

Clinic Attendance Default among Patients with Chronic Hepatitis B Infection in a Low-Income Setting: A Cause for Concern

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ABSTRACT

BACKGROUND: Nigeria bears a heavy burden of hepatitis B virus infection as about 24 million Nigerians are chronically infected. It is conventionally believed that default rates are high among chronic hepatitis B (CHB) patients attending gastroenterology clinics across Nigeria but the actual rates and the reasons for such have not been quantitatively evaluated.

MATERIAL AND METHODS: The study was a descriptive cross-

sectional survey involving CHB patients that attended a gastroenterology clinic in Nigeria between July 2011 to December 2016. Case files of patients were retrieved from the medical record department from which their phone numbers and relevant data were obtained. A predesigned questionnaire containing questions relating to socio-demographic characteristics, knowledge of CHB, reasons for clinic attendance default and what could be done to make the patient keep clinic appointments, was administered to each participant.

RESULTS: A total of 87 subjects aged 18 to 55 years were interviewed. The clinic attendance default rate was 87.4% and 61.8% of the defaulters did so after the first clinic appointment. HBV knowledge [OR = 9.10 (95% CI 2.33 -35.63), $p = 0.002$] and the monthly family income [OR = 1.01(95% CI 1.00 -1.02), $p = 0.008$] of the participants were found to be positively associated with clinic attendance.

CONCLUSION: There was a high rate of clinic attendance default among the population of CHB patients we studied. Inadequate disease knowledge and financial incapability stood as two major factors needing attention in order to solve this problem.

Key words: Chronic hepatitis B; Clinic attendance; Default; Low income; Nigeria

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INTRODUCTION

Hepatitis B virus (HBV) infection is a major public health concern worldwide but the resource-limited countries bear a greater burden of the disease. According to the World Health Organization's (WHO) estimate, 2 billion people have been infected with HBV globally,

among which approximately 350 million are chronic carriers^[1,2]. The prevalence of HBV differs from one region of the world to another. Prevalence is classified into low (< 2%), intermediate (2-7%) and high (> 8%)^[2]. The highly endemic regions include the sub-Saharan Africa, the Amazon Basin, Central and Southeast Asia whose estimated prevalence is up to 8% and sometimes reaching 10-15% in some countries^[2]. Northern Europe, North America, and Australia have low HBV endemicity; whilst Eastern and Southern Europe, South America, and the remaining regions in Africa and Asia have intermediate endemicity^[2]. The infection is the 10th leading cause of death worldwide^[1]. About 15-40% of individuals infected with HBV will develop cirrhosis, liver failure, or hepatocellular carcinoma (HCC), and 500,000 to 1.2 million people die of HBV infection annually^[1,2]. The 5-year cumulative incidence of developing cirrhosis in individuals with chronic hepatitis B is estimated to be between 8 and 20%, with HCC annual incidence of 3-6%^[3,4].

There are numerous challenges militating against effective management and containment of chronic HBV infection in the resource-limited regions of the world. These include poor governments' political will; absence of accurate prevalence data; lack of well-thought-out national programs for disease prevention, control and treatment; and lack of understanding regarding HBV infection by both the general public and health care providers. The scarcity of trained medical manpower necessary for accurate diagnosis and treatment of chronic hepatitis B (CHB) in poor nations is a huge challenge. Other challenges include stigmatization of patients, co-infection with other viruses, lack of management guidelines, and absence of an effective patient referral system. The direst of the problems is the scarcity and high cost of laboratory tests and drugs.

Nigeria is a sub-Saharan African country with an estimated population of over 180 million people in 2015, according to the Central Intelligence Agency World FactBook^[5]. There are several HBV prevalence studies in different population groups and subgroups in the country, but the true number of people with the infection is unknown^[6]. The country belongs to the group of countries with high prevalence of HBV infection with an estimated exposure rate of about 75%^[2,7]. A recent meta-analysis yielded a pooled CHB prevalence of 13.6% in Nigeria (95% CI: 11.5-15.7%), though prevalence rates among population groups in the country vary.⁽⁸⁾ This translates to above 24 million people with CHB infection in the country. More than half of the Nigerian population live in the rural areas^[5], meaning that a substantial number of the individuals with CHB infection live in such places where facilities for performing laboratory tests for the disease are not available.

The prevalence of HBV among patients with the acquired immunodeficiency virus (HIV) infection varies widely in Nigeria depending on the study population^[9]. However, a meta-analysis of 33 studies from Nigeria yielded an HBV pooled prevalence of 15% (95% CI: 13-17) among such individuals^[9].

HBV vaccine became available to the public in Nigeria in 2004^[10] but there is the challenge of cold chain maintenance in the vaccine administration because of erratic power supply. There is currently no robust data on HBV vaccine coverage in Nigeria. The WHO estimates of HBV vaccine coverage at the 24th hour after birth and the percentage of surviving infants who received the 3rd dose of hepatitis B vaccine following the birth dose stood at 32 and 49% respectively^[11]. However, a hospital based study in the South-South geopolitical zone of the country reported a coverage of 83% among children aged 2 months to 15 years^[12].

Vital laboratory tests for the evaluation and management of CHB and drugs for treating the disease became reasonably available in

Nigeria in less than a decade ago. It is conventionally believed that default rates are high among CHB patients attending gastroenterology clinics across Nigeria for various reasons but the actual rates and the reasons for such among the patients have not been quantitatively evaluated and documented.

This study, therefore, sought to determine the clinic attendance default rate and the factors influencing this among CHB patients attending the gastroenterology clinic of the LAUTECH Teaching Hospital (LTH), Ogbomoso, Nigeria.

MATERIALS AND METHODS

Study setting

The study was conducted at the LTH, Ogbomoso. The LTH, Ogbomoso, is a relatively new tertiary healthcare facility that provides outpatient, inpatient and round the clock emergency services. The hospital commenced operation in 2011. It serves as a referral center to primary and secondary health care facilities in Ogbomoso and neighboring communities in Oyo state and the bordering states of Osun and Kwara, Nigeria. The gastroenterