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Hepatitis B and E viral infections among Nigerian healthcare workers

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Abstract

Background: There is dearth of information on Hepatitis E virus (HEV) infection and its co-infection with HBV among Nigerian healthcare workers (HCWs). Hence, there is the need to determine the rate of HEV infection and its association with HBV among HCWs who are at greater risk of nosocomial infections.

Methodology: Sera from 88 HCWs and 44 non-HCWs healthy adults as controls were tested for the presence of antibody to HEV (anti-HEV). The HCWs were also tested for HBsAg and antibody to Hepatitis B core antigen (anti-HBc) using commercially available ELISA kits.

Results: The prevalence of anti-HEV obtained among the HCWs and controls were 43% and 94% respectively ($p<0.005$) while those of HBsAg and anti-HBc in HCWs were respective 13% and 56%. Overall among HCWs, the prevalence of HBV infection was 65.9%, higher than HEV infection ($p<0.005$) with only anti-HBc greater among the male participants ($p<0.005$) while co-infection of HBV with HEV was 27.3%. HEV infection was least among the Paediatricians (18%) and highest among the Surgeons (55%) while HBV infection was similar in all the different occupational groups of HCWs (44-59%) except among the Gynecologists and Obstetricians (80%).

Conclusion: - Infection with HEV is high among Nigerian HCWs but lower than the rate among non-HCWs. It is also co-infected with HBV especially among the different groups of the HCWs and could occur with the diverse clinico-serological patterns of HBV infection.

Keywords: - *Hepatitis E virus, hepatitis B virus, Nigerian healthcare workers.*

Résumé

Contexte: Il y a peu d'information sur l'infection du virus l'hépatite E (VHE) et son infection conjointe par le VHB parmi les agents de santé au Nigéria (AS). Par conséquent, il est nécessaire de déterminer le taux d'infection par le VHE et son association avec le VHB chez les agents de la santé qui sont plus à risque d'infections nosocomiales.

Méthodologie: Les sérums de 88 agents de santé et 44 des adultes qui ne le sont pas mais qui sont sains et considérés comme pilotes ont été testés pour déterminer la présence d'anticorps au VHE (anti-VHE). Les agents de santé ont également été testés pour déterminer l'agent de l'HB et l'anticorps à l'antigène principal de l'hépatite B (anti-HBc) à l'aide des kits ELISA disponibles en vente.

Résultats: La prévalence des anticorps anti-VHE obtenus chez les agents de santé et chez le groupe pilote était de 43% et 94% respectivement ($p<0,005$), tandis que celles de l'Ag HBs et des anti-HBc chez les AS étaient respectivement 13% et 56%. Pour l'ensemble des agents de santé, la prévalence de l'infection par le VHB était de 65,9%, supérieure à l'infection VHE ($p<0,005$) avec seulement l'anti-HB c plus élevé chez les participants de sexe masculin ($p<0,005$) alors que l'infection conjointe du VHB avec le VHE était de 27,3%. L'infection du VHE était faible chez les pédiatres (18%) et plus élevée chez les chirurgiens (55%) alors que l'infection du VHB était similaire dans tous les groupes professionnels des agents de santé (44-59%), sauf chez les gynécologues et obstétriciens (80%).

Conclusion: - L'infection du VHE est élevée chez les agents de santé du Nigéria, mais inférieure au taux obtenu chez ceux qui ne sont pas agents de santé. Il est également co-infecté avec le VHB en particulier parmi les différents groupes d'agents de santé et pourrait se produire avec les modèles divers clinico-sérologiques de l'infection du VHB.

Introduction

Viral hepatitis is common worldwide with varying aetiologies such as hepatitis A-G viruses and the non – A- G viruses, and each predominating diversely in different geographical locations [1]. Similarly, the viruses are majorly transmitted by parenteral (hepatitis B, C, D, and G) and enteral (hepatitis A, E) routes. Of those spread parenterally, hepatitis B virus is the commonest in Nigerians [2, 3]. Among the feaco-orally transmitted hepatitis viruses, hepatitis A is highly prevalent among the different strata of Nigerians except those below 10 years of age [4] while HEV has been sparsely reported among Nigerians [5, 6].

