HEPATITIS A SEROEPIDEMIOLOGY IN EASTERN TURKEY

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ABSTRACT

Background: It has been reported that there are great deal of changes in the epidemiology of hepatitis A at the present. The epidemiologic studies regarding to hepatitis A virus (HAV) infection are not sufficient both in the country and study region.

Objective: To investigate HAV seroprevalence and association with socio-demographic variables.

Design: Cross-sectional and community based study.

Setting: Erzurum Province, Eastern Turkey between April and June 1998.

Subjects: Four hundred and fifty persons under the age of 30 years.

Results: The rate of the study involvement was 87.1 % (392 persons) and ratio for seropositivity 84.2%. Although seropositivity is elevated by age, it has been high within the younger age group. Epidemiological changes could not be interpreted, since the study results were first for the group of people aged under 30 years. Statistical significance was found between hepatitis A seroprevalence and age, the number of households and localisation of toilet within the house. There was no correlation between hepatitis A and sex, jaundice history, family type, tap water availability in the residential area.

Conclusion: The frequency of hepatitis A infection appearance in the region was found out to be high as compared to other regions of Turkey.

INTRODUCTION

Hepatitis A Virus (HAV) has a worldwide distribution and although it is typically self-limited and moderately symptomatic, acute infection can be fulminate and even fatal. HAV is an extremely stable virus which is spread primarily by the faecal-oral route, either directly from person to person or by contaminated food or water (1-3). HAV prevalence is found from one population to another and is related to socio-economic factors and living standards of the population.

In the developing countries, HAV is acquired very early in life and nearly all the adults have detectable levels of antibody to HAV (anti- HAV) in contrast, the epidemiology of HAV in developed countries is characterised 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 the United States, low socio-economic status has been associated with higher prevalence of infection, and certain populations, such as American Natives, Alaska Natives and Hispanics, have been shown to have high rates of infection (6). The highest seropositivity rates is increased with age and economic improvements. Over the last three decades in the United States, the predominant age groups have changed from 5 to 14 years in the 1961 to 15 to 24 years in the 1971 to 20 to 29 years epidemic recently (7).

We don't know real dates for HAV incidence in the country, as no health registration files of schools were available. The HAV prevalence in Turkey is

similar to that of developing countries representing 40% in 0-10 year age group and 90% in 15 year age group (8,9). The aim of the study was to investigate HAV seroprevalence and association with socio-demographic variables. In addition, it has been thought that the study could be starting point for other related studies in the region.

MATERIALS AND METHODS

Study design and sample: This was a cross-sectional and community based study, and the data were collected in the year 2002. The study sample consisted of 450 persons aged under 30 years in Erzurum Provinces, Eastern Turkey. The sampling method of 30 clusters recommended for field studies by the World Health Organisation was used (10). For this reason, each street in urban area and each village in rural area were assigned as one cluster, and 15 children were randomly selected from each cluster. Twenty seven (6.0%) selected subjects could not be reached, twenty four (5.3%) subjects or parents did not accept to participate in the study , and blood samples of seven (1.6%) subjects could not be obtained. Therefore, the data in this study were obtained from three hundred and ninety two (87.1%) subjects. A structured questionnaire form was used to gather information on selected subjects.

Blood samples and measurement: Blood samples were taken from the subjects aseptically by venopuncture. All the subjects were tested by enzyme-linked immunoabsorbant assay technique (Behring anti-HAV OQEC 11) for the seroprevalence of hepatitis A Ig G antibody (anti-HAV Ig G).

Statistical analysis: Chi-square and logistic regression analysis were used to identify differences among the frequency distributions of the groups. Statistical procedures were carried out using the Epi Info version 6.04 developed by Centers for Disease Control and Prevention (CDC).

RESULTS

Sex distribution of the study was 50.8% males and 49.2% females. The prevalence of HAV was 84.2%, seroprevalence of HAV was 83.4% in males and 85% in female, representing no statistical difference. Anti-HAV positivity was increased depending on age group of 10-14 years after that the level of positivity was gradually dropped. There was relation between age and seroprevalence of HAV (Table 1).

