

# Seroprevalence of Hepatitis E Virus Infection among Blood Donors in Aminu Kano Teaching Hospital, Kano State

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## Abstract

Hepatitis E Virus (HEV) is a spherical, non-enveloped, single-stranded, positive-sense RNA virus, approximately 32nm to 34nm in diameter. The virus belongs to Hepeviridae family and the Hepevirus genus. There are four major genotypes of human HEV recognized; - HEV genotypes 1 and 2 have been found only in humans and HEV genotypes 3 and 4 are zoonotic in nature and both are widespread in developed countries. HEV has been known to cause self-limited acute infection in humans, but new reports showed evidence that HEV infection can cause significant morbidity and mortality in certain high risk group and individual with compromised immune systems. HEV has the ability to be transmitted by the transfusion of contaminated blood since it has an asymptomatic blood borne phase and may survive in blood components during processing and storage. A total of 90 blood samples from physically fit Blood Donors were collected. All Blood Donor's socio-demographic characteristics were collected using a structured questionnaire forms. Samples were examined for anti-HEV IgG using Melsin HEV-IgG ELISA. The association of anti-HEV status with risk factors was assessed. Analyses were performed using SPSS version 20. Seroprevalence of 23.3% for HEV IgG was determined. A higher prevalence of HEV was observed in the young adult age group with 76.1% (16/21) of the anti-HEV positive donors aged 21 – 40 years old. In the study, no significant association was observed between seropositivity and the risk factors associated with HEV infection. This study revealed that the potentials for HEV contamination in the blood supply to recipients does exist. More investigation of HEV especially in Kano should be conducted to establish a national estimate and validate these findings.

**Keywords:** Hepatitis E Virus, physically fit Blood Donors

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## INTRODUCTION

Hepatitis E Virus (HEV) is a spherical, non-enveloped, single-stranded, positive-sense RNA virus, approximately 32nm to 34nm in diameter. Recognized originally as a member of the genus Calcivirus, of the *Calciviridae* family but now reclassified into the *Hepeviridae* family and the Hepevirus genus (Teshale *et al.*, 2011)

There are four major genotypes of human HEV recognized; - HEV genotypes 1 and 2 have been found only in humans and are prevalent in developing countries. They are responsible for both sporadic cases and large out breaks linked to drinking contaminated water (Mansuyet *al.*, 2016).

HEV genotypes 3 and 4 are zoonotic disease, maintained in nature by animals and transmissible to humans, or vice versa and widespread in developed countries (Mansuyet *al.*, 2016).

These HEV genotypes have been detected in a wide range of domestic and wild animals, which are believed to play a major role in the human epidemiology of the virus (Kamaret *al.*, 2012).

HEV has been reported to be transmitted via faecal-oral route. The first reported cases of Hepatitis E virus was in 1955 during an outbreak in New Delhi, India (Hoofnagle *et al.*, 2012). Hepatitis E Virus (HEV) infection is newly recognized serious threat to global public health and Africa has been reported to be among the most severely affected regions in the world, most likely due to poor sanitation and weak public health facilities (Kim *et al.*, 2014). Every year, there are an estimated 20 million HEV infections worldwide, leading to an estimated 3.3 million symptomatic cases of Hepatitis E (Rein *etal.*, 2012)

Ordinarily, HEV has been known to cause self-limited acute infection in humans, but new reports showed evidence that HEV infection can cause significant morbidity and mortality in certain high risk group and individuals with compromised immune systems (Olabodeet *al.*, 2017). These include patients with pre-existing liver disease (where HEV infection can result in death with mortality rate as high as 60%, or evolve to a chronic state), immune-compromised subjects (Dalton *et al.*, 2009; Kamaret *al* 2012), and transplant recipients (Koenecke *et al.*, 2012).

In addition to Hepatitis, HEV infection also appears to be associated with some extra-hepatic manifestations; neurological disorders such as Guillain-Barre syndrome (acute limb weakness) and neuralgic amyotrophy (arm and shoulder weakness) due to peripheral nerve involvement, Haematological diseases such as haemolytic anaemia (in people with the hereditary risk factor glucose-6-phosphate dehydrogenase deficiency) and Severe thrombocytopenia, glomerulonephritis with nephrotic syndrome and mixed cryoglobulinemia (Bazerbach *et al.*, 2015)

However, sporadic cases without travel to disease-endemic areas caused by genotype 3 are being increasingly reported (Mushahwaret *al.*, 2008) Undercooked pork and wild boar products have been implicated as a source of HEV infection by epidemiologic and molecular studies (Adlhochet *al.*, 2009; Wenzel *et al.*, 2011).

HEV has the ability to be transmitted by the transfusion of contaminated blood since it has an asymptomatic blood borne phase and may survive in blood components during processing

and storage. The transmission of hepatitis E through transfusion therapy has been suggested by a number of studies done in both non-endemic countries (Matsubayashi *et al.*, 2008) and endemic countries (Khuroo *et al.*, 1993; Arankalle *et al.*, 2000).

