Indian J Med Res 150, November 2019, pp 508-511
DOI: 10.4103/ijmr.IJMR_787_18

Quick Response Code:

Status of adult immunity to hepatitis A virus in healthcare workers from a tertiary care hospital in north India

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Received April 23, 2018

***Background & objectives*: Humans are considered to be the principal host for hepatitis A virus (HAV) infection. In India, heterogeneous groups of susceptible individuals coexist in different regions. There has been a decline in antibody titres to HAV among young adults which may pose a major public health problem. The objective of this study was to assess the IgG anti-HAV level among healthcare workers (HCWs) in the age group of 20-60 yr and its association with the socio-demographic variables.**

***Methods*: Blood sample (2 ml) was collected under aseptic conditions from each participant followed by the preparation of serum and storing at −20°C. ELISA-based kits were used for the determination of IgG antibodies to HAV in the human serum samples.**

***Results*: Two hundred and fifty four HCWs were enrolled. IgG anti-HAV antibodies were detected in 97.2 per cent of the samples analyzed. No differences were observed in the levels of IgG anti-HAV antibody and education, income, occupation and socio-economic classes of the HCWs. A seropositivity rate of over 90 per cent was seen amongst all the socio-economic classes.**

***Interpretation & conclusions*: High levels of IgG protective antibodies were seen among the studied HCWs, hence HAV vaccination may not be required. It will be advisable to do a cost-benefit analysis of vaccination for HAV.**

Key words Anti-hepatitis A virus antibody - healthcare workers - hepatitis A virus - north India - prevalence - vaccination

The hepatitis A virus (HAV) infection occurs throughout the world, and humans are thought to be its principal host. The virus replicates in the liver and is transported through the bile to the stool, and shedding of virus starts one to three weeks before the onset of illness and continues for around two weeks after onset of jaundice[1]. The virus is transmitted from person to person through faeco-oral route. Nearly 70 per cent of infections in children younger than six years of age are asymptomatic, whereas more than 75 per cent of adults with hepatitis A infections are symptomatic[2,3]. Though most patients recover completely and uneventfully, the potential seriousness of hepatitis A in adults is under appreciated. Coagulopathy, encephalopathy, renal failure, relapse and prolonged duration of illness are its complications.

The overall incidence of fulminant hepatic failure due to hepatitis A is less than one per cent, and it occurs commonly in individuals over 50 yr of age[4]. The same holds true for relapse. Several factors have contributed to the decline in infection rate, including rising incomes, access to clean drinking water, improved socio-economic status and sanitation facilities[5]. However, healthcare workers (HCWs) remain in the category of high-risk for HAV infection.

In India and China, many high endemicity areas for HAV infection coexist with other areas of low endemicity[6,7]. Thus, the declining antibody titres among young adults may pose a major public health problem in the years to come.

Data on vaccination strategies emerging from the developing nations such as India suggest a decline in seroprevalence of anti-HAV antibodies, especially in the adult population[8]. The Indian Academy of Paediatrics (IAP) 2016 Immunization Schedule recommends hepatitis A vaccination at 12 months of age[9]. The aim of the present study was to see the level of anti-HAV antibody levels in HCWs (20-60 yr of age) from a tertiary care hospital in north India and to study the various socio-demographic factors influencing it.

Material & Methods

This cross-sectional observational study was conducted at the King George's Medical University (KGMU), Lucknow, India, from December 2016 to December 2017. The participants were HCWs employed in KGMU. A total of 254 HCWs were selected in the age group of 20-60 yr, under four categories (20-29; 30-39; 40-49; 50-60 yr).

Written informed consent was obtained from each participant and the study was approved by the Institutional Ethics Committee, KGMU.

The data for socio-demographic and clinical variables were obtained from the participants on a predesigned questionnaire. The socio-demographic variables included were education, income and occupation. Socio-economic status was determined as per the Modified Kuppuswamy Scale[10]. All healthcare workers with the previous history of hepatitis A vaccination, age more than 60 yr or less than 20 yr, were excluded from this study.

A venous blood sample (2 ml) was taken by peripheral venipuncture with proper aseptic precautions. The serum was separated by standard techniques and stored at −20° C. ELISA-based kits (DIA.PRO Diagnostic BioProbes Srl, Italy) were used for the determination of IgG antibodies to HAV in the human serum samples. Pre Assay controls and operations were checked and matched. The test results were calculated by means of a cut-off value determined as per the manufacturer's instructions.

Results & Discussion

Of the 254 apparently healthy HCWs tested, anti-HAV IgG antibodies were detected in 247 (97.2%) samples. Only seven participants tested negative for anti-HAV IgG. Table I shows the distributions according to age groups studied. There was a consistent seropositivity for IgG anti-HAV of nearly 95 per cent in all the age groups studied. No significant differences were observed in the levels of anti-HAV IgG amongst participants. A seropositivity rate of over 90 per cent was seen amongst all socio-economic classes (Table II).

