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Seroprevalence of Hepatitis E amongst Pregnant Women in Asmara, Eritrea

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Abstract:

Introduction: Hepatitis E is a liver disease caused by the Hepatitis E virus (HEV). Based on the WHO (2010), HEV is a member of the genus Hepevirus and so far, there are two species in this genus: (1) Mammalian HEV that causes human disease and infects several other mammalian species. (2) Avian HEV, which is responsible for big liver and spleen disease in chicken, and is known to infect other birds. HEV is noted to affect an estimated of one-third of the world population this makes the virus the most or second most common cause of acute viral hepatitis among adults in majority parts of Asia,

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the Middle East, and Africa. In the general population the case fatality rate (CFR) is between 1 and 2%, which can rise to over 40% in pregnant women.

Objective: This is the first study in Eritrea which is expected to illuminate some facts about the seroprevalence of HEV. The objective of the study is to determine the seroprevalence of hepatitis E among the pregnant women attending ANC in the selected health facilities of Asmara city and to identify possible risk factors of the infection.

Methods: The research study has applied cross-sectional descriptive laboratory based study design. In total, 153 pregnant women following ANC has included from four health facilities. Recruiting participants voluntary sampling technique and structured questionnaire was used to collect the socio-demographic; and Enzyme linked immune sorbent assay (ELISA) method was applied to examine for IgG and IgM antibody. Epi-Info for data entry and SPSS version 20 for analysis was used.

Results: Out of the 153 pregnant women 41 (26.8%) were seropositive for HEV IgG antibody. However, only for 82 blood samples were analyzed for IgM antibodies and all were found to be seronegative for HEV.

Conclusion: The study showed that significant finding of HEV IgG among the pregnant women. Therefore, it is high time for further deeper and large studies to be made on this virus in Eritrea.

Key words: HEV, Pregnant women, ANC, Asmara, Eritrea, ELISA

INTRODUCTION

Hepatitis E is a liver disease caused by the Hepatitis E virus (HEV). Based on the WHO (2010), HEV is a member of the genus Hepevirus and so far, there are two species in this genus: (A) mammalian HEV, that causes human disease and infects several other mammalian species, in particular pigs; and (B) avian HEV, which is responsible for big liver and spleen disease in chicken, and is known to infect other birds. HEV is transmitted mainly through the fecal-oral route due to fecal

contamination of drinking water (1). HEV infection is a significant public health problem in many parts of the world; though, the virus can affect different groups of the population, research studies have noted that the case-fatality is higher among the pregnant women (2). Clinical outcomes associated with HEV infection are quite diverse and indistinguishable from acute hepatitis caused by other hepatotropic viruses. The viral particles are relatively stable in the environment and have been recovered from sewage samples (3). HEV is a small, non-enveloped virus, approximately 27-34 nm in diameter. (4) The virus has a polyadenylated, single-stranded ribonucleic acid (RNA) genome, approximately 7.2 kilobases in length, with a positive polarity and a cap at its 5'-end. The viral genome contains short non-coding regions at both the 5' and the 3' ends, and contains three discontinuous and partially overlapping open reading frames (1).

Previous studies on seroprevalence of HEV antibodies show that it varies from country to country. A systematic review on hepatitis E virus in Africa has shown that the seroprevalence was 11.6% in Burkina Faso (2010-2012), 84.3% in Egypt (1997-2003), 14.2% in Gabon (2005, 2007), 28.7% in Ghana (2008) and 12.1% in Tunisia (2008-2009) among the pregnant mothers (5). Another study in India in 2014 done among male blood donors 18 to 60 years showed that only 4.78% were positive for IgM for HEV (6). Similar study on voluntary blood donors in the central part of Iran showed that 14.3% of the donors were detected to have anti-HEV (7). A study conducted in Malawi during 1989-2008 was noted that the seropositive was 16.5% for HEV based on IgG antibody (8). In Sudan, Medani hospital, a study on seroprevalence HEV on maternal and new born was conducted and the result showed that 12.5% of the women and 1.0% of the newborns had a positive result for anti-HEV IgG (9). Another study in Khartoum, Sudan, showed that seroprevalence of HEV IgG

antibodies were 61.2% (57/93) among the pregnant mothers (10).

Population based research information of HEV was never conducted or inaccessible in the country of Eritrea. Thus, none is known on the disease prevalence and its associated risk factors. Therefore, this research study is designed to provide the baseline information and to assess the seroprevalence of hepatitis E virus among pregnant women attending ANC in Asmara city.

MATERIALS AND METHODS

Study Population and Study Area

The research topic has noted that pregnant women attending ANC are the study subjects and Asmara, the country's capital city, is the targeted area of the study. Generally, there are six districts/regions (locally called 'zobas') and Asmara is in central region in Eritrea. The main reason why Asmara is selected for the study is firstly because it is easily accessible, and secondly because it is the place where the highest delivery services and other related maternal health services are provided. 153 pregnant women were included in the study from four health facilities namely Villagio community hospital, Edagahamus hospital, Akria health center and Godaif hospital to represent Asmara city.

Study Design

The research study followed a cross-sectional descriptive laboratory based study method which is common study design in multiple disciplines. Unlike other design such as longitudinal cohort study, in this type of design, it is conducted once across the targeted study population group.

Sample Determination and Recruitment Subjects

Pregnant women in the reproductive age, 15 to 49 years old, were the targeted groups of the study. The data collection period was for one month, from 1st to 30th of July 2016, in all the four health facilities. Voluntary sampling technique, which is a commonly used technique of recruiting study groups in health researches, was applied to recruit the pregnant women following their consents to participate in the research study (11). A standardized structured questionnaire was used to collect the demographic data plus the risk factors information regarding the study participants. Data collection tool was checked and screened for consistence and completeness to obtain the required information (12).

Assay Test

Enzyme linked immune sorbent assay (ELISA) method for semi-quantitative in vitro determination of antibodies (Abs) of the immunoglobulin classes IgG and IgM against hepatitis E antigens (Ags) in serum or plasma for the diagnosis of infection with HEV was done by EUROIMMUN Medizinische Labordiagnostika AG test kit at National health laboratory (NHL) Eritrea using automatic microplate washer and microplate photometric measurement analyzers.

The anti hepatitis E virus ELISA IgG and IgM test used was based on recombinant target Ags of HEV genotypes 1 and 3. The careful selection of Ags provides highly specific detection of anti HEV Abs of classes IgG and IgM.

Statistical analysis

The study variables were pre-coded for entry into Epi-Info version 7.0 and then exported to the Statistical Package for the Social Sciences software (SPSS version 20) for analysis. Descriptive analyzes is an initial step used to describe the data sets in terms of frequency and proportion for the categorical

variables of the study using SPSS analysis package (13). Considering its relevance to this study the analytical statistical tool, chi-square test was applied. Chi-squared test (also denoted by $\chi 2$) is a non-parametric analysis tool which is used to identify an association, not the strength of the association between two categorical variables. Hence in this study, the chi-squared test has applied to screen for an association between IgG antibody seropositive results and the several risk factors included in the study (14).

RESULTS

In total, 153 pregnant women had part in the study. Of which, 41 cases (26.8%) were confirmed seropositive for HEV using IgG. Only for 82 the blood samples were analyzed for IgM antibodies and all were found to be seronegative for HEV.

Based on the IgG antibody results, the prevalence of HEV among the three age groups was relatively higher (47.6%) in the 35 – 44 age groups as compared to the age groups of 15 – 24

(11.9%) and 25 – 34 (28.9%); Chi-square test indicated prevalence of HEV was noted to have association with pregnant women's age group with *p=0.008*. Results of the study indicated that 20.7% of the seropositive of HEV for IgG were pregnant in their 1st trimester, and the seropositivity was 28.8% and 27.6% in mothers of 2nd and 3rd trimesters, respectively. Chi-square test results identified, there was no significant association between seropositivity and women's pregnancy stages (*p=0.704*).

The prevalence of seropositive in HEV using IgG were 31.8%, 28.3% and 16.0% in each of the three educational categories, primary, secondary and above, respectively. This seropositive was found to have no association with pregnant women's educational level (*p=0.389*).