The hepatitis E virus used to be called the enterically transmitted non-A, non-B (NANB) hepatitis virus, a non enveloped positive sense, single

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stranded RNA virus, belonging to a family *Hepeviridae* and genus hepevirus. It is a major public health problem in developing countries due to inadequate sanitation and poor personal hygiene with outbreaks and epidemics being associated with overcrowding, rainy seasons, floods causing water supply contamination with human faces. In developed countries, it has emerged as a significant cause of non-travel-associated acute hepatitis. Although it is mainly feaco-orally transmitted, it could also be acquired by contact from person to person, vertically from mother to child, parenterally through transfusion of blood of infected subjects and foodborne by ingestion of contaminated raw deer meat [7]. Although, it behaves like Hepatitis A virus by running a self-limiting course, in contrast, it could run a fulminant course in pregnant women particularly during third trimester, patients already suffering from chronic liver disease of different aetiologies and run a prolonged mild hepatitis with viral shedding in immuno-compromised patients during chemotherapy for T-cell lymphoma [8] and a chronic form in solid organ transplant patients [9]. Furthermore, HEV infection may be associated with some complicating extra-hepatic inflammatory disorders [7].

The pattern of manifestation of HEV infection seems to simulate those of HBV infection in pursuing not only a self-limiting course but in addition the fulminant and chronic courses. Since HEV infection has been described among some Nigerian workers of industrial companies attending the Occupational Health Service as well as hospitalized patients and pregnant women, therefore the hospital worker are at risk of acquiring the infection. Furthermore, the report of autochthonous hepatitis E virus infection in a UK hospital - based study of patients with unexplained hepatitis and treated as drug induced hepatitis, suggests some patients with HEV infection in Nigerian hospitals must have been misdiagnosed as drug induced hepatitis [10]. In addition, the hospital workers are exposed to the various routes of possible transmission of HEV in the hospital setting. However, there is no report of the infection among Nigerian hospital workers. Hence, we present the report of our study on hepatitis E and B viral infections among the hospital workers in a Nigerian teaching hospital.

Methodology

The study involved volunteered consecutive 88 Nigerian HCWs from a Nigerian teaching health care facility and 44 healthy Nigerian adults (non-HCWs) as control that consented to the study. The HCWs included doctors in the departments of Medicine (34), Surgery (18), Obstetrics / Gynaecology (10) and Paediatrics (11), dental surgeons (7) as well as nurses (6) of the same health facility.

The sera of the blood collected from the subjects were tested by Enzyme linked Immuno-Assay (ELISA) method using Amrad HEV Reagent, Melbourne (Batch No 4A197) Australia at the WHO referenced Virology Laboratory located at the University College Hospital Ibadan, Nigeria. The sera of the HCWs were also screened for HBsAg and anti-HBc by ELISA. The study was conducted following ethical clearance obtained from the UCH Ethical Review Board. The data were analyzed statistically at a significant level of $p< 0.05$.

Results

The subjects that were studied consisted of 22 females and 66 males among the HCWs and 11 females and 33 males among the control, the two groups were age and sex matched. HEV infection was high in all the age groups among the controls but only highest among the 31-40 year group of the HCWs. The overall prevalent rate of HEV were 44% and 93% among the HCWs and control ($p<0.005$), and were without gender differences, Table 1. The prevalence of HBsAg and anti-HBc among the HCWs were 13% and 56% respectively ($p<0.05$) with HBsAg found only among the 21-40 age group and higher among 21-30 age group than those aged 31-40 years($p<0.05$) while anti-HBc was present in all the age groups with the prevalence increasing with age. There was no difference in the prevalence of HBsAg between male and female subjects but that of anti-HBc was higher in the males than the females ($p<0.05$). Overall among the HCWs, HBV infection was 62% and was higher among the males than females, commoner than HEV infection ($p<0.005$) while co-infection of HBV with HEV was 27.3% and was unaffected by gender, Table 2.

