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Seroprevalence of Hepatitis A Virus IgG Antibodies among Ain Shams University Outpatient Clinic Egyptian Children and Adolescents

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Abstract

Background: Hepatitis A virus is a non-enveloped ribonucleic acid virus that is transmitted via the fecal-oral route. It is one of the most frequent communicable diseases with an estimated 1.5 million cases diagnosed each year globally.

Aim of Study: To assess the seroprevalence of hepatitis A IgG antibody in a group of Egyptian children and adolescents and to correlate the findings with possible socioeconomic and demographic risk factors.

Patients and Methods: This was a cross sectional study conducted at Ain Shams University Children's hospital outpatient clinic (OPC), Cairo, Egypt during the period from September 2023 to March 2024 and performed on 200 Egyptian children and adolescents above the age of 1 and below the age of 16 years.

Results: To all enrolled cases, history was taken focusing on the course of the presenting complain and demographic risk factors, clinical examination was conducted including general, chest, cardiac and abdominal examination, evaluation of socioeconomic status was done and serum sample withdrawn for assessment of Hepatitis A IgG antibody seropositivity. As regards demographic risk factors, there was no statistically-significant difference regarding gender between males and females. There was also no statistically significant difference regarding anthropometric measures between seropositive and negative cases. As regards presenting symptoms, respiratory and GIT symptoms were the most frequent presenting symptoms among studied cases with a frequency of 38% and 30% respectively. Our study showed that the seropositivity of Hepatitis A IgG antibody increased significantly with decreasing social class from 31.6% among children in the high social class to 64.3% in the middle social class to 76.5% in the low social class. Despite improvements in gross national products and in socioeconomic standards.

Conclusion: The overall seroprevalence of Hepatitis A IgG antibody among our cases of 200 Egyptian children and adolescents was 68%. Hepatitis A IgG antibody prevalence was statistically significantly higher with higher age, lower social class, lower paternal education and residence in Lower Egypt. Higher social class is the group at risk for infection occurring later in adolescence or early adult life with more severe symptoms in the case of contact with HAV patient.

Key Words: *Seroprevalence Hepatitis A – IgG.*

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Introduction

HEPATITIS A virus is a non-enveloped ribonucleic acid virus that is transmitted via the fecal-oral route **[1]**.

It is one of the most frequent communicable diseases with an estimated 1.5 million cases diagnosed each year globally **[2]**.

In most developing countries where low sanitation, crowdedness and poor hygiene are major problems, this led to HAV endemic infection among children **[3]**. There is significant difference in the seroprevalence of hepatitis A infection among children of different socioeconomic status with a lower prevalence of anti-HAV antibody among the higher socio-economic status and better environmental condition **[4]**.

Most infections in children under the age of six are asymptomatic (70%) and if infection occurs, it is usually anicteric. Therefore, the disease is unrecognized and underreported **[5]**.

In 2008, the overall seropositivity of HAV Ab among Egyptian children was previously estimated to be 61.4% **[6]**.

In a small number of cases (less than 1%) fulminant hepatitis may occur; that subsequently results in liver failure which is fatal unless a transplant is available [7].

An increase in the occurrence of the infection among adolescent and adults was noted in many parts of the world due to the transition pattern of the HAV epidemiology [8].

These changes and the availability of effective vaccines have renewed interest in this infection [9]. Vaccination against HAV was introduced in many countries as a solution to reduce the morbidity and the mortality rates [10]. Hepatitis A is not a part of the standard vaccination programme in Egypt.

Aim of the work:

To assess the seroprevalence of hepatitis A IgG antibody in a group of Egyptian children and adolescents and to correlate the findings with possible socioeconomic and demographic risk factors.

Patients and Methods

This is a cross sectional study conducted at Ain Shams University Children's Hospital Emergency Room (ER) and outpatient clinic (OPC), Cairo, Egypt during the period from September 2023 to February 2024 aiming to determine the hepatitis A virus seroprevalence in Egyptian children above the age of 1 and below the age of16 years and to correlate that with social and economic status.

An informed consent obtained from legal guardians before enrolment in the study. The study was reviewed and approved by the research ethics committee of Ain Shams University, Faculty of Medicine.

Study population: Children and adolescents above the age of 1 year and below the age of 16 years.

Inclusion criteria: Children and adolescents above the age of 1 year and below the age of 16 years.

Sex: Both males and females.