HEV IgG Result among the different characteristics is summarized in Table 1

Table1: Seropositivity of HEV IgG among study population

Characteristics		HEV IgG Result				Chi-square test	Sign.	Total	
		Negative		Positive					
		N	%	N	%			N	%
Health Facility	Edagahamus	42	72.4%	16	27.6%	0.798	0.850	58	37.9%
	Akria	29	78.4%	8	21.6%			37	24.2%
	Villagio	21	72.4%	8	27.6%			29	19.0%
	Godaif	20	69.0%	9	31.0%			29	19.0%
Age group	15 - 24	37	88.1%	5	11.9%	9.591	0.008	42	27.5%
	25 - 34	64	71.1%	26	28.9%			90	58.8%
	35 - 44	11	52.4%	10	47.6%			21	13.7%
Marital status	Married	102	72.9%	38	27.1%	0.100	0.752	140	91.5%
	Not married	10	76.9%	3	23.1%			13	8.5%
Education	Primary	15	68.2%	7	31.8%	1.891	0.389	22	14.4%
	Secondary	76	71.7%	30	28.3%			106	69.3%
	Above	21	84.0%	4	16.0%			25	16.3%
Occupation	Housewife	87	73.7%	31	26.3%	0.376	0.829	118	77.1%
	Daily worker	15	75.0%	5	25.0%			20	13.1%
	Other	10	66.7%	5	33.3%			15	9.8%
Pregnancy stage	1st trimester	23	79.3%	6	20.7%	0.703	0.704	29	19.0%
	2nd trimester	47	71.2%	19	28.8%			66	43.1%
	3rd trimester	42	72.4%	16	27.6%			58	37.9%
	Total	112	73.2%	41	26.8%			153	100.0%

Several research studies were identified that source of water, use of raw meat, availability of sanitary facilities and availability of domestic animals are risk factors for the disease caused hepatitis E virus. Hence, this research study has included it, of these risk factors, the chi-square test result noted a statistically significant association between availability of toilet and IgG result for HEV positivity (*p=0.045*). The IgG Result among the different causes of HEV is shown in table 2:

Table 2: Summary of IgG Result among the different causes of HEV

Causes of HEV		IgG Result				Chi-square test	Sign.	Total	
		Negative		Positive					
		N	%	N	%			N	%
Source water	Pipe water	73	70.2%	31	29.8%	2.952	0.229	104	68.0%
	Well	6	100%	0	0.0%			6	3.9%
	Other	33	76.7%	10	23.3%			43	28.1%
Raw meat	No	107	74.3%	37	25.7%	1.518	0.218	144	94.1%
	Yes	5	55.6%	4	44.4%			9	5.9%
Sanitation status	Latrine	71	68.3%	33	31.7%	4.029	0.045	104	68.0%
	Open	41	83.7%	8	16.3%			49	32.0%
Availability of cat	No	87	75.0%	29	25.0%	0.790	0.374	116	75.8%
	Yes	25	67.6%	12	32.4%			37	24.2%
Availability	ofNo	82	75.9%	26	24.1%	1.388	0.239	108	70.6%

other animal	Yes	30	66.7%	15	33.3%			45	29.4%
Soil contact	No	108	74.0%	38	26.0%	0.964	0.326	146	95.4%
	Yes	4	57.1%	3	42.9%			7	4.6%
	Total	112	73.2%	41	26.8%			153	100.0%

DISCUSSION

According to WHO, so far, there are two species of genus Hepevirus which are: (1) mammalian HEV, which causes human disease and infects several other mammalian species, in particular pigs; and (2) avian HEV, which is responsible for big liver and spleen disease in chicken, and other birds. Hepatitis E is virus caused disease which has affected an estimated of one-third of the population of the world, and it is noted that HEV is the most or second most common cause of acute viral hepatitis among adults in majority part of regions of Asia, the Middle East, and Africa. In the general population, the hepatitis E virus caused case-fatality (CFR) is between 1 and 2%, which can rise to over 40% in pregnant women (2).

In this study, a total 153 pregnant women had part and 41 (26.8%) were confirmed to seropositive for HEV using IgG antibody. However, only for 82 the blood sampled were analyzed for IgM antibodies and all were found to be seronegative for HEV. The result of the study showed that there is a strong association between HEV seroprevalence and age of the pregnant (*p=0.008)* and also is the availability and access to toilets (*p=0.045*).

A systematic review on hepatitis E virus in Africa has shown that the Seroprevalence was 11.6% in Burkina Faso (2010-2012), 84.3% in Egypt (1997-2003), 14.2% in Gabon (2005, 2007), 28.7% in Ghana (2008) and 12.1% in Tunisia (2008-2009) among the pregnant mothers (5). Another study in India in 2014 done among male blood donors 18 to 60 years showed that only 4.78% were positive for IgM for HEV (6). Similar study on voluntary blood donors in the central part of

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Study results showed variation among countries; this can be influenced due to differences in the demographics of the population studied, antibody detection assays used and other factors.