Table 1: Age distribution of HEV infections among a cohort of Nigerian Health care workers and controls at Ibadan, Nigeria.

Age group (years)	Number (%)	
	Control (N=44)	HCWs (N=88)
20	1(100)	1(0)
21-30	11(91)	23(36)
31-40	23(91)	45(51)
41-50	7(100)	16(31)
51-60	2(100)	3(67)
Total	44(93)	88(44)
Mean ± SD	36±6.9	35.4±7.3

Table2: Gender and infections with HEV and HBV in healthcare workers at a health facility in Ibadan, Nigeria.

Groups	Number	Age (years)	Percentages				
			Anti-HEV⁺	HBsAg⁺	Anti-HBc⁺	HBV⁺	HBV⁺+HEV⁺
Female	22	28-53	43	18	45	50	36
Male	66	20-58	45	11	59	66	25
Total	88	26-58	43	13	56	62	28

Considering the pattern of HBV infection among the HCWs, acute, acute/chronic, occult or past exposure and susceptibility to HBV infection were present in 9.1%, 3.4%, 53.4% and 34.1% respectively while respective co-infection with HEV were 2.3%, 1.1%,23.9% and 15.9%. Only 18.2% of the HCWs were neither HBV nor HEV infected whilst lone infections of HBV and HEV were 38.6% and 15.9% respectively, Table 3.

than that of HBV in all different groups of HCWs ($p<0.05$ each) except among the Surgeons. HBsAg was present only among those in the Medicine and Paediatrics departments while anti-HBc was present in HCWs regardless of the department though highest among those in the Obstetrics and Gynaecology department.

Although, co-infection of both HEV and HBV was highest among the doctors in Medicine

Table 3: HEV and HBV infections among Nigerian Healthcare workers at a health facility in Ibadan, Nigeria.

Types of infection	HEV	HBsAg	Anti-HBc	Number (%)
HEV alone	+	-	-	14(16)
Acute HBV alone	-	+	-	6(7)
Acute HBV +HEV	+	+	-	2(2)
Acute/Chronic HBV alone	-	+	+	2(2)
Acute/Chronic HBV +HEV				1(1)
Occult HBV	-	-	+	26(30)
Occult HBV +HEV	+	-	+	21(24)
Susceptible	-	-	-	16(18)
Total	88(100)			88(100)

Table 4: HEV and HBV infections among Nigerian Health care workers at a health facility in Ibadan, Nigeria.

Groups (Number)	Age (years)	Percentages				
		Anti-HEV⁺	HBsAg⁺	Anti-HBc⁺	HBV⁺	HBV⁺+HEV⁺
Doctors (73)	26-58	40	14	55	61	26
Medicine (34)	28-52	44	26	50	59	32
Paediatrics (11)	26-47	18	12	36	55	18
Surgery (18)	26-43	55	0	44	44	17
O & G (10)	29-58	20	0	80	80	20
Dentistry (7)	32-53	43	0	100	100	43
Nurses (8)	31-52	62	0	75	75	50
Total (88)	26-58	43	13	56	66	27

Among the different occupational groups of the HCWs, HEV infection was commonest among the Surgeons (55%) but least among the Paediatricians and Obstetricians/Gynaecologists while the prevalence of HBV infection was similar in all the groups (44-59%) except the Gynaecologists/Obstetricians (80%), Table 4. The prevalence of HEV infection is lower

department, acute and acute/chronic patterns of HBV infection with or without HEV were present only in those subjects of Paediatric and Medicine departments. HEV co-infects all the different clinical and serological patterns of HBV infection although with many of the HCWs susceptible to both infections, Table 4.