Sample size: The sample size was 200 participants. Using the OpenEpi program for sample size calculation, reviewing results from a previous study (Ikobah et al., 2015), showed that HAV infection was prevalent in the study population, as subjects tested positive for anti-HAV total antibody giving a prevalence rate of 55.2%. A sample size of at least 95 produces a two-sided 95% confidence interval with a width equal to 0.199 when the sample proportion is 0.55.

Methodology: After an informed consent from parents, 2ml fresh blood sample will be withdrawn from the target population, collected on plain serum test tube with clot activators and tested for serum hepatitis A Virus IgG antibody using enzyme linked immunosorbent assay (ELISA) method.

Study tools: Cases enrolled in this study will be subjected to data collection through:

History taking: Personal history including name, age, gender, order of birth,paternal and maternal education and occupation, and place of residence which was classified into Greater Cario, Upper Egypt and Lower Egypt. Current complaint and reason for coming to the pediatric outpatient clinic. Practice of cleaning, personal hygiene, crowding, sanitation and socioeconomic status according to El-Gilany et al. [3] socioeconomic scalethat is a questionnaire which includes seven domains (education and cultural, family, economic, occupational, family possessions, home sanitation and health care domain) and has a total score of 84. For each participant, a score was assigned for each item of the questionnaire, the total score was calculated and the socio-economic level was classified into Very low, low, middle and high levels depending on the quartiles of the calculated scores; score from zero to 21 represents the Very low socioeconomic level, score from 22 to 42 goes for low level, 43 to 63 is the middle level while score higher than 63 represent the high level. (The detailed scale is shown in appendix one).

Past history of jaundice, change of color of urine and stool, history of gastroenteritis, history of documented Hepatitis A virus infection or contact with an infected family member, Hepatitis A vaccination status and fever hospital admission.

Clinical examination: General examination including: general appearance, vital data including heart rate, respiratory rate and temperature. Anthropometric assessment: Weight in kg, height in cm and plotting them on the age and sex standard percentile according to Egyptian growth charts. Body mass index (BMI): Wwill be calculated as weight in (kg) / height in (m^2), the obtained number will be plotted on appropriate CDC gender -specific BMI-for-age growth chart to determine BMI percentile and Z score. Systemic examination including cardiac and chest examination with focus on abdominal examination.

Laboratory studies: Serum hepatitis A IgG detection by enzyme linked immunosorbent assay (ELISA) method (Qualitative).

Statistical methods: The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 28.0, IBM Corp., Chicago, USA, 2021. Quantitative data tested for normality using Kolomogrov-Smirnov test, then described as mean ± SD (standard deviation) as well

as minimum and maximum of the range, and then compared using independent *t*-test. Qualitative data described as number and percentage and then compared using Chi square test and Fisher's Exact test. Logistic regression for independent factors affecting having Hepatitis A IgG antibodies. The level of significance was taken at *p*-value ≤0.050 was significant, otherwise was non-significant.

Definition of the family: It includes nuclear or joint family. Married couple with unmarried children or without children. Head of the family will be either husband/wife. Dependent father/mother/brother/sister does not become member of the family unless he/she is earning and one kitchen with pooled income is managed by him/her.

This scale includes 7 domains with a total score of 84

Socioeconomic level: to be classified into very low, low, middle and high levels depending on the quartiles of the score calculated.

NB In case of death or retirement of husband or wife, record the education and occupation before death or retirement

Education and cultural domain
(for both husband & wife)
(score = 30)

Highest level of education	Husband	Wife
Illiterate	0	0
Read & write	2	2
Primary	4	4
Preparatory	6	6
Secondary (general & technical of 3 or 5 years)	8	8
Intermediate (2 years) institutes	10	10
University graduate	12	12
Postgraduate degree	14	14

Access to health information (1 each for the following items): Printed materials, e.g. books, posters, booklets, etc.; Audiovisual message on television &/or radio

Occupation domain
(for both husband & wife)
(score = 10)

Occupation	Husband	Wife
Non-working/house wife	0	0
Unskilled manual worker	1	1
Skilled manual worker/farmer	2	2
Trades/business	3	3
Semi-professional/clerk	4	4
Professional	5	5

Family possessions domain
(score = 12: 1 each for the presence of items given below)

Refrigerator - Radio - Television - Washing machine - Telephone/ mobile phone - Car - Agricultural land - Non-agricultural land for housing - Shop or animal shed - Other house (beside the house in which the family is living) - Animals/poultry - Computer/ Internet

Family domain
(score = 10)

Residence: Urban slum = 0; Rural = 1; Urban = 2

Number of family members (parents, children & all dependents): < 5 members = 2; ≥ 5 members = 1

Number of earning family members: 1 member = 1; 2 members = 2; ≥ 3 members = 3

Education of children (aged ≥ 5 years, whether free or private education): All children going or ever gone to school/university = 3; ≥ 50% going or ever gone to school/university = 2; < 50% going or ever gone to school/university = 1; None go/gone to school/university/not applicable = 0

Home sanitation domain
(score = 12)

Services (1 each for the presence of the following items): Pure water supply - Electricity - Natural gas - Sewerage system - Municipal collection of solid wastes - Flush latrine - Air conditioning

Type of house: Owned, ≥ 4 rooms = 4; Owned, < 4 rooms = 3; Rented, ≥ 4 rooms = 2; Rented, < 4 rooms = 1; No place to reside = 0

Crowing index: (number of family members divided by number of rooms): ≤ 1 person per room = 1 = 1; > 1 person per room = 0

Economic domain
(score = 5)

Income from all sources: In debt = 0; 1 Just meet routine expenses = 1; Meet routine expenses and emergencies = 2; Able to save/invest money = 3

Family receives governmental support: Yes = 1; No = 0

Family pays tax: Yes = 1; No = 0

Health care domain
(score = 5)

Usual source of health care: Private health facilities = 5; Health insurance = 4; Free governmental health service = 3; More than one of the above sources = 2; Traditional healer/self-care = 1

Fig. (1): Egyptian socioeconomic status scale **[3]**.

Results

Table (1) showed the Demographic characteristics among the studied cases. Mean ± SD of age (years) was 6.7±4.1. Males were 55.5% where as females were 44.5% of studied cases. The residence of the majority of cases was Greater Cairo (79.5%).

Table (2) showed that the most frequent paternal education grade was secondary (53.0%), and most of them were non-skilled workers (47.5%). Maternal education grade was secondary in about 54.0% of cases, and 89% of them were non working.

Table (3) showed cases distribution among the social classes were low, middle, high and very low representing 49% (nearly half), 35%, 9.5% and 6.5% respectively.

Table (4) showed that history of chronic illness was positive in 9.0% of studied cases. The cases were either hematological, diabetes, asthma or neurological representing 3%, 2.5%, 2% and 1.5% of the total number of studied cases respectively. History of previous surgery was reported in more than 10% of the cases. Previous HAV vaccination and previous contact with HAV cases were infrequent (0.5%) each, whereasprevious HAV infection or fever hospital admission were not reported at all in the studied cases.

Table (1): Demographic characteristics of the studied cases.

Characteristics	Mean ± SD	Range
Age (years)	6.7±4.1	1.0–15.0
Birth order	2.4±1.3	1.0–7.0
	(Total number=200)	%
Age categories:		
1-5 years	88	44.0
6-10 years	65	32.5
11-15 years	47	23.5
Birth order categories:		
1st	63	31.5
2nd	55	27.5
3rd	49	24.5
4th or more	33	16.5
Gender:		
Male	111	55.5
Female	89	44.5
Residence:		
Greater Cairo	159	79.5
Lower Egypt	29	14.5
Upper Egypt	12	6.0

Table (2): Parents characteristics of the studied cases.

Characteristics	(Total number=200)	%
Paternal education:		
Non educated	26	13.0
Primary	14	7.0
Preparatory	13	6.5
Secondary	106	53.0
High	41	20.5
Paternal occupation:		
Not working	11	5.5
Non skilled worker	95	47.5
Skilled worker	63	31.5
Professional	31	15.5
Maternal education:		
Non educated	25	12.5
Primary	14	7.0
Preparatory	16	8.0
Secondary	108	54.0
High	37	18.5
Maternal occupation:		
Non working	178	89.0
Professional	22	11.0

Table (3): Domains of El-Gilani Score among the studied cases.

Domains of El-Gilani score	Mean ± SD	Range
Education and culture	16.7±7.2	0.0–28.0
Family	5.8±1.4	3.0–9.0
Economic	1.3±1.2	0.0–5.0
Occupation	2.8±2.1	0.0–10.0
Family possessions	5.3±1.4	2.0–15.0
Home sanitation	6.8±2.0	1.0–11.0
Health care	2.9±1.0	1.0–8.0
Total score	41.5±12.2	14.0–70.0
	n=200	% among cases
Classes of El-Gilani score:		
Very low	13	6.5%
Low	98	49.0%
Middle	70	35.0%
High	19	9.5%

Table (4): Chronic illnesses and clinical history of the studied cases.

Characteristics	n=200	%
Chronic Illness:		
Hematological	6	3.0
Diabetes mellitus	5	2.5
Asthma	4	2.0
Neurological	3	1.5
Clinical history:		
Previous surgery	24	12.0
Fever hospital admission	0	0.0
Previous HAV infection	0	0.0
Previous HAV vaccine	1	0.5
Previous contact with HAV case	1	0.5

In Table (5), Respiratory symptoms were the most frequent presenting symptoms (38% of the studied cases), followed by GIT (30%), neurological (10%), fever (7.5%), cardiac (6.5%), renal (4.5%) and dermatological were 3.5% of them. The presenting symptoms had no correlation to the prevalence of Hepatitis A IgG antibodies.

Table (6) showed the wide range of weight, height and BMI Z score among studied patients. As regards the distribution of anthropometric measures Z scores in the studied cases, most of the cases were having average weight (84.5%), height (71.5%) and BMI (91.5%). Height Z score were distributed between average, low and high as 71.5%, 24% and 4.5% respectively. Average BMI Z score was reported in 91.5% of the cases.

Table (7) showed that Hepatitis A IgG antibodies found in more than two thirds of the studied cases (68%).

Table (5): Presenting symptoms of the studied cases.

Characteristics	n=200	%
Presenting Symptom:		
Respiratory symptoms	76	38.0
GIT symptoms	60	30.0
Neurology symptoms	20	10.0
Fever	15	7.5
Cardiovascular symptoms	13	6.5
Renal symptoms	9	4.5
Dermatological symptoms	7	3.5

Table (6): Anthropometric measures of studied cases and distribution of cases among low, average and high Z scores.

Anthropometric Measures	Mean ± SD	Range
Weight (z-score)	–0.58±1.36	–5.80 to 2.67
Height (z-score)	–0.81±1.83	–5.70 to 4.30
BMI (z-score)	–0.05±1.22	–4.30 to 1.80
	n=200	%
Weight Z score:		
Low	27	13.5
Average	169	84.5
High	4	2.0
Height Z score:		
Low	48	24.0
Average	143	71.5
High	9	4.5
BMI Z score:		
Low	17	8.5
Average	183	91.5
High	0	0.0

Table (7): Hepatitis A IgG antibodies among the studied cases.

Hepatitis A IgG	n=200	%
Positive	136	68.0
Negative	64	32.0

Table (8) showed no significant difference between HAV IgG positive and negative groups regarding birth order, birth order categories and sex. On the other hand, comparing between the three age categories, there was a significant difference of (p=0.044) and significant difference (p=0.018) between the three residential categories. There was no significant difference in Anthropometric measures Z scores between both groups.

Table (9) showed that there was neither a significant difference between Hepatitis A IgG antibody positive and negative cases as regards paternal occupation nor maternal occupation. There was a significant difference between both groups as regards maternal education (p=0.029) and significant difference as regards paternal education (p=0.045).

Table (8): Comparison of demographic characteristics and anthropometric measures between hepatitis A IgG positive and negative cases.

Characteristics	Hepatitis A IgG antibodies		p-value
	Positive n=136	Negative n=64	
Age (years)	7.2±4.1	5.5±4.0	0.006*
Birth order	2.3±1.3	2.4±1.2	0.506
Age categories:			
1-5 years	52 (59.1%)	36 (40.9%)	0.044*
6-10 years	47 (72.3%)	18 (27.7%)	
11-15 years	37 (78.7%)	10 (21.3%)	
Birth order categories:			
1st	47 (74.6%)	16 (25.4%)	0.345
2nd	34 (61.8%)	21 (38.2%)	
3rd	35 (71.4%)	14 (28.6%)	
4th or more	20 (60.6%)	13 (39.4%)	
Sex:			
Male	74 (66.7%)	37 (33.3%)	0.652
Female	62 (69.7%)	27 (30.3%)	
Residence:			
Greater Cairo	101 (63.5%)	58 (36.5%)	0.018*
Lower Egypt	26 (89.7%)	3 (10.3%)	
Upper Egypt	9 (75.0%)	3 (25.0%)	
Weight Z score	–0.65±1.37	–0.43±1.32	0.270
Height Z score	–0.91±1.82	–0.60±1.86	0.265
BMI Z score	–0.06±1.28	–0.02±1.10	0.848

Percentages were taken from total of rows.
^Independent t-test. #Chi square test. *Significant.