High prevalence of HEV-specific antibodies, e.g., among blood donors, has been shown by several studies in Europe and the United States unexpectedly (Christensen *et al.*, 2008; Dalton *et al.*, 2008; Mansuyet *et al.*, 2008)

## **MATERIALS AND METHODS**

The study was a cross-sectional study. It was conducted in Aminu Kano Teaching Hospital (AKTH). Blood samples were collected from 90 blood donors who met all the criteria for blood donation: Age 18-60, weight 50kg, Hemoglobin not less than 13% for male and 12.5% for female physically healthy, Free from Drug, Not a Smoker and Non-reactive to transfusion transmissible infection HIV, HBV, HCV and VDRL in Aminu Kano Teaching Hospital (AKTH) Kano. The serum samples were used for the analysis. Ethical clearance to conduct the research was sought and obtained from the ethical committee of Aminu Kano Teaching Hospital (AKTH) with reference number "AKTH/MAC/SUB/12A/P-3/VI/2417" dated 25th August, 2018. Consent of the participants was also sought from each individual subject prior to the sample and data collection. The serum was assayed for the presence of Hepatitis E Virus IgG antibodies using Hepatitis E Virus (HEV) ELISA kit technique (Melsin Medical Co., Limited, China). The manufacturer's instructions were strictly adhered to.

## **STATISTICAL ANALYSIS**

The data obtained was evaluated using SPSS version 20.0 package, Statistically significant difference was determined using appropriate measurement of tendency and dispersion considering a ninety five (95%) confidence interval and p value of less than 0.05 as significant difference, Chi-square was used.

## **RESULTS**

A total of 90 subjects were assayed for the presence of anti-HEV IgG antibodies, this includes 88 (98%) males and 2 (2%) females, with their ages ranging from 18 to 50 years, and a median (IQR) age of 29 years (24 to 35). Among the study subjects, 43% were married, 52% of the study subjects were single and 5% were divorced. The majority (77%) belongs to Hausa ethnic group. Majority of the subjects had 33(37%) secondary education and 45(50%) Tertiary education.

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**Table 1** Socio-demographic Characteristics of the study subjects

Characteristics	Frequency(%) n = 90
Age	
≤ 20	8(9)
21 - 40	69(77)
> 40	13(14)
Sex	
Male	88(98)
Female	2 (2)
Ethnicity	
Hausa	69(76)
Fulani	9(10)
Yoruba	7(8)
Others	5(6)
Nationality	
Nigerian	90(100)
Non-Nigerian	0
Marital Status	
Single	47(52)
Married	39(43)
Divorced	4(5)
Educational Level	
Primary school	10(11)
Secondary school	33(37)
Tertiary Education	45(50)
Others	2(2)

**Prevalence of HEV Infection.**

The seropositivity rate of anti-HEV IgG among Blood Donors recruited in to the study was 23.3 % (21 out of 90) of the total study participants, while 78.7% (69 out of 90) was tested negative.

**Table 2:** Seroprevalence of HEV infection among Blood Donors in Aminu Kano Teaching Hospital, Kano

Result	Frequency (%)
Positive	21(23.3)
Negative	69(76.7)
Total	90(100.0)

Table 3 shows the Socio-demographic characteristics of HEV Infection of 90 blood donors distributed according to HEV seroprevalence. Subjects aged 21-40 years had the highest rate of HEV Infection 16(76.1%), followed by age group >40 (19.1%) and ≤ 20 (4.8%) positivity rate ( $p=0.629$ ). positivity rate among ethnic-group 15(71.4) out of 69(77%) Hausa, 3(14.3%) out of 7 (8%) Fulani and 3 (14.3%) out of 5(6%) others ethnic groups were tested positive for HEV ( $p=0.09$ ).

Seven (33.3%) out of 39 who are married, 13 (61.9%) out of 47 who are single and 1(4.8%) out of 4 who are divorced were tested positive ( $p=0.579$ ). Among Subjects who had primary education level 3 (14.3%) out of 10, Secondary 6 (28.6%) out of 33, Tertiary 12 (57.1%) out of 45 education were tested positive for HEV infection ( $p=0.653$ ). No significant association was observed between seropositivity and Socio-demographic characteristics with HEV Infection including Age, Ethnicity, Marital status, Level of education.

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**Table 3:** Socio-demographic characteristics of HEV Infection among the study subjects distributed according to HEV seroprevalence.

Variables	HEV positive (%)	HEV negative (%)	P value
Age			
≤ 20	1 (4.8)	7 (10.1)	0.629
21 - 40	16(76.1)	53(76.9)	
> 40	4 (19.1)	9 (13.0)	
Ethnicity			
Hausa	15(71.4)	54(78.3)	0.09
Fulani	3 (14.3)	6(8.7)	
Yoruba	0 (0.0)	7(10.1)	
Others	3 (14.3)	2 (2.9)	
Marital status			
Single	13(61.9)	34 (49.3)	0.568
Married	7 (33.3)	32(46.4)	
Divorced	1 (4.8)	3(4.3)	
Level of education			
Primary	3 (14.3)	7 (10.1)	0.653
Secondary	6 (28.6)	27 (39.1)	
Tertiary	12 (57.1)	33 (47.8)	
Others	0 (0.0)	2 (2.9)	

**p>0.05 - statistically no significant difference**

Risk factors associated with HEV Infection among the study subjects distributed according to HEV seroprevalence.