The results of logistic regression analysis displayed that there is relation between anti-HAV existence and age presence of toilet in house and number of persons in the family. It has, however, no

Table 1

Serum antibody results to HAV by gender and age

| Gender | Serum Antibody Results | | | | | | Significance |
| | Positive | | Negative | | Total | | |
	No.	(%)*	No.	(%)*	No.	(%)**	
Male	166	83.4	33	16.6	199	50.8	$X^2 = 0.2$
Female	164	85.0	29	15.0	193	49.2	P>0.05
Age							
0	10	76.9	3	23.1	13	3.3	
1-4	33	66.0	17	34.0	50	12.8	
5-9	57	77.0	17	23.0	74	18.9	$X^2 = 23.8$
10-14	83	93.3	6	6.7	89	22.7	P < 0.001
15-19	54	90.0	6	10.0	60	15.3	
20-24	42	87.5	6	12.5	48	12.2	
25-29	51	87.9	7	12.1	58	14.8	
Total	330	84.2	62	15.8	392	100.0	

* Row percent   ** Column percent

relation with sex, history of jaundice, settlement localisation, tap water and structure of house (Table 2).

DISCUSSION

The studies carried on HAV seroprevalence in our country are inadequate and most of these studies were carried out on children. This study carried out in the region of Erzurum for the first time revealed that a number of persons aged under 30 years were HAV positive. In most developing countries, older children get infected with HAV (5) the fact that has been supported by our findings.

HAV seroprevalence in children was detected in 51% of immigrants in U.S.A., 28% in Portugal and 86% in Brasil respectively (11-13). As seen, the distribution of HAV all over the world shows a variety. Throughout the country, in a study carried out in under 30 year age group, total HAV seroprevalence was detected in 71.3% (14). In the studies carried out on children in Turkey, seropositivity of anti-HAV varies from 29% to 95% (15-19). It is clear that there was great difference between the regions as regards to HAV seroprevalence. That the main reason that it may originate from socio-economic level between the region in our country. In the arrangement of socio-economic growth carried out throughout the country, because Erzurum is fairly sub-rows, the fact that HAV seroprevalence became high is normal (20).

Similarly, the fact that the cities, the HAV seroprevalences of which became low, become the first place as regards to socio-economic status showed that HAV infection was associated with socio-economic status and environmental factors. In a study carried out in Taiwan, while anti-HAV seropositivity was 12% in western region which is better than eastern region as regard to socio-economic status, anti-HAV seropositivity was 81% in eastern region (21).

There was no statistical difference between the genders. In studies carried out in Australia and India, similar results were obtained (22,23). In

Table 2

Logistic regression analysis results by some independent variables

Independent Variables	P-value	Odds Ratio	% 95 Confidence Interval	
			Lower Border	Upper Border
Age	0.001*	1.0	1.0	1.1
Gender	0.8	0.9	0.5	1.7
Toilet in house	0.04*	0.3	0.1	0.9
The number of household	0.004*	1.3	1.1	1.5
Family type	0.4	0.7	0.3	1.5
Jaundice history				
Yes	0.9			
No	0.8	0.8	0.1	4.9
Not remember	0.9	0.9	0.2	4.2
Drinking water				
Tap water	0.7			
Spring water	0.7	1.4	0.3	5.9
Well water	0.4	2.8	0.2	33.3
Residential area				
Province	0.2			
County	0.2	1.7	0.9	3.5
Village	0.4	0.5	0.1	2.7
House type				
House in the garden	0.3			
Apartment house	0.3	0.4	0.1	2.1
Shanty	0.1	0.3	0.1	1.5
Village type	0.9	1.1	0.1	14.5

* Significant values

studies carried out in Turkey, it was detected that there was no statistical difference between the gender as regards to HAV positivity (14,24). As HAV seroprevalence was 76.9% in infants under one year of age and 85% in women under the age of 30, we concluded that the transmission of maternal antibodies occurs at a high rate. The fact that the seroprevalence rate decreased to 66.0% between the age of one to four years despite contact with hepatitis A suggests that the high level of HAV seroprevalence is caused by maternal antibodies in children under one year of age.

It was detected that anti-HAV positivity increased in ten to four year age group, and there was a relationship between HAV seroprevalence and age. In a study carried out in Instabul where socio-

economic status is higher than in our study region, the age group in which HAV seroprevalence is highest is 15 years and above (25). As the socio-economic status increases, it is reported that the age group in which HAV seroprevalence is peak shifts forward (6).

