contact with sea or river water and family history of hepatitis were recorded. Anti-HAV antibodies were present in 38.6% of all children, 9% in São José School, 49.1% in São Torquato School and 61.7% in Cobi School. Logistic regression analysis demonstrated a positive correlation of positive anti-HAV test with age, non white color of the skin, absence of sewage treatment and domestic water filter, and a past history of hepatitis. The prevalence of anti-HAV antibodies in school children in Vila Velha, ES, was lower than that observed in the same age group in North and Northeast Brazil and was significantly higher in children from families with low socioeconomic status. In addition the results indicate a changing epidemiologic pattern of hepatitis A in our country, with an increasing number of children and adolescents with high risk for HAV infection, mainly in high socioeconomic class. A consideration must be given to the feasibility of vaccination programs for children and adolescents in our country.

Key-words: *Hepatitis A. Hepatitis. Hepatitis A virus. Brazil.*

RESUMO

É descrita a prevalência de anticorpos antivírus da hepatite A em crianças de diferentes condições socioeconômicas matriculadas em escolas de ensino fundamental no Município de Vila Velha, na região metropolitana de Vitória, Estado do Espírito Santo. Os anticorpos anti-VHA foram pesquisados por ELISA no soro de 606 crianças (quatro a catorze anos de idade) de escolas fundamentais localizadas em bairros com diferentes rendas familiares: Escola São José, 200 crianças, renda familiar acima de US$700; Escola São Torquato, 273 crianças renda familiar entre US$200 e US$300; e Escola Cobi, 133 crianças, renda familiar menor do que US$200. De cada criança foram tomados dados sobre idade, sexo, cor da pele, condições sanitárias, freqüência de contacto com água de rio ou de mar e história de hepatite na família. Anticorpos anti-VHA estavam presentes em 38,6% de todas as crianças, 9% na Escola São José, 49,1% na Escola São Torquato e 61,7% na Escola Cobi. Análise de regressão logística demonstrou correlação entre o teste anti-HAV positivo com idade, pele preta ou mulata, ausência de esgoto domiciliar e de água filtrada e história de hepatite na família. A prevalência de anticorpos anti-HAV em Vila Velha foi menor do que a observada, no mesmo grupo etário, no Norte e Nordeste do Brasil, e foi maior nas crianças de piores condições socioeconômicas. Também, os dados indicam uma mudança no perfil epidemiológico da hepatite A no nosso meio, com um aumento do número de crianças e adolescentes com alto risco de infecção, especialmente nas classes socioeconômicas mais altas. Deve-se discutir a necessidade de vacinação para hepatite A nas crianças e adolescentes no nosso meio.

Palavras-chaves: *hepatite A. Hepatite. Vírus da hepatite A. Brasil.*

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Recebido para publicação em 3/2/2004
Aceito em 28/4/2005

The prevalence of hepatitis A infection varies according to hygienic conditions, being very high in developing countries where the majority of infections are clinically undetected, and have low or no significant morbidity. With improvement in hygienic conditions, these countries may enter a transition phase in which the virus is prevalent but the infection occurs in older individuals, like in areas of the world with high hygiene standards. This older susceptible population is more likely to experience morbidity when infected leading to a greater risk of symptomatic diseases[11 12 13 27].

The publications on the prevalence of hepatitis A in Brazil[1 3 4 6 8 10 14 21 22 23 24 25 26 28 29 30 31 32] have shown high prevalence in the North, Northeast and Central-West regions (the less developed regions of Brazil) and intermediate or low prevalence in the Southeast and South (more developed regions). They demonstrate the relationship between the prevalence of hepatitis A infection and the socioeconomic status of the sample for Brazil (data summarized in Table 1). In this way, the average age of infection is increasing in the South and Southeast regions, increasing the number of people at risk of symptomatic HAV infection and the rise of a significant public health problem.

Table 1 - Summary of reports on hepatitis A prevalence in different areas of Brazil, from 1984 through 2002.

Author	City, State or Region	Positive for anti-HAV(%) age (years)	
		age<10	age>10
Gayotto et al[14]	Amazon Region	73.3	95
Pannutti et al[22]	São Paulo, SP	40.3*/75**	91.9
Abuzwalda et al[1]	Rio de Janeiro, RJ	40*/90**	>90/90
Yoshida et al[32]	Rio de Janeiro, RJ	NA	97
Oliveira et al[21]	Rio de Janeiro, RJ	NA	54.3
Queiroz et al[25]	Goiânia, GO	80	92.9
Queiroz et al[26]	Goiânia, GO	69.7	NA
Ferreira et a[l8]	Porto Alegre, RS	7*/53**	17*/71**
Pinho et al[24]	Campinas, SP	NA	19.6*/95**
Vitral et al[31]	Rio de Janeiro, RJ	34%	66
Focaccia et al[10]	São Paulo, SP	28%	56
Struchiner et al[28]	Rio de Janeiro, RJ	12*/36.6**	NA
Clemens et al[6]	Manaus, AM	NA	92.6
	Fortaleza, CE	NA	76.5
	Rio de Janeiro, RJ	NA	55.7
	Porto Alegre, RS	NA	55.7
Paula et al[23]	Amazon Region	90	93.7
Trinta et al[29]	Rio de Janeiro, RJ	7#/38.1##	95#/93%##
Villar et al[30]	Rio de Janeiro, RJ	NA	54.02
Assis et a[l4]	Peixoto Azevedo, MT	86.4	NA
Almeida et al [2 3]	Duque de Caxias, RJ	60.3	89.4

* high socioeconomic class; ** low socioeconomic; # urban population; ## rural population; NA not available.

In Espirito Santo, a State in Southeast Brazil, there are no reports on the prevalence of hepatitis A virus (HAV) infection in the general population, but acute hepatitis A is frequent in children. It is the main cause of severe acute hepatitis diagnosed at a reference Children's Hospital in Vitória, the capital of the state[20]. For this reason we suspected that the prevalence of hepatitis A infection would be intermediate, especially in higher socioeconomic classes, in which the risk of infection would be shifting to older children and young adults. The detection of this shift is relevant for public health measures because the infection can be prevented with a vaccine.

This report describes age specific anti-HAV prevalence among school children 6 to 14 years old, living in three neighborhoods with different socioeconomic status, in the city of Vila Velha, one of the cities of Metropolitan Vitória.

MATERIAL AND METHODS

Study sample. The survey was performed in the City of Vila Velha, one of the municipalities that forms the metropolitan Vitória (Figure 1). The city has 346,878 inhabitants[17], living in the urban periphery (low our low-middle socioeconomic status) and in the downtown, near the beach (high socioeconomic status).

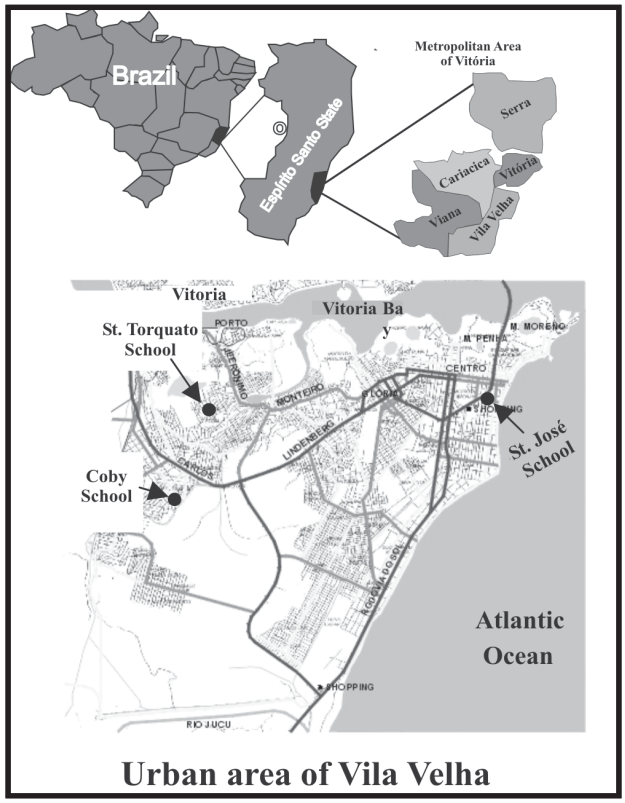


Figure 1 - Map of the Metropolitan Area of Vitória and the urban area of the City of Vilha Velha showing the location of the three elementary schools of the children enrolled in the study.

The sample was made up of 606 children enrolled in one of three elementary schools: (a) 200 children from one private school (São José School), located in the downtown area where children are from families with monthly income higher than US$700; (b) 273 children from a public school located in the area of São Torquato (São Torquato School), where children are from families with monthly income ranging from US$200 to US$300; and (c) 133 children from a public school located in Cobi (Cobi School) where children are from families with monthly income less than US$200.

This sample size is based on an expected infection rate of a least 70% in children of 7-10 years of age in developing countries.

Signed informed consent was obtained from the parents of the children. A questionnaire for sociodemographic data and previous exposures and illnesses was administered to parents and children, and all children were submitted to a clinical examination for evaluation of nutritional status. A 5ml blood sample was obtained and the sera stored at –20ºC.

Laboratory procedures. Serum samples were analysed for total anti-HAV using a commercial enzyme-linked immunosorbent assay kit (Hepanostik HAV Antibody, Organon Teknika, Baxtel, Netherlands), according to manufacturer's instructions.