Table (9): Comparison of paternal and maternal education and occupation between Hepatitis A IgG positive and negative cases.

Characteristics	Hepatitis A IgG antibodies		*p*-value
	Positive n=136	Negative n=64	
Paternal education:			
Non educated	18 (69.2%)	8 (30.8%)	0.045*
Primary	10 (71.4%)	4 (28.6%)	
Preparatory	11 (84.6%)	2 (15.4%)	
Secondary	77 (72.6%)	29 (27.4%)	
High	20 (48.8%)	21 (51.2%)	
Paternal occupation:			
Not working	8 (72.7%)	3 (27.3%)	0.398
Non skilled worker	67 (70.5%)	28 (29.5%)	
Skilled worker	44 (69.8%)	19 (30.2%)	
Professional	17 (54.8%)	14 (45.2%)	
Maternal education:			
Non educated	17 (68.0%)	8 (32.0%)	0.029*
Primary	11 (78.6%)	3 (21.4%)	
Preparatory	11 (68.8%)	5 (31.3%)	
Secondary	80 (74.1%)	28 (25.9%)	
High	17 (45.9%)	20 (54.1%)	
Maternal occupation:			
Not working	125 (70.2%)	53 (29.8%)	#0.055
Professional	11 (50.0%)	11 (50.0%)	

Percentages were taken from total of rows.
#Chi square test.
*Significant.

Table (10): Comparison of Domains of El-Gilani score between hepatitis A IgG positive and negative cases.

Domains of El-Gilani score	Hepatitis A IgG antibodies		*p*-value
	Positive n=136	Negative n=64	
Education and culture	16.1±6.9	17.9±7.7	0.093
Family	5.6±1.4	6.0±1.4	0.103
Economic	1.1±1.0	1.8±1.4	0.001*
Occupation	2.5±1.9	3.3±2.4	0.011*
Family possessions	5.2±1.4	5.5±1.2	0.252
Home sanitation	6.7±1.9	7.1±2.2	0.190
Health care	2.7±0.9	3.2±1.3	0.008*
Total Score	40.0±11.1	44.7±13.9	0.011*
Classes of El-Gilani score:			
Very low	10 (76.9%)	3 (23.1%)	0.001*
Low	75 (76.5%)	23 (23.5%)	
Middle	45 (64.3%)	25 (35.7%)	
High	6 (31.6%)	13 (68.4%)	

Percentages were taken from total of rows.
^Independent *t*-test. #Chi square test. *Significant.

Table (11): Logistic regression for independent factors affecting Hepatitis A IgG antibodies among the studied cases.

Factors	β	SE	*p*-value	95% CI
- Age ≥6.0 years	0.78	0.32	0.016*	2.17 (1.16–4.08)
- Residence in lower Egypt	1.53	0.65	0.018*	4.60 (1.30–16.33)
- Below high socioeconomic	0.54	0.23	0.022*	1.71 (1.08–2.71)
- Paternal high education	–1.07	0.37	0.004*	0.34 (0.17–0.72)

β : Regression coefficient. CI: Confidence interval.
SE: Standard error. * : Significant.

Table (10) showed a significant difference between Hepatitis A IgG positive and negative cases as regards economic (p=<0.001), occupation (p=0.011) and health care domain (p=0.008) as well as the total score of El-Gilani score (p=0.011). Very low, low and middle social classes showed a significantly higher number of Hepatitis A IgG cases. On the other hand, the number of negative Hepatitis A IgG cases was significantly higherin high socioeconomic class (p=0.001).

Table (11) showed that age ≥6.0 years, Residence in lower Egypt and Below high socioeconomic were significant independent risk factors that increased the likelihood of having positive Hepatitis A IgG antibodies denoting past exposure to Hepatitis A virus. While Paternal high education was a significant independent protective factor that decreased the likelihood of having positive Hepatitis A IgG antibodies.

