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RESEARCH ARTICLE

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Viral Hepatitis Infections in Africa - A Meta-analysis

ABSTRACT:

Hepatitis infections are a global public health challenge involving the inflammatory condition of the liver. Transmission is a common occurrence and a potential risk especially in Sub-Saharan Africa which is an area of high endemicity. The objective of the present work was to investigate incidence of viral hepatitis infections in Africa. Literature search was performed using Pubmed, American society for microbiology (ASM) journals, Google scholar and other sources to establish conclusions from the results of randomized and cross sectional clinical studies in Africa. The quality of studies was assessed using descriptive and inferential statistics with adjusted odds ratio of 95% confidence interval (CI) for the most prevalent hepatitis infection, ages of susceptible individuals and health status involved. The results revealed the most and least prevalent Hepatitis as B and A, respectively. Seroprevalence was highest among women 21–25 years of age. About three-quarter (73.4%) were in their third trimester of pregnancy. Multiple logistic regression analysis was used to identify factors that are significantly associated with maternofoetal transmission which remains a contributor to high prevalence of chronic infection. We found that viral load and age showed significant contributions. The results showed high correlation between viral hepatitis and maternofoetal transmission in pregnant women.

KEY WORDS:

Viral Hepatitis, Maternofoetal Transmission, Trimester.

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INTRODUCTION:

Hepatitis (inflammation of the liver) is a major public health challenge and highly endemic in several African countries with high mortality rate. Exposure to contaminated and faecal polluted drinking and recreational water is a key contributor to the high incidence of hepatitis A (López-Pila *et al.*, 2000). In South Africa, contaminated river and dam water used for domestic, irrigation and recreational purposes have been implicated in Hepatitis A viral infections (Schoub *et al.*, 2000) with the causative viral pathogens including adenovirus, hepatitis E virus, HAV, and other picornaviruses (Havelaar *et al.*, 2001). Several attempts have been made towards determining the risk of infection posed by viruses in drinking and recreational waters which include epidemiological studies, analytical approaches and mathematical models that are based on dose-response relationships (Vivier *et al.*, 2002). Previous studies have also shown that Sub-Saharan Africa is an area of high endemicity for hepatitis B virus (HBV), where more than 75% of adults have been infected with an estimated 5–25% being chronic carriers with known HIV status. The maternofoetal transmission of hepatitis B virus (HBV) from HBV-positive mothers to their infants is a common occurrence when the mother is hepatitis B e antigen (HBeAg) positive and/or has a high HBV DNA load (Kfutwah *et al.*, 2012). According to studies carried out in Ghana, the predominant route of HBV transmission is horizontal, most children being already infected by the age of five (Kew *et al.*, 1987; Martinson *et al.*, 1998; Dumpis *et al.*, 2001; Candotti *et al.*, 2007) while maternofoetal transmission seems to play a minor role. On the other hand, in Cameroun, the major mode of

disease transmission of HBV is perinatal transmission from infected mothers to their children during pregnancy, at birth or after birth (Guntupalli and Steingrub, 2005). In Cameroun, the high prevalence of HBV has also been linked to the pregnant status among women suggesting that pregnant women serve as a very important reservoir to fuel the HBV epidemic in the general population in Cameroun (Kfutwah *et al.*, 1912). Similar results were obtained in Côte d'Ivoire (Rouet *et al.*, 2004) and Tanzania (Jacobs *et al.*, 1997). The overall 8.3% (17/204) HBV maternofoetal transmission rate observed in Ghana was like the 7% rate reported from Senegal in infants at birth, but was higher than previously reported in other studies from sub-Saharan Africa (Candotti *et al.*, 2007). The world health organization lists Nigeria as a highly endemic country (Olaitan and Zamani, 2010). In reported studies for hepatitis B carried out in Nigeria, prevalence of HBV was estimated as 8% (Olaitan and Zamani, 2010). The prevalence of HBsAg found in pregnant women attending antenatal clinic in Gwagwalada, Abuja, Nigeria falls within the range of earlier reports from Nigeria, Africa and the rest of the world (Uneke *et al.*, 2005). High prevalence was also observed in other parts of Africa such as in Burkina Faso where prevalence rate is estimated at 17.3% (Collenberg *et al.*, 2006). Lower levels reported include 5.3% in Ethiopia (Walle *et al.*, 2008) and 6.3% in Tanzania (Menendez *et al.*, 1999). Viral hepatitis during pregnancy can be very fatal because of the high risk of maternal complications. Vertical transmission can lead to foetal and neonatal hepatitis which can cause impaired mental and physical health later in life and is also a leading cause of maternal mortality (Elinav *et al.*, 2006). It is also said to be the most familiar cause of jaundice in pregnancy (Hill *et al.*, 2002). Perinatal transmission of this disease occurs if the mother has had acute Hepatitis B infection during late pregnancy. Studies conducted in Nigeria by Uneke *et al.* (2005), suggests an inverse relationship between the educational status of the women and the seroprevalence of HBsAg. The study revealed that women with high prevalence level of HBsAg are illiterates (76.7%) while those with some level of education had lower prevalence (23.3%). Business women had higher prevalence than other women studied. There was no significant relationship between infection and the occupation of the women seen ($P < 0.05$) in Nigeria.