Discussion

Although health facilities are homes for patients and work place for the healthcare workers, they also serve as avenues for the transfer of infections and diseases. These could occur by contact, aeration of pathogens in the air, spillage or processing of body secretions, waste and tissues, accidental transmission percutanously through mucous membrane, cuts; needle pricks during wound dressings, procedures and different treatment options for patient's care. In addition, the role of personal hygiene, environment sanitation, provision of running portable water, sterilized consumables and proper disposal of hospital waste have great role in the spread of infections within the setting inter and intra the patients and the hospital workers.

Our study showing the prevalence of 13% for HBsAg among the HCWs corroborates the published fact that Nigeria remains a hyperendemic nation for the HBV infection [11]. Similarly, the high rate of anti-HBc among the workers shows that many of the workers have been exposed to the infection either in the work place or the community and these exposed workers could have recovered from the acute infection, be undergoing active infection or an HBsAg carrier. Isolated assay of HBsAg is an under estimation of the prevalence of HBV infection but the co-assay of anti-HBc gives a true picture of the infection since absence of HBsAg does not exclude occult HBV infection which the estimation of anti-HBc would eliminate [12]. The presence of the HBV infection in higher level among those workers of the 21-30 year age group than those aged 31-40 years is not a surprise because the subjects in the former group are likely to be newly employed and with little experience [13-15]. In comparison, our study revealed a higher prevalence of HEV infection among both adult health and non-health care workers than the result from a previous study among the patients and the healthy subjects in the community [6]. This suggests that the healthcare setting is a home for transmission of the infection especially when there may be lack of adequate running tap water, soap and hand gel for hand hygiene which would curtail contact spread of the infection [16]. The situation of absence of safe water supply more than its lack in the community with possible poor personal and environmental hygiene could feasibly explain our observation of higher HEV infection among the non-health care workers. The presence of the infection in all the age group regardless of gender is not unexpected but the peak occurrence among the 30-40 year age group might be secondary to the group being the most active cluster of the working class.

The co-occurrence of both HEV and HBV infections among the HCWs even in all age groups and the two genders is not unusual since the routes of spread of both infection are florid within the hospital setting and is a reflection of the low standard of health care facility in Nigeria in terms of the expectations for a health care setting for ensuring a low risk level for occupational health and safety [10, 13, 14, 18]. The rather high prevalence of the co-infections among healthcare workers is alarming although this is the first publication among Nigerians; and suggests the assay of serological markers for HEV infection in the assessment of patients with hepatitis. This is of upmost importance since the co-occurrence of HBV and HEV are prevalent among various clinico-serological patterns of HBV in spite of the lone occurrences of either HBV or HEV infection [2]. It calls for stricter implementation of work ethics among HCWs and provision of necessary wares by the government for good medical practice in its healthcare institutions. The presence of susceptible HCWs to both infections emphasizes the need to ensure proper and complete immunization of HCW against both infections and the development of safe local vaccines [10, 18].

Concerning the pattern of both infections among the different groups of HCWs, the prevalence of HBV infection among the doctors, nurses and dentists follow previous report [17] while the lower prevalence of HEV infection among the Paediatricians and Obstetricians/Gynaecologists could be secondary to differences in observation of sanitation ethics at the workplace [19]. The peak prevalence of the two infections among the physicians is of serious concern because this may be a reflection of the dichotomy between knowledge and its application in practice since the group is expected to be most knowledgeable about the infections.

In conclusion, the study has demonstrated that HEV infection is high among Nigerian HCWs regardless of the age and sex but higher among the non-HCWs. Although, HEV is less common that HBV infection, co-infections are common in the different groups of the HCWs and could occur with the different clinico-serological patterns of HBV infection. This calls for strict implementation of personal and environment hygiene including work ethics among the work force as well as provision of a safe environment and wares for good medical practice. In addition, all HCWs should be screened for both infections and treated if infected to reduce the spread of the infection. The susceptible subjects should be immunized against HBV and HEV while there should be active efforts towards local production of vaccines for HBV and HEV.

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