



Seroprevalence of Hepatitis B and C Infections in Mokolo District Hospital, Northern Cameroon: The Value of a Screening Campaign

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Received January 17, 2018; Accepted March 6, 2018; Online Published April 21, 2018

Abstract

Background: Infections due to the hepatitis B (HBV) and hepatitis C (HCV) viruses constitute a global public health problem. Although screening of these infections remains a pivotal tool for timely detection and management of carriers, this preventive measure has been neglected in Africa.

Objective: The current study determined the prevalence of hepatitis B surface antigen (HBsAg) and anti-HCV as well as their risk factors through a screening campaign organized in a rural setting in northern Cameroon.

Methods: A cross-sectional analytical study was conducted during a screening campaign for viral hepatitis organized at the Mokolo District Hospital, Cameroon, from January 19, 2017 to February 27, 2017. Sociodemographic data from all consenting participants was collected and each participant was examined for signs of chronic liver disease. Participants were then screened for HBsAg and anti-HCV using a rapid diagnostic test (ACON®).

Results: Of the 364 participants enrolled, 28.6% tested positive for HBsAg and 2.2% for anti-HCV. All HBsAg-positive and anti-HCV-positive individuals were asymptomatic and unaware of their infection status prior to testing. None of the socio-demographic factors assessed was associated with a positive HbsAg status.

Conclusion: HBV and HCV infections are endemic in this rural health district. Participants who tested positive were apparently healthy and completely unaware of their infection status. Transmission of the hepatitis virus may be a public health concern in this district. It is recommended that community health education activities on preventive measures for HBV and HCV infections, regular screening for disease surveillance, and close follow-up of disease progression in these asymptomatic individuals be conducted.

Keywords: Hepatitis B Virus, Hepatitis C Virus, Rural, Cameroon, Screening, Seroprevalence

1. Background

Viral hepatitis is a major global public health problem, predominantly affecting low- and middle-income countries (LMIC) in the African and western Pacific regions.¹ Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections account for a significant proportion of viral hepatitis infections.¹ Worldwide, 2 billion people are infected with hepatitis B, and there are 257 million and

71 million cases of chronic HBV and HCV infections, respectively.² In all, about 1.4 million people died from viral hepatitis-related causes (cirrhosis and hepatocellular cancer) in 2015, with HBV and HCV responsible for 96% of these deaths.² This number is greater than the number of deaths caused by HIV/AIDS and compares to the annual number of deaths due to tuberculosis.² The median seroprevalence of hepatitis B surface antigen (HBsAg) is

estimated to be 6.9% in Nigeria, 8% in Ivory Coast, 12% in Ghana, 14.2% in Zimbabwe, and 15.5% in Benin.³

Previously cited risk factors for these infections in Africa include being born of an HBV-positive mother,⁴ having a history of scarification,⁵ prior contact with a jaundiced or HBV-infected individual,⁶ blood transfusion,⁷ history of sexually transmitted diseases,^{8,9} and multiple sexual partners.^{8,9} Likewise, recent reports¹⁰⁻¹² portray that a younger African population seems to be more affected by these viral infections, suggesting high rates of fetomaternal transmission. Also, due to shared routes of transmission, the advent of the HIV pandemic has increased the health burden associated with these infections in Africa through the earlier onset and rapid progression of complications.¹⁰ The risk of acquiring HBV or HCV infections is 1.4- to 1.6-fold higher among HIV-positive individuals.¹⁰

In response to this situation, the World Health Organization (WHO) adopted the Global Health Sector Strategy on viral hepatitis, 2016-2021, which calls for the eradication of the public health threat of viral hepatitis by 2030 and the reduction of new infections and mortality by 90% and 65%, respectively.² However, limited access to affordable testing and the largely asymptomatic nature of these infections^{11,12} prevent early detection and appropriate management, with a resultant increase in morbidity and mortality, particularly in LMICs.^{13,14} Screening campaigns present a unique opportunity to test healthy individuals for HBV or HCV infections with the aim of identifying healthy carriers, reducing horizontal and vertical transmission, preventing progression to chronic liver disease or hepatocellular carcinoma (HCC), and reducing mortality.^{2,15} Hence, the WHO recommends routine testing of all adults living in areas with known seroprevalences of $\geq 2\%$ for HBsAg and $\geq 5\%$ for anti-HCV antibodies (anti-HCV).¹⁶