METHODOLOGY:

Study Population:

This study involves a record–review of five peer–reviewed researches of two thousand seven hundred and sixty-one (2761) subjects for a period of six years ranging from 2007–2012 in Department of Microbiology, University of Lagos, Nigeria in March 2016. The demographics of the subjects includes Age of women, Pregnancy status, Level of Pregnancy, Viral Hepatitis Status, Type of Hepatitis, HIV Status and Type of Clinical Status. The subjects from this study originated from various social and ethnic groups as well as geographically distinct areas from the territory of sub–Saharan African.

Data Management and Analysis:

Data analyses were carried out with EPI–INFO version 3.5.1. Descriptive statistics such as means, medians, ranges and standard deviations were used to summarize quantitative variables such as patients' characteristics while categorical variables such as level of adherence were summarized with proportions and percentages. Bivariate analysis such as Chi–square test was used to investigate the association between compliance and the selected variables. Logistic regression was further used to determine the factors that may be significantly associated with compliance of the patients. Model fit was assessed using the Hosmer Lemeshow goodness of fit test. All tests were carried out at 5% level of significance.

RESULTS AND DISCUSSION:

Table 1 shows a summary of the socio–demographic characteristics of five peer–reviewed researches. The mean age was 24.9 ± 8.8 years. Majority of the women were between 21–25 years (28.2%). More than three–quarter (79.4%) of the patients were pregnant women. Also, about three–quarter of the pregnant women were in their third trimester. Type B was the most common Hepatitis (55.2%). Less than two–third (60.4%) of the patients were HIV positive. The most common diagnosed clinical signs were vomiting (12.9%) and jaundice (15.8%). Table 2 displays the test of association between viral hepatitis status and its associated factors. There was a significant association in comparison of Viral Hepatitis Status with Age group of women ($P < 0.001$) and Level of pregnancy ($P = 0.028$). Also, Viral Hepatitis Status was significantly higher among those HIV positive status (62.9) compared with HIV negative status (37.1). Table 3 shows the logistic regression analysis of factors influencing prevalence of viral hepatitis condition. The variables considered included age of the women, their various levels of pregnancies and the respective HIV status. The factors identified to be significantly associated with prevalence of viral hepatitis condition in bivariate analysis were harvested and subjected to multivariate analysis. Women who were above 25 years are five times more likely to (OR = 4.832, $P = 0.032$, 95% CI: 2.021, 7.289) have viral hepatitis condition than women who were between 21–25 years. Also, women who are HIV positive are three times more likely (OR =