Discussion

Hepatitis A, caused by the Hepatitis A virus (HAV), is a highly contagious viral infection that primarily affects the liver. This form of hepatitis is transmitted via the faecal–oral route through the ingestion of contaminated food or water, making it a significant public health concern worldwide, that closely correlates with the degree of environmental sanitation and the socioeconomic and hygienic conditions.

Unlike other forms of viral hepatitis, such as Hepatitis B and C, which can lead to chronic liver disease, Hepatitis A typically results in acute illness without long-term consequences according to Lemon et al. **[11]**.

This was a cross sectional study conducted at Ain Shams University Children's Hospital Outpatient Clinic, Cairo, Egypt during the period from

September 2023 to March 2024 and performed on 200 Egyptian children and adolescents, whose ages were above the age of 1 year and below 16 years.

This study was conducted aiming to determine the seroprevalence of hepatitis A virus IgG in Egyptian children and adolescents and to correlate this prevalence with socioeconomic and demographic risk factors.

To the best of our knowledge, there is a paucity of recent studies in literature evaluating prevalence of HAV infection in Egyptian children; that represent a strength point in our study.

Among 200 patients enrolled in our study, 68% were serologically positive for HAV IgG antibodies using ELISA. This is similar to Al-Aziz and Awad **[6]** findings who studied 296 patients and the overall prevalence of HAV IgG was 61.4%. Despite the variability in sampling from different areas with different sanitation facilities as 43.9% of their sample in Cairo were high social class compared to 9.5% in ours and the study done more than 15 years ago, still results are nearly the same.

Cases with serologically positive HAV IgM showed lower scores in most of socioeconomic evaluation domains used in the study; this is in agreement with Yanik et al. **[12]** findings who studied the HAV seropositivity (IgG and IgM) on 4664 sample from a population of different age groups, in Turkey, in the period from January 2009 and December 2012; and their results revealed a high seropositivity in population with lower socioeconomic status.

Carrilho et al. [**13**] assessed the prevalence of HAV infection across different Brazilian regions; a study that revealed significantly higher prevalence in low socioeconomic group; a result that is in consistency with our study findings.

Kumar et al. **[14]** conducted a prospective exploratory study in India from November 2009 through July 2011 to assess the clinical course in children with HAV infection; majority of patients belonged to the lower class (61.5%), findings that to a great limit match with our study findings.

Our study showed that the seropositivity of HAV antibodies increased significantly with decreasing social class from 31.6% among children in the high social class to 64.3% in the middle social class to 76.5% in the low social class. This agrees with Al-Aziz and Awad **[6]** who reported a prevalence of HAV antibodies of 27.3% and 81% among high and low social classes respectively.

There was no statistical significant difference regarding gender in our study that matches with Bauer et al. **[15]** findings; who conducted a study at the Vienna general hospital from 2008 to 2018 on 578 patients with documented HAV infection and their results also revealed no significant difference between males and females.

Fouad et al. **[16]** conducted a study between November 2016 and July 2017 in twelve districts in Sohag governorate to assess prevalence of HAV infection that showed highly stastically significant association between age and Anti-HAV prevalence while there is no stastically significant association between gender and seropositivity. This is in agreement with our findings as we found that there is a statistically significant association between advancing age and seropositivity, and no significant difference between genders.

Among the HAV seropositive patients in Yassin et al. **[17]** study, they found that; a low maternal and paternal domestic hygiene are great risk factors for HAV infection which despite expected, did not appear to be a risk factor in our study; this can be attributed to the small sample size. However, it showed that low maternal and paternal education are significant risk factors for HAV infection, and no significant association between Hepatitis A IgG antibodies and anthropometric characteristics were found,which are in agreement with our findings.

The level of education of both parents (being domains of social class classification) was very important in our study. Paternal high education was a significant independent protective factor that decreased the likelihood of having positive Hepatitis A IgG antibodies, from 48.8% to 69.2% among highly educated and non-educated parents respectively. This is in agreement with Gomes et al. **[18]** findings in Brazil which demonstrated low level of parental education as a contributor to HAV antibody positivity in children. This could be due to poor hygiene and poor knowledge of the disease and its mode of transmission. This informs the need for educational campaigns on the mode of transmission and prevention of this infection in the community, and the need for raising awareness about the risk of consuming street food and increasing supervision over it.

A higher prevalence of anti-HAV anti bodies was noted with greater family size but it was not statistically significant in our study. However, Fix et al. **[19]** had a similar study in Chile and found a significant association between the prevalence of anti-HAV antibodies and crowded living situations.

Our results showed Hepatitis A IgG antibody was more frequent in 11-15 years (78.7%), followed by 6-10 years (72.3%) and least frequent in 1-5 years (59.1%), the differences were statistically significant. This is presumably due to increased likelihood exposure to HAV with advancing age; and this is in agreement with Al-Aziz and Awad **[6]** findings which showed an increase of HAV Ab with

increasing age from 53.1% in the age group 2.5-6 years to 73.8% by age 9–18 years.

El-Demerdash pediatric hospital is a nonprofit referral care institution and this can explain the socioeconomic level of our studied cases; 49%, 35% and 9.5% were low, middle and high socioeconomic class respectively based on Egyptian socioeconomic status scale updated by El-Gilany [3]. There was alack of diversity in socioeconomic standards among studied population and so, multicenter studies are warranted.

In our study, hepatitis A IgG antibody was most frequent in cases with residence from Lower Egypt (89.7%), followed by Upper Egypt (75.0%) and least frequent in cases from Greater Cairo (63.5%), the differences were statistically significant. It is possible that the prevalence of anti HAV Ab varies in different regions of Egypt, which may be related to differences in HAV epidemiology in different population groups. This may explain the difference between our result and other Egyptian studies Salama et al. [4]. This could also be explained in part by the diversity in standards for environmental hygiene and safety of water supply, despite the homogeneity of the population regarding cultural practices and habits.

Between 2001 and 2004, asentinel surveillance for acute viral hepatitis was conducted in a network of five infectious disease hospitals (namely, Alexandria, Mahalla, Abassia, Qena, and Aswan). This surveillance demonstrated that the risk of HAV infection was high in the rural areas of Egypt and that the infection occurred more likely in children (median age: 4 years). By contrast, HAV infection in the urban areas occurred more likely among young adults (median age: 14 years). Between 2014 and 2017, HAV was the most common cause of acute viral hepatitis in Egypt, representing 93.4% of all confirmed acute viral hepatitis cases.HAV infection occurred most likely among children under the age of 16 (81.8%) and most patients resided in the urban areas (82.8%). The median age of patients with HAV infection was significantly lower in the rural areas compared with that in the urban areas (5 vs. 8 years; $p<0.001$) [20].

There are three epidemiologic patterns of HAV infection found around the world according to WHO [21]. The first pattern is in the developing world where HAV is highly endemic. Most children therefore become infected early in life and by the age of 10 years most of the population is immune. Vaccination has no role in these areas.

The second pattern is in countries where standards of hygiene have been steadily improving in certain areas within developing countries, where the high social classes have improved sanitation and standards of living so the prevalence may have declined considerably.

The third pattern is where HAV has almost been eradicated because of high standards of hygiene and sanitation, as in developed countries. HAV infection is uncommon in the young, and is generally only acquired during travel to endemic areas. Here the chance of an epidemic is high and vaccination is recommended according to Vitral et al. [22] findings in Brazil.

In our study 71.4% of children aged 6 to 9 years within the high social class were seronegative for HAV Ab, i.e. by the age of 10 years most of this class were not immune and will be at risk of infection in case of contact with HAV case. By the age of 15 years, still 50% were not immune. Improvements in general standards of sanitation have a paradoxical effect of greatly increasing the number of susceptible adults and creating the potential for large-scale epidemics. There is a possibility for older children and young adults to be at higher risk for more severe course of the clinical disease according to Saffar et al. [23]. In this situation, prophylaxis against hepatitis A has become increasingly important for this high-risk group to avoid the potential complications including coagulopathy and fulminant liver failure in 1.3% up to liver transplantation according to Dimmock et al. [7].

In contrast only 22.0% of age group 6-9 years within the low social class were seronegative for HAV, i.e. by the age of 10 years most of these children were immune to HAV (86.6% seropositive). Vaccination of this group is not recommended.

As regard the middle social class, 31.6% of age 6–< 9 years were seronegative, so by age of 10 years 75% of this social class were immune to HAV. So vaccination for this group may not be mandatory now. Still different social classes are living together and there is risk of infection transmission between different social classes; thus HAV vaccination is recommended. Especially that 95% of vaccinated individuals have a long lasting immunity against Hepatitis A that can last up to 20 years [24].

But what is against this recommendation is the low incidence of complications of HAV which is why it might not be cost effective enough and so it could be recommended as a non obligatory vaccine for patients of high socioeconomic status.

The limitations of the study are worthy of mention including: Relatively small sample size and not being a multicentric study to some degree affected the appropriate evaluation of association between socioeconomic class and the prevalence of HAV infection among children above the age of 1 year and below the age of 16 years.

Conclusion:

The overall seroprevalence of Hepatitis A IgG antibody among our cases of 200 Egyptian children and adolescents was 68%. Hepatitis A IgG

antibody prevalence was statistically significantly higher with higher age, lower social class, lower paternal education and residence in Lower Egypt. Higher social class is the group at risk for infection occurring later in adolescence or early adult life with more severe symptoms in the case of contact with HAV patient.

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مدى انتشار الأجسام المضادة (IgG) لفيروس التهاب الكبد الوبائى (أ) بين الأطفال والمراهقين المصريين

الخلفية: فيروس التهاب الكبد الوبائى (أ) هو فيروس حمض الريبي النووى غير المغلف الذى ينتقل عبر الطريق البرازى الفموى. وهو أحد الأمراض المعدية الأكثر شيوعًا حيث يتم تشخيص ما يقدر بنحو ١,٥ مليون حالة كل عام على مستوى العالم.

الهدف من العمل: تقييم الانتشار المصلي للأجسام المضادة لالتهاب الكبد A IgG فى مجموعة من الأطفال والمراهقين المصريين وربط النتائج بعوامل الخطر الاجتماعية والاقتصادية والديموغرافية المحتملة.

المرضى والطرق: هذه دراسة مقطعية أجريت فى العيادة الخارجية لمستشفى الأطفال بجامعة عين شمس، القاهرة، مصر خلال الفترة من سبتمبر ٢٠٢٣ إلى مارس ٢٠٢٤ وتم إجراؤها على ٢٠٠ طفل ومراهق مصرى فوق سن سنة واحدة وأقل. سن ١٦ سنة.

النتائج: لجميع الحالات المسجلة، تم أخذ التاريخ المرضى مع التركيز على مسار الشكوى وعوامل الخطر الديموغرافية، وتم إجراء الفحص السريرى بما فى ذلك الفحص العام والصدر والقلب والبطن، وتم تقييم الحالة الاجتماعية والاقتصادية وسحب عينة المصل لتقييمها. إيجابية مصل التهاب الكبد الوبائى IgG. وفيما يتعلق بعوامل الخطر الديموغرافية، لم يكن هناك فروق ذات دلالة إحصائية بين الذكور والإناث فيما يتعلق بالجنس. كما لم يكن هناك فروق ذات دلالة إحصائية فيما يتعلق بالقياسات البشرية بين الحالات الإيجابية والسلبية. وفيما يتعلق بظهور الأعراض، كانت أعراض الجهاز التنفسى وأعراض الجهاز الهضمى هي الأعراض الأكثر شيوعاً بين الحالات المدروسة بتكرار ٣٨٪ و٣٠٪ على التوالى. أظهرت دراستنا أن الإيجابية المصلية للأجسام المضادة لالتهاب الكبد A IgG زادت بشكل ملحوظ مع انخفاض الطبقة الاجتماعية من ٣١,٦٪ بين الأطفال فى الطبقة الاجتماعية المرتفعة إلى ٦٤,٣٪ فى الطبقة الاجتماعية المتوسطة إلى ٧٦,٥٪ فى الطبقة الاجتماعية المنخفضة. وعلى الرغم من التحسن فى الناتج القومى الإجمالى وفى المعايير الاجتماعية والاقتصادية،

الاستنتاج: بلغ معدل الانتشار المصلى للأجسام المضادة لالتهاب الكبد الوبائى A IgG بين الحالات التى شملت ٢٠٠ طفل ومراهق مصرى ٦٨٪. كان معدل انتشار الأجسام المضادة IgG لالتهاب الكبد A أعلى بشكل ملحوظ إحصائيًا مع ارتفاع العمر، وانخفاض الطبقة الاجتماعية، وانخفاض مستوى تعليم الأب، والإقامة فى الوجه البحرى. الطبقة الاجتماعية العليا هى المجموعة المعرضة لخطر الإصابة بالعدوى التي تحدث فى وقت لاحق من مرحلة المراهقة أو بداية حياة البالغين مع ظهور أعراض أكثر خطورة فى حالة الاتصال بمريض التهاب الكبد الوبائى.