Cameroon is a highly endemic country with prevalence rates of 11.2%¹⁷ and 6.5%¹⁸ for HBV and HCV infections, respectively. The hepatitis B vaccine was introduced in 2005 as a routine vaccine under the expanded program of immunization (EPI) in Cameroon³ in line with the WHO recommendations of 1991.¹⁹ By 2015, a coverage rate of 83% was achieved for hepatitis B vaccination among Cameroonian children,³ and some studies reported a dramatic reduction in the prevalence of HBsAg and anti-HBc among offspring born after 2005.²⁰ Though prevalence studies are critical in guiding the appropriate allocation of resources for the elimination of HBV and HCV,²¹ there is little data on interventions like screening campaigns to estimate HBV and HCV seroprevalence in rural settings in Cameroon. Furthermore, the recent systematic review conducted on the seroprevalence of HCV infection in Cameroon by Bigna et al had no representative data from northern Cameroon.¹⁸

In addition to investigating seroprevalence, risk factors for HBV and HCV infections need to be identified in each setting so as to allow for the implementation of appropriate preventive interventions.

2. Objective

This study sought to determine the seroprevalence and risk factors for HBV and HCV infections in a rural health district in northern Cameroon.

3. Methods

This cross-sectional, analytical study was carried out in the Mokolo District Hospital of Cameroon from January 19, 2017 to February 27, 2017. Mokolo is the headquarter of the Mayo-Tsanaga division in the far-north region of Cameroon and is home to 289 776 inhabitants, most of whom are Muslims. Mokolo is a rural area covering a surface area of 1000 km² and situated in proximity to the Cameroon-Nigeria borders. The main activities of the native population are cattle rearing and farming. The health district of Mokolo is made up of six private and 12 government integrated health centers. The Mokolo District Hospital is situated in the center of the district and serves as the main referral center for the entire health district.²² All consenting inhabitants of Mokolo aged above 17 years were consecutively enrolled in the current study during a screening campaign of HBV and HCV infections at the Mokolo District Hospital.

A structured questionnaire was used to collect socio-demographic data on age, gender, level of education, profession, and marital status. All participants were then briefly physically examined for signs of liver disease: jaundice, palmar erythema, finger clubbing, petechiae or purpura, leukonychia, easy bruising, Dupuytren's contracture, right upper quadrant tenderness, hepatomegaly, gynaecomastia, and atrophied testes. Samples of three milliliters of venous blood were collected into an ethylenediaminetetra-acetic acid (EDTA) tube through a venipuncture of the anterior cubital vein of each participant. Blood samples were centrifuged for five minutes, after which plasma was collected and tested for the presence of HBsAg and anti-HCV using rapid diagnostic test strips (ACON®). These test strips use an immunochromatographic method derived from the enzyme-linked immunosorbent assay (ELISA) technique for the detection of HBsAg and anti-HCV. To this end, a pipette was used to deposit two drops of plasma onto the corresponding receiving section of the strip. A minimum time lapse of 5 minutes was observed before reading the results.

Testing procedures and result interpretation followed the manufacturer's instructions. Test results (HBsAg and anti-HCV) were considered positive when 2 bands appeared: one in the control zone and another in the test zone. The results were negative if only one band appeared in the control zone and none in the test zone. The results were invalid when no band was seen in the control region. For invalid results, the test was repeated using a new strip. Cases which tested positive for HBsAg or anti-HCV further underwent a confirmatory enzyme immunoassay test.

Data was analyzed using Epi Info version 3.5.4. The seroprevalence of HBV was calculated as the ratio between

HBsAg positive samples to the total samples collected. Likewise, the seroprevalence of HCV was determined as the ratio of anti-HCV positive samples to the total samples collected. Means, medians, and interquartile ranges (IQR) were used to summarize continuous variables, while frequencies and proportions were calculated for categorical variables. The chi-square test was used to compare categorical variables where applicable. Statistical significance was set at a *P* value less than 5%.

4. Results

A total of 364 participants were enrolled in this study, of whom 199 (54.7%) were females. The median age was 38 years (interquartile: 30-75), and half of the study population was aged between 19-39 years. One third had a secondary level of education, one third were housewives, and 82.7% were married (Table 1).