2.788, *P* = 0.008, 95% CI: 1.774, 4.683) to have viral hepatitis condition compared to women who are HIV negative. However, none of the levels of pregnancy {First and Third Trimester} do have significant association with viral hepatitis condition (*P* = 0.099, *P* = 0.856). The model was a good fit as Hosmer and Lemeshow goodness of fit was not significant (χ^2 = 3.377, *P* = 0.295). Our meta-analysis suggests a significantly increased risk of viral hepatitis in women who are above 25 years of age and who are HIV-positive. Previous studies have established a correlation between chronic hepatitis B and HIV status. According to reports by Hyams (1995) and Thio *et al.* (2003), individuals who are at risk of developing chronic hepatitis B include those who are human immunodeficiency virus (HIV) seropositive, immunosuppressed, and elderly at the time of infection. It has been suggested that the host immune response also performs a key and major role in determining the outcome, because a vigorous, polyclonal cytotoxic-T-lymphocyte (CTL) response correlates with viral clearance (Rehermann *et al.*, 1995; Chisari, 1997). The data reported herein revealed the roles of HIV status and age in prevalence of hepatitis B viral infection in African countries such as in Cameroun (Kfutwah *et al.*, 2012; Ndumbe and Njie, 1989) in Tanzania (Jacobs *et al.*, 1997), in Ghana (Allain *et al.*, 2003). Viral load was also observed to be an important risk factors in this study. This is consistent with the report of (Allain *et al*., 2003) who observed that 20% of HBV-infected young adults in Ghana are carrying a high viral load. In this study, we analysed the socio–demographic characteristics of the patients and carried out test of association of viral hepatitis status and its associated factors as well as the Logistic Regression Analysis of Factors influencing prevalence of viral hepatitis condition. The quality of the studies was evaluated based on the study design, data analysis and adjustments of odds ratios.

Table 1. Socio–demographic characteristics of the patients of five peer–reviewed research materials

Variable	Frequency	Percentage
Age of women (years)		
<=20	335	12.1
21 – 25	779	28.2
26 – 30	568	20.6
31 – 35	321	11.6
36 – 40	290	10.5
>40	468	16.9
Total	2761	100.0
Pregnancy status		
Pregnant	2193	79.4
Not pregnant	568	20.6
Total	2761	100.0
Level of Pregnancy		
First trimester	329	15.0
Second trimester	255	11.6
Third trimester	1609	73.4
Total	2193	100.0
Viral hepatitis status		
Present	2099	76.0
Absent	662	24.0
Total	2761	100.0
Type of Hepatitis		
A	176	8.3
B	1159	55.2
C	409	19.5
E	355	16.9
Total	2099	100.0
HIV status		
Positive	1667	60.4
Negative	1094	39.6
Total	2761	100.0
Type of clinical signs		
Vomiting	355	12.9
Jaundice	437	15.8
Hepatalgia	28	1.0
Hepatomegaly	16	0.5
Asthenia	23	0.8
Unknown	1902	68.9
Total	2761	100.0

Table 2. Test of association of Viral Hepatitis Status and its associated factors

Variable	Viral Hepatitis Status		χ^2	*P*–value
	Present	Absent		
Age of women (years)			24.462	P< 0.001**
<=20				
21 – 25	255 (12.1)	80 (12.1)		
26 – 30	592 (28.2)	187 (28.2)		
31 – 35	432 (20.6)	136 (20.5)		
36 – 40	244 (11.6)	77 (11.6)		
>40	221 (10.5)	69 (10.4)		
Total	356 (16.9)	112 (16.9)		
	2099 (100.0)	**662 (100.0)**		
Pregnancy status			3.597	0.061
Pregnant				
Not pregnant	1595 (75.9)	448 (67.7)		
Total	504 (24.1)	214 (32.3)		
	2099 (100.0)	**662 (100.0)**		
Level of Pregnancy			13.483	0.028**
First trimester				
Second trimester	262 (15.7)	83 (15.8)		
Third trimester	155 (9.3)	48 (9.1)		
Total	1250 (74.9)	395 (75.1)		
	1667 (100.0)	**526 (100.0)**		
HIV status			7.569	0.010**
Positive	1322 (62.9)	444 (67.1)		
Negative	777 (37.1)	218 (32.9)		
Total	**2099 (76.0)**	**662 (24.0)**		

** Significant *P*–value (*P<0.05*)

Table 3. Logistic Regression Analysis of Factors influencing prevalence of Viral Hepatitis condition

Variables	Odds Ratio	*P*-value	95% CI
Age of women			
>25 years	4.832	0.032*	(2.021, 7.289)
21–25 years*			
Level of Pregnancy			
Third trimester	2.307	0.099	(0.606, 1.812)
First trimester	1.558	0.856	(0.722, 3.473)
Second trimester*			
HIV status			
Positive			
Negative *	2.788	0.008*	(1.774, 4.683)

* Reference Category

CONCLUSION:

The result of the study revealed a high incidence of HBV infection among pregnant women in Africa. Pregnancy and viral load are factors observed to be associated with the frequency of vertical transmission.

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