In a study carried out in under 30 year age group in Syria, the fact that the age group in which HAV seroprevalence reached peak became 11-15 year age group made us think that environmental conditions would be similar (26). While HAV seroprevalence was 10% under 35 year age group in Netherlands, it was found as 85% in 79 year age group (27). In a study carried out in Japan, while HAV was not detected in under 30 years, it was 50% over 70 year age group (28). As in these studies, due to both immunisation programmes against HAV in the country and environmental circumstances, HAV seroprevalence was high in older age groups.

In the results of logistic regression analysis, it was detected that there was a relationship between a toilet inside the house, the number of household, and HAV seroprevalence; but there was no relationship among gender, history of jaundice, settlement place, type of drinking water, and type of the house. Seropositivity was generally lower in subjects living in houses with tap water and toilet than in those without these facilities, suggesting that unplanned development without adequate sanitary infrastructure may be a risk factor for the disease (29). As expected, contact with hepatitis A seemed more likely in large families. This is not surprising if we accept that the higher number of family members is inversely correlated with the welfare level and socio-cultural development of the family.

In a study carried out in Brasil, it was detected that HAV infection risk reduced in the houses where two to three people lived (30). Also in studies carried out in Portugal, India and Italy, it was found that living in crowded areas increased the risk of HAV infection, as independent from other variables (11,31,32). In a study carried out in Turkey, the correlation between the number of household and HAV seropositivity was found to be significant. These results are compatible with our findings. In addition the fact that HAV seroprevalence increased with the toilet outside the house may originate from lack of individual hygiene.

In conclusion, HAV seroprevalence detected in all age groups is fairly high, and hepatitis A infection is an important public health problem in our region. In the United States, hepatitis A vaccination recommended since the year 2000 in states with high incidence rate of hepatitis A and in the year 2001, the routine immunisation schedule included HAV vaccine in six states (33). Since there is a similar programme, it may be recommended in the hyperendemic region in Turkey. Anti-HAV seropositivity is fairly high in small age groups as well as increasing with age.

It was detected that the correlation between the age, the number of household, having a toilet inside the house and hepatitis A seroprevalence was significantly meaningful. In children in primary school level, due to high anti-HAV seropositivity, educational programmes dealing with the diseases transmitted by oral faecal way should be developed.

REFERENCES

1. Snyder J.D., and Pickering L.K. Hepatitis A through E. In: Bohrman R.E., Kliegman, Arvin M.A., (eds). *Nelson Textbook of pediatrics.* 1996, pp: 909-911.

2. Dienstag J.L., Szmunees S.V., Stevens C.E., *et al.* Hepatitis A virus infection. New insights from seroepidemiologic studies. *J. Infectious Dis.* 1978; **137:** 328-340.

3. Koff R.S. Seroepidemiology of hepatitis A in the USA *J. infect Dis.* 1995; **171:** 19-23.

4. Steven D.M. Who should receive hepatitis A vaccine? *Cleveland Clinic J. Med.* 2001; 68; **10:** 825-827.

5. Margolis H.S. Viral hepatitis. In: Last J.M., Wallace R.B., (eds). *Public Health and Preventive Medicine.* 1992;13th edition, pp: 131-133.

6. Coulehan J.I., Eberhard S., Kapner L. *et al.* Vitamin C and acute illness in Navaj schoolchildren. *N. Engl. J. Med.* 1996; **295:** 973.

7. Hendley J.O., Edmondson W.P. Jr., and Gwaltney J.M. Jr. Relationship between naturally acquired immunity and infectivity of two rhinoviruses in volunteers. *J. Infect Dis.* 1972; **125:** 243.

8. Badur S. Status of Viral Hepatitis in Turkey. Kiliç Turgay K (ed). Viral Hepatitis 1994. Istanbul: Nobel Medicine Publishing House, 1994; pp:15-37.

9. Uzunalimoglu Ö., Özden A., Kesim E. and all. Hepatitis A epidemiology in Turkey. 10. Turkey Gastroenterology Congress, *Bursa,* 1993, pp: 330.

10. Vaughan J.P., and Morrow R.H. Manual of

Epidemiology for District Health Management. World Health Organization : *Geneva,* 1989, pp:78-80.

11. Dentinger C.M., Heinrich N.I., Bell B.P., Fox L.M. *et al.* A prevalence study of hepatitis A virus infection in a migrant community: Is hepatitis A vaccine indicated? *J. Pediatr.* 2001; **138:** 705-912.

12. Barros H., Oliveria F., and Miranda H. A survey on hepatitis in Portuguese children and adolescents. *J. Viral Hepatitis.* 1999; **6:** 249-253.