Table 4 shows risk factors associated with HEV Infection of 90 blood donors distributed according to HEV seroprevalence. 6(28.6%) out of 32 participants who had access to bore hole/pipped water were tested positive while 26(37.7%) out of 32 were tested negative, 1(4.8%) out of 3 participants who had access to well water were tested positive while 2(2.9%) out of 3 were tested negative 14(66.7%) out of 55 participants who had access to Bottle/Sachet water were tested positive while 41(59.4%) out of 55 were tested negative(p= 0.711). Positivity rate for sanitary condition among participants 1(4.8%) out of 2 subjects who had access to Open field defecation was positive, 5(23.8%) out of 26 who had access to pit latrine were tested positive, 15 (71.4%) out of 62 who had access to Flush toilet were tested positive (p=0.587). 21(100%) out of 83 participants who practice hand washing before eating and after defecation were tested positive while 62(89.9%) out of the 83 participants were tested negative of HEV infection. no statistically significant association was found between hand washing practice infection (p=0.129). There was no statistically significant association between animal contact and HEV infection (p=0.428). Among subjects who had history of blood transfusion 1(4.8%) out of 5 participants who had history of blood transfusion were tested positive while 20(95.2%) out of the 85 subjects who had no history of blood transfusion were tested positive of HEV infection. However, no association was observed between HEV infection and previous blood transfusion in this study population. (P = 0.856).

**Table 4** Risk factors associated with HEV Infection of 90 blood donors distributed according to HEV seroprevalence.

Variables	HEV positive (%)	HEV negative (%)	P value
Source of drinking water			
Well	1 (4.8)	2 (2.9)	0.711
Bottle/Sachet	14 (66.7)	41(59.4)	
Borehole/pipped	6 (28.6)	26 (37.7)	
Sanitary conditions			
Open field defecation	1 (4.8)	1 (1.4)	0.587
Pit latrine	5 (23.8)	21 (30.4)	
Flush toilet	15(71.4)	47 (68.1)	
Hand washing after toilet			
Yes	21 (100.0)	62 (89.9)	0.129
No	0 (0.0)	7 (10.1)	
History of blood transfusion			
Yes	1 (4.8)	4 (5.8)	0.856
No	20 (95.2)	65(94.2)	

**p>0.05 - statistically no significant difference**

## DISCUSSION

Transfusion-transmitted infections are a major problem associated with blood transfusion. While many studies have investigated the prevalence of HIV, HBV, and HCV infection in blood donors, only recently has the prevalence of HEV infection in blood donors been examined. (Assarehzadegan *et al.*, 2008, Kaufmann *et al.*, 2011). There are no documented data regarding the HEV prevalence in kano state. Therefore, we measured the anti-HEV IgG antibody seroprevalence among healthy blood donors in AKTH Kano and noticed a prevalence of 23.3%.

In this study, 90 blood samples were screened from blood donors in Aminu Kano Teaching Hospital and found the HEV seroprevalence to be 23.3%). This rate is significantly higher than the 5.3% recently reported in blood donors in Lagos, South-West Nigeria as reported by Olabode *et al.* (2017). This finding is also higher when compared with the previous reports by Alkali *et al.* (2010) 9.9% in Sokoto State among pregnant women. This seroprevalence is low when compared with the figure of 42.7% IgG obtained among the general population by Junaid *et al.* (2014) in Jos, Nigeria. This difference might be due to the difference in the target population as sampling in the Jos study was performed in general population including urban and rural participants. In dissimilarity, in the present study we studied only urban participants.

Age has been shown to be a risk factor for HEV infection, and older age is correlated with HEV antibody seropositivity (Christensen *et al.*, 2008). In consistent with previous studies, we found that the percentage of HEV IgG seropositivity increased with the age of the blood donors in the current study. For those donors aged between 21-40 years in particular HEV IgG seropositivity was higher. This discovery is also consistent with Adesina *et al.* (2009) who detected the prevalence of anti-HEV antibodies to be highest in ages 20-40 years in Ekiti State.

Sex may be another risk factor for HEV infection because we found that male blood donors accounted for higher anti-HEV seropositive compared to female donors. These data are consistent with those of a previous study showing higher prevalence of anti- HEV reactivity in male than in female blood donors in Lagos (Olabode *e tal.*, 2017). Thus, it appears that male blood donors are more likely to become infected by HEV than female donors. The low number

of females detected in this research could account for this but most notably, the cause for this could be due to the fact that majority of blood donors in Nigeria are men although previous studies have documented that HEV infections are predominantly reported in men (Kamareta<sup>l.</sup>, 2014).

## CONCLUSION

In conclusion, as this is the first study to investigate HEV seroprevalence among blood donors in Aminu Kano Teaching Hospital, will provide some preliminary data on actual risk of transfusion transmittable HEV and has revealed that though low the potential for HEV contamination in the blood supply to recipients do really exist.

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