Of the 254 participants, 30 had a history of jaundice; of these three were tested positive for anti-HEV IgM and of these two were tested positive for anti-HAV IgG. The remaining 27 HCWs with past history of jaundice were also tested positive for anti-HAV IgG. Among the 247 HCWs who were tested positive for anti-HAV IgG, 27 gave prior history of jaundice (10.93%). The overall anti-HAV IgG positivity was found to be >95 per cent and no significant differences were observed across the various age groups. No differences were observed in the seropositivity rates and the socio-economic class of the HCWs, with 93.4 per cent positivity in the upper class (Modified Kuppuswamy score 26-29) and 100 per cent positivity in the upper lower class (Modified Kuppuswamy score 5-10). The seven HCWs tested negative belonged to the upper and upper-middle socio-economic class; however, they only constituted for 4.8 per cent of the total participants tested in these classes.

Table I. Anti-hepatitis A virus IgG positivity in healthcare workers of various age groups

Age group (yr)	IgG HAV status		Total
	Positive, n (%)	Negative, n (%)	
20-29	89 (96.73)	3 (3.26)	92
30-39	62 (98.41)	1 (1.58)	63
40-49	59 (98.33)	1 (1.66)	60
50-59	37 (94.87)	2 (5.12)	39
Total	247 (97.24)	7 (2.75)	254

n, number of healthcare workers in the specified age; HAV, hepatitis A virus

Table II. Anti-hepatitis A virus IgG level and socio-economic variable in healthcare workers

Socio-economic factor	Number of patients						Total
	Male			Female			
	Positive (%)	Negative (%)	Total	Positive (%)	Negative (%)	Total	
Education							
Profession/honours	3 (100)	-	3	1 (100)	-	1	4
Graduate/post-graduate	64 (96.96)	2 (3.03)	66	24 (96)	1 (4)	25	91
Intermediate/post-high school diploma	35 (97.22)	1 (2.77)	36	41 (97.6)	1 (2.38)	42	78
High school	21 (91.30)	2 (8.69)	23	5 (100)	-	5	28
Middle school	14 (100)	-	14	5 (100)	-	5	19
Primary school	5 (100)	-	5	7 (100)	-	7	12
Literate	7 (100)	-	7	15 (100)	-	15	22
Total							254
Occupation							
Professional	53 (96.36)	2 (3.63)	55	47 (95.91)	2 (4.08)	49	104
Semi-professional	14 (93.33)	1 (6.66)	15	4 (100)	-	4	19
Clerical/shop owner	20 (90.90)	2 (9.09)	22	8 (100)	-	8	30
Skilled worker	34 (100)	-	34	1 (100)	-	1	35
Semi-skilled worker	0	0	0	0	0	0	0
Unskilled	19 (100)	-	19	29 (100)	-	29	48
Unemployed	9 (100)	-	9	9 (100)	-	9	18
Total							254
Income (₹)							
41,430	43 (93.47)	3 (6.52)	46	23 (95.83)	1 (4.16)	24	70
20,715-41,429	23 (92)	2 (8)	25	17 (100)	-	17	42
15,536-20,714	14 (100)	-	14	9 (100)	-	9	23
10,357-15,535	33 (100)	-	33	26 (96.29)	1 (3.70)	27	60
6214-10,356	36 (100)	-	36	21 (100)	-	21	57
2092-6213	0	0	0	2 (100)	-	2	2
<2091	0	0	0	0	0	0	0
Total							254
Socio-economic class							
Upper	35 (92.10)	3 (7.89)	38	22 (95.65)	1 (4.34)	23	61
Upper middle	47 (95.91)	2 (4.08)	49	34 (97.14)	1 (2.85)	35	84
Lower middle	42 (100)	-	42	16 (100)	-	16	58
Upper lower	25 (100)	-	25	26 (100)	-	26	51
Lower	0	0	0	0	0	0	0
Total							254

In a study conducted in New Delhi, India, the seropositivity of anti-HAV IgG in 500 healthy controls was found to be 71.2 per cent; the positivity in participants over 35 yr of age (92%) was significantly higher than that in participants less than 35 yr (57%). This showed a decreasing prevalence of IgG anti-HAV, in the age group between 16 and 35 yr[11]. This was also corroborated by another study conducted by Dhawan *et al*[12] who also obtained a seroprevalence rate of 78 per cent. In another study undertaken in New Delhi, to assess whether the

proportion of adults with acute HAV infection has been increasing over the years and to analyze the seroprevalence of IgG anti-HAV antibodies in young adults above the age of 15 yr, it was found that the frequency of HAV infection among adults increased (3.4-12.3%)[13]. These findings were in contrast to a previous study done by Arankalle *et al*[14], who reported a seroprevalence of nearly 95 per cent. This difference was said to be due to a rapid increase in the number of non-immune individuals over the past few years.

The high seropositivity level of anti-HAV-IgG antibodies in HCWs indicated exposure of HAV. Therefore, they may not need to be vaccinated against HAV. However, it will be advisable to do a cost-benefit analysis of vaccination for HAV elimination.

***Financial support & sponsorship*:** The study was supported by intramural funding from the King George's Medical University, Lucknow.

***Conflicts of Interest*:** None.

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