13. Assis S.B., Souto F.J., Fontes C.J., *et al.* Prevalence of antibodies to hepatitis A and E infection in school children of an Amazonian Municipality in Matograsso State. *Rev. Soc. bras. Med. Trop.* 2002; **35:** 155-158.

14. Kanra G., Tezcan S., and Badur S. The prevalence of hepatitis A and varicella antibodies in the Turkish population, study report . 1998-1999; pp:3,21

15 Sidal M., Unuvar E., Oguz E., *et al.* Age-specific seroepidemiology of hepatit A,B, and E infections among children in Istanbul, Turkey. *Eur. J. Epidemiol.* 2001; **17:** 141-144.

16. Sahin M.K., Yarkin E., Kocabas E., *et al.* The research of HAV, HBV and HCV markers in children. *Turkish J. Viral Hepatitis.* 1998; **2:** 104-108.

17. Baki A., Köksal İ., Aynaci M., *et al.* Hepatitis A prevalence in Trabzon, Turkey, children . *Doga Turk. J. Med. Sci.* 1992; **16:** 206-209.

18. Akgün N., Koçak A., Tekin N., *et al.* HAV and HBV infection prevalence among children. *XXI. Congres of UMEMPS,* Izmir in Türkey. Abstract Book. pp: 55.

19. Aribas E.T., Altindis M., Koc H., *et al.* Hepatitis A and hepatitis E seroprevalence among children in Konya, in Turkey. *J. Child Health.* 1999; **42:** 505-511.

20. The East Anatolia Project director summary book. *Turkey Republic of Prime Minister of the state planning organization.* Ankara. 2000, pp: 1-2.

21. Wu J.S., Lu C.E., Wu L.Z., Wong C.K., *et al.* Changing seroepidemiology of hepatitis A virus infection between two regions in Taiwan differing in socio-economic status. *J. Farmos Med. Assoc.* 1993; **92:** 812-815.

22. Amin J., Gilbert G.L., Escott R.G., *et al.* Hepatitis A epidemiology in Australia: National seroprevalence and notifications. *Med. J. Aust.* 2001; **174:** 338-341.

23. Mall M.L, Rai R.R., Philip M., *et al.* Seroepidemiology of hepatitis A infection in India: changing pattern. *Indian J. Gastroenterol.* 2002; **21:** 132-135.

24. Atabek M.E., Ural O., and Coban H. Hepatitis A, B and hepatitis E seroprevalence among children in Konya, in Turkey. *J. Child Health.* 2001; **44:** 66-70.

25. Aldeniz C., Çavuslu S, Altunay H., *et al.* Hepatitis A and hepatitis E seroprevalence among children in Istanbul. *J. Viral Hepatitis of Turkey.* 1998; **1:** 31-36.

26. Antaki H., and Kebbewar M.K. Hepatitis A seroprevalence rate in Syria. *Trop. Doct.* 2000; **30:** 99-101.

27. Termorshizen F., Dorigo – Zetsma J.W., de melker H.E., van den Hof S., Conyn *et al.* The prevalence of antibodies to hepatitis A virus and its determinants in The Netherlands: a population-based survey. *Epidemiol Infect.* 2000; **124:** 459-466.

28. Akbar S.M., Onji M., Kanaoka M., Horiike H. *et al.* The seroepidemiology of hepatitis O and B in a Japanese Town. *Asia Pac. J. Public Health.* 1992-1993; **6:** 26-29.

29. Chin K.P., Lok A.S., Wong L.S., *et al.* Current seroepidemiology of hepatitis A. *Hong Kong J. Med. Virol.* 1991; **34:** 191-193.

30. Almeida L.M., Werneck G.L., Cairncross S., *et al.* The epidemiology of hepatitis A in Rio de Janeiro: Environmental and domestic risk factors. *Epidemiol Infect.* 2001; **127:** 327-333.

31. Arankalle V.A., Chadha M.S., Chitambar SD, *et al.* Changing epidemiology of hepatitis A and hepatitis E in urban and rural India (1982-98). *J. Viral Hepat.* 2001; **8:** 293.

32. Strofpolini T., Chiaramonte M., Eranco E., *et al.* Seroepidemiology of hepatitis A virus infection among children and teenagers in Italy. *Infection.* 1991; **19:** 97-100.

33. Notice readers : recommended childhood immunisation Schedule-United States 2000. *MMWR* 2001; **50:** 7-10.