Of the 364 participants screened, 104 (28.6%) and 8 (2.2%) tested positive for HBsAg and anti-HCV, respectively. All patients who tested positive were asymptomatic. Due to the small number of anti-HCV-positive participants, risk factors were assessed only for HBsAg-positive participants. None of the socio-demographic variables assessed was associated with HBsAg positivity (Table 2).

5. Discussion

This study aimed to determine the seroprevalence and risk factors of HBV and HCV through a screening campaign organized in Mokolo District Hospital. Prevalence rates of 28.6% and 2.2% for HBV and HCV infections, respectively, were found. None of the factors assessed was associated

with HBsAg positivity.

This prevalence rate ranks the Mokolo health district as a zone of high ($\geq 8\%$) and intermediate (2%–4%) endemicity for HBV and HCV, respectively.²³ This result can probably be explained by the fact that the majority of childbirths in this region occur at home, and thus the provision of perinatal preventive measures for mother-to-child transmission of HBV is hindered.²⁴ Also considering the fact that all participants who tested positive were unaware of their current infection status, the high prevalence rates in this study are particularly worrisome, as they suggest possible uncontrolled and unintended transmission from carriers to uninfected individuals within this community through multiple means of transmission. The seroprevalence of HBsAg rates found in this study concur with those of Noah et al,²⁵ who observed a rate of 22.8% for HBsAg in the far-north region of Cameroon. Indeed, the seroprevalence of HBV is higher in the far-north region of Cameroon than in other regions of the country; other studies have reported prevalence rates of 11.8% for HBsAg and 0.6% for anti-HCV in the east,²⁶ 4.1% for HBsAg and 0.4% for anti-HCV in the west,²⁷ 10.1% for HBsAg and 4.8% for anti-HCV in the Littoral Region,²⁸ 4.39%–12.14 % for HBsAg^{29,30} and 1.44% for anti-HCV³⁰ in the center region, and 9.7% for HBsAg in the southwest region.³¹

The current study did not identify factors significantly associated with HBsAg positivity in contrast with other studies which reported at least one risk factor.⁶⁻⁸ The heterogeneity between communities' determinants of hepatitis infection could account for these disparities. Also, the inability to precisely recall high-risk events which might have predisposed one to HBsAg infection limited the identification of potential risk factors. Hence, this study failed to identify any risk factors for a positive HbsAg test result. Furthermore, the dominant social context (being a Muslim community) precluded the disclosure of information related to sexual behaviors, such as age at first intercourse,⁸ history of sexually transmitted diseases,^{8,9} and multiple sexual partners.^{8,9}

The adoption of a more robust vaccination system can reduce the burden imposed by HBC and HCV infections in this rural health district. The anti-HBV vaccine is highly immunogenic and well tolerated in all age groups.³² Routine administration of all three doses of the pentavalent vaccine (Zilbrix™, a DTPw-HBV combination vaccine) to infants at 6, 10, and 14 weeks of age should be emphasized. The same protocol should be used in unvaccinated adults. For almost two decades, the Global Alliance for Vaccines and Immunization in collaboration with the Cameroonian Ministry of Public Health have included HBV vaccination in the EPI, rendering the vaccine free for children less than 11 months of age and achieving a coverage rate of 83% in the year 2015.³ Many efforts are needed to achieve full coverage, more so in rural areas where high rates of illiteracy translate to low rates of awareness and an increased risk of viral transmission of hepatitis.¹⁸ At the time of the current study, there was a shortage of supply of

Table 1. Socio-demographic Characteristics of Participants

Variables	Number (n=364)	Percent
Age groups (y)		
<19	12	3.3
19-39	182	50
40-59	136	37.4
60	34	9.3
Gender		
Female	199	54.7
Male	165	45.3
Level of education		
Informal	103	28.3
Primary	73	20.1
Secondary	124	34.1
Higher	64	17.6
Marital status		
Married	301	82.7
Unmarried	63	17.3
Occupation		
Employed	191	52.4
Housewife	125	34.6
Pupil/student	33	9.3
Unemployed	15	4.1

Table 2. Factors Associated With HBsAg Positivity in Mokolo District Hospital

Variable	HBsAg Positive (n=104)	HBsAg Negative (n=260)	Odds ratio	95% CI	P Value
Gender					
Female	50 (48%)	115 (44%)	0.86	0.54 - 1.35	0.505
Male	54 (52%)	145 (56%)			
Marital status					
Married	86 (83%)	215 (83%)	1.0	0.55 - 1.82	0.999
Unmarried	18 (17%)	45 (17%)			
Level of education					
≤ Primary	54 (52%)	122 (47%)	1.22	0.78 – 1.93	0.389
> Primary	50 (48%)	138 (53%)			
Employment status					
Employed	51 (49%)	140 (54%)	0.83	0.52 - 1.30	0.407
Unemployed	53 (51%)	120 (46%)			
Age (y)					
< 40	61 (59%)	133 (51%)	1.36	0.86 – 2.15	0.195
≥ 40	43 (41%)	127 (49%)			

P value is used for chi-square test.

this vaccine, and thus, some newborns did not receive the birth dose, although universal hepatitis B immunization at birth is a current recommendation. The authors of this study recommend frequent community health education talks be held on the prevention of vertical and horizontal transmission of HBV and HCV through healthy sexual behavior and appropriate vaccination.

Findings from the current study should be interpreted within the context of its limitations. Rapid diagnostic tests were used which, when compared to enzyme immunoassays, have been shown to have a poor sensitivity (64.5% vs. 100%) and specificity (94.5% vs. 98.3%).³³ Hence, the true prevalence of HBsAg and anti-HCV may have been underestimated in this study. However, rapid diagnostic tests remain valid for a cost-effective purpose in targeting a large population during a screening campaign, particularly in such a resource-challenged setting. Furthermore, limitations pertaining to the low number of participants in the younger age group will lead to the underestimation of true prevalence, as there are studies which suggest increased prevalence in children. Also, as the study population was drawn from a single district hospital, the findings may not be generalizable to the whole population.

In conclusion, this study highlights the burden of hepatitis B and C infections as major public health problems in the Mokolo health district. Prevalence rates of 28.6% for HBV and 2.2% for HCV infections were observed in an apparently healthy population that was completely unaware of its infection status. None of the variables assessed was found to be associated with a positive HBV status. Hence, there is an urgent need to revamp the current health policies in this rural health district through regular screening to improve disease surveillance and follow-up of HBV- or HCV-positive patients. Moreover, there is a need for community health education on various preventive

measures for HBV and HCV infections. Further studies conducted in similar rural settings with larger sample sizes and more robust methods to identify risk factor for HBsAg and anti-HCV are warranted. Failure to timely detect HBsAg and anti-HCV in asymptomatic individuals will perpetuate the transmission of these infections, with a consequential delay in the achievement of the sustainable development goal: reduce new viral hepatitis infections by 90% and mortality by 65% by the year 2030.

Authors' Contributions

ARN, JNT, CD and MNT: study conception and design, data collection and analysis, interpretation of results, manuscript writing and critical revision. FLT, RT and VA: critical revision of the manuscript. All the authors read and approved the final version of the manuscript.

Conflict of Interest Disclosures

The authors declare that they have no conflicts of interest.

Ethical Approval

Ethical approval was obtained from the Institutional Review Board of the Faculty of Medicine and Biomedical Sciences of the University of Yaounde I. Written informed consent was obtained from all participants prior to enrollment. All study procedures involved minimum risk to participants. Rapid diagnostic tests done for hepatitis B and C were free of charge for participants. Participants' identifications were encoded in the collection of blood samples, and sealed test results were returned to each participant after s/he was counselled on means of prevention and treatment of hepatitis B and C infections. Participants who tested positive for either or both hepatitis B and C infections were taken care of by the viral hepatitis treatment center of Mokolo District Hospital.

Research Highlights

What Is Already Known?

Cameroon is a highly endemic country for viral hepatitis with prevalence rates of 11.2% and 6.5% for hepatitis B Virus (HBV) and hepatitis C Virus (HCV) infections, respectively. There is little data on interventions like screening campaigns to estimate HBV and HCV seroprevalences in rural settings in Cameroon. No study to date has assessed the seroprevalence of HCV in the far-north region of Cameroon.

What This Study Adds?

The current study highlights the urgent need for community health education activities on preventive measures for HBV and HCV infections, regular screening for disease surveillance, and close follow-up of disease progression in asymptomatic individuals.

Acknowledgments

We would like to acknowledge the study participants for their commitment. The authors equally thank Dr. Tambosho Afizu Chrakoh and Bissemou Jean Jacques, administrative authorities of the Mokolo's Health District.

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