Data analysis. For analysis the SPSS version 10.0 for Windows was used. Seroprevalence was stratified by school, according to age group, with calculation of 95% confidence intervals. The socioeconomic status was defined by family income and was confirmed by differences in body mass index and in skin color distribution. The odds-ratio with 95% confidence interval was calculated for the association with the different risk factors. Multivariate analysis by logistic regression was used to adjust for various risk factors of HAV infection.

RESULTS

The main sociodemographic data of the three samples studied are displayed in Table 2. There is no difference in gender distribution among the samples, but the number of children over ten years old is greater in the two schools of lower socioeconomic status. The significant differences observed in regard to availability of treated water (use of domestic filter), sewage facilities and body mass index confirm the expected socioeconomic differences among the three samples studied.

The results of the serology for total anti-HAV antibodies are displayed in Table 3. There is significant difference between the prevalence of positive serology in children from the families with higher incomes (São José School) and the two groups of children belonging to families with low-middle or low incomes. The age-specific anti-HAV prevalence (with 95% CI) are displayed in Figure 2, and demonstrate significant differences between the children with high socioeconomic status (São José School) in comparison with the children of the low-middle or low socioeconomic status. Multivariate analysis by logistic regression (Table 4) demonstrate that age, black color of skin, absence of domestic water filter, absence of sewage system and a past history of hepatitis were significantly associated with a positive anti-HAV serology.

Table 2 - Sociodemographic data of 606 children from three elementary schools of the City of Vila Velha, ES, Brazil.

Variables	St José school	St Torquato school	Cobi school	Total	p
Gender					
male	104 (52.0%)	122 (44.6%)	67 (51.4%)	293 (48.3%)	
female	96 (48.0%)	151 (55.4%)	66 (48.6%)	313 (51.7%)	0.211
Age (years)					
6	9	32	41	82	
7	42	53	21	116	
8	59	47	18	124	
9	56	50	8	114	
10	33	52	16	101	
11	1	17	12	30	
12	-	15	11	26	
>12	-	6	7	13	0.000
Skin color					
white	123 (61.8%)	97 (35.5%)	36 (27.1%)	256 (42.3%)	
mulatto	70 (35.1%)	136 (49.8%)	57 (42.8%)	263 (43.5%)	
negro	6 (3.0%)	40 (14.6%)	40 (30.1%)	86 (14.2%)	0.000
Use of filtered water					
yes	200 (100.0%)	196 (72.3%)	50 (37.5%)	446 (73.8%)	
no	0	75 (27.7%)	83 (62.5%)	158 (26.2%)	0.000
Sewages facilities					
yes	200 (100.0%)	185 (720.6%)	32 (24.6%)	417 (70.4%)	
no	0	77 (29.3%)	98 (75.4%)	175 (29.6%)	0.000
River or sea swimming					
yes	120 (60.0%)	94 (34.5%)	45 (33.8%)	259 (42.7%)	
no	80 (40.0%)	179 (65.5%)	88 (66.2%)	347 (57.3%)	0.000
Persons living in home					
1-3	119 (59.7%)	118 (43.3%)	45 (33.8%)	282 (46.6%)	
4-6	62 (31.1%)	99 (36.2%)	60 (45.1%)	221 (36.5%)	
>7	18 (9.1%)	55 (20.1%)	28 (21.0%)	101 (16.7%)	0.000

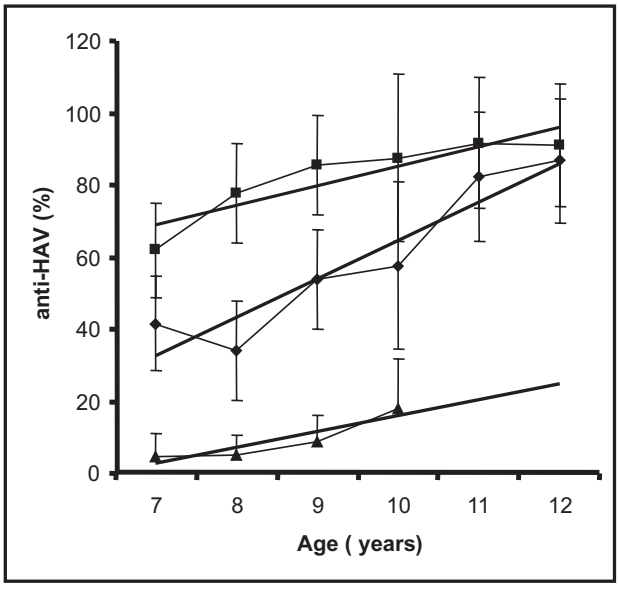
Table 3 - Anti-HAV antibodies in children from three elementary schools in the Municipality of Vila Velha, ES, Brazil.

	Anti-HAV				
	positive		negative		
School	nº	%	nº	%	Total
São José*a	18	9.0	182	91.0	200
St Torquato**b	134	49.1	139	50.9	273
Cobi***	82	61.7	51	38.3	133
Total	234	38.6	372	61.4	606

Socioeconomic status: * high,**low-middle and ***low

a: p=0,000 compared to St Torquato and Cobi;

b: p=0,017 compared to Cobi.



■Children with low socioeconomic status (Cobi school). ◆Children with low-middle socioeconomic status (St Torquato school). ▲Children with high socioeconomic status (St José school). Vertical lines indicate the 95% confidence intervals.

Figure 2- Age distribution (with tendency lines) of positive anti-HAV antibodies in children from three elementary schools of the City of Vila Velha, ES, Brazil.

DISCUSSION

The three samples studied are representative of 7 to 11 year old children living in Vila Velha because, according to the Education Department of the Municipality, 98% of children in this age group are enrolled in elementary school. In addition, the significant differences in regard to the number of people living at each home, the presence of sewage systems, utilization of water filter, body mass index and color of skin confirm the socioeconomic differences of the three samples studied. The gender distribution was similar in the three samples. The differences in regard to age were due to the greater number of children from low socioeconomic families that did not pass the elementary school examinations.

The prevalence of anti-HAV positive serology observed for all children (38.6%) was lower than that reported in North and Centerwest[1 4 6 14 22 32] and was more similar to that reported

Table 4- Multivariate analysis by logistic regression of anti-HAV risk factors in children enrolled in three elementary schools in the City of Vila Velha, ES, Brazil.

Variables	OR	95% CI	p
Age (years)			
7	2.086	1.085 - 4.013	0.028
8	2.704	1,411 - 5.181	0.003
9	1.802	0.948 - 3.427	0.072
10	reference		
Gender			
female	0.810	0.512 - 1.228	0.369
male	reference		
Skin colour			
white	0.409	0.253 - 0.660	0.000
negro or mulattoe	reference		
Positive answer to			
domestic water filter	0.308	0.171 - 0.552	0.000
sewages facilities	0.430	0.267 - 0.719	0.001
river swimming	0.672	0.420 - 1.076	0.098
sea swimming	0.570	0.203 - 1.598	0.285
more than four persons in home	1.445	0.913 - 2.289	0.116
past history of hepatitis	3.019	1.006 - 9.057	0.049
past history of surgery	0.695	0.334 - 1.414	0.329
past history of blood transfusion	4.642	0.926 - 23.276	0.062
hepatitis in family	2.114	0.859 - 5.200	0.103

in Southeast and South Brazil[3 6 8 10 23 24 28 29 30 31]. When the prevalence of a positive serology for anti-HAV is stratified by socioeconomic status, the differences observed are significant. There is a higher prevalence in children from Cobi (low socioeconomic status) and São Torquato (middle-low socioeconomic status) schools than in children from São José school (high socioeconomic status). In addition, the prevalence of positive serology in children seven years of age or less in all socioeconomic levels was lower than that reported for highly endemic areas.

However, even when we considered only the children from low or low-middle socioeconomic status, the prevalence of anti-HAV antibodies in children seven years of age or less is still lower than that reported in North and Center-West Brazil, areas of very high incidence of HAV infection[1 14 21 22 25 26 32].

The correlation between positive anti-HAV serology and various factors including age, low socioeconomic status, absence of sewage facilities, domestic water filter and a past history of hepatitis in the family supports similar findings elsewhere in the world[5 18 19] as well as in Brazil[3]. As reported in Chile[9], swimming in the sea or a river, was not positively associated with the presence of anti-HAV antibodies.

Taken together these results demonstrate in Vila Velha a pattern of HAV infection characterized by an increasing number of susceptible children, especially in high or low-middle socioeconomic status. Considering that Brazil has been considered a country of very high prevalence of HAV infection, according to the map published by the Centers for Disease Control, USA[7], our results suggest that we may need to reconsider the pattern of this infection. The pattern appears to be changing in recent years like in other more rapidly developing countries and cities[8 9 15 16 24 27].

There remains little information on the frequency of clinically apparent HAV infection in adolescents and young adults in Vila Velha or Vitória, although the high frequency of clinically apparent cases, including severe forms of the disease, diagnosed at the Children's Hospital in Vitória may be a partial marker. This is in concordance with the results of our study and further supports our hypothesis that the pattern of HAV infection is changing in our country.

The result of this new pattern of prevalence is a high number of susceptible children living near areas where the virus is clearly still prevalent, putting these children in a situation similar to travelers from non-endemic to endemic areas. In this context, consideration must be given to the feasibility of vaccination programs for children and adolescents in our country. This would require further study of the cost-benefit ratio of this strategy in developing countries[6].

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