CONCLUSION

The study result has confirmed that 26.8% of the pregnant women in the study area of Asmara city health facilities were identified seropositive for HEV using ELISA IgG antibody. Only for 82 |of the total 153| of the blood samples were analyzed using ELISA for IgM antibodies and all were found to be seronegative for HEV.

The IgG result of the study revealed that there is a strong association between HEV seroprevalence and age of the pregnant women (*p=0.008)* and also with availability and access to toilets (*p=0.045*).

This study's seroprevalence result was lower as compared to finding from Khartoum, Sudan and Egypt. However, as compared to those results from countries of Tunisia, Gabon and Burkina Faso, the result of the study is higher.

RECOMMENDATION

It is quite obvious, risk factors associate to HEV are comparatively lower in the targeted area of the study as compared to the others parts of the country; therefore, it is recommended that:

- Extensive study with bigger sample size covering different parts of the country is necessary as results of the study clearly show significant seropositivity using IgG test among the study subjects.
- It is quite high time to devise deeper exploration mechanisms to assess seroprevalence of HEV among different groups of the community.
- An awareness campaign and health education should be provided to address the importance of the disease in the country of Eritrea.

REFERENCES

1. **World Health Organization (WHO, 2010).** *The Global prevalence of Hepatitis E Virus Infection and Susceptibility:* A systematic Review. WHO/IVB/10.14.
2. **BioMed Central Ltd** (2014). *A systematic review of the epidemiology of hepatitis E virus in Africa.* BMC Infectious Disease. (14): 308.
3. **Infectious Diseases Society of America, (2010)**. The two faces of Hepatitis E Virus. Div of Viral Hepatitis, Mailstop G-37, 1600 Clifton Rd, Atlanta.
4. **Chandra V; Taneja S; Kalia M; Jameel S** (2008). *Molecular biology and pathogenesis of hepatitis E virus.* J Biosci. 33(4): 51-64.
5. **Kim, J.; Nelson, E.K; Panzner, U.; Kasture, Y.; Labrique, B.A.; Wierzba, F. T (2014).** *A systematic*

review of the epidemiology of hepatitis E virus in Africa. BMC Infectious Diseases.

6. **Gajjar, D. M.; Bhatnagar, M. N.; Sonani, V. R.; Gupta, S.; Patel, T. (2014).** *Hepatitis E Seroprevalence among blood donors: A pilot study from Western India, Asia.* J Transfus Sci. 8(1): 29-31.
7. **Ehteram, H.; Ramezani, A.; Eslamifar, A.; Sofian, M.; Banifazl, M.; Ghassemi, S.; Aghakhni, A.; Mashayekhi, P.(2012).** *Seroprevalence of Hepatitis E Virus infection among volunteer blood donors in central province of Iran in 2012.* Iran J Microbiol. 5(2): 172-176.
8. **Taha, E. T.; Rusie, K. L.; Labrinque, A.; Nyirenda, M.; Soko, D.; Kamanga, M.; Kumwenda, J.; Farazadegan, H.; Nelson, K.; Kumwenda, N.(2015).** *Seroprevalence for Hepatitis E and other Viral Hepatitis among Diverse Population, Malawi.* Emerg Infect Dis. 21(7): 1178-1182.
9. **Eltayeb, R.; Gasim, I. G.; Elhassan, M. E.; Abdullahi, H.; ARayis, D. (2015).** *Maternal and newborn Seroprevalence of Hepatitis E virus at Medani Hospital, Sudan.* F1000Research (1)
10. **Musa, N. and Abuzei, K. (2015).** *Seroprevalence of HEV infection and risk factors among Sudanese pregnant women in Khartoum state* 2015.
11. **Statistics Canada**, **Minister of Industry, (2010)**. *Survey methods and practices*. 2010
12. **Woldie, M, (2015).** *Coverage of child health services in rural districts of Ethiopia with the health services extension program*. 7(7): 223-23.
13. **Bruce, N.; Pope, D.; Stanistreet, D. (2008).** *A Practical Interactive Guide to Epidemiology and Statistics.* JWiley and Sons Ltd, Chichester. UK.
14. **Steward, A., (2002)**. *Basic statistics and Epidemiology: A practical guide.* Radcliffe Medical Press Ltd, Marcham Road, Abingdon, Oxon OX141AA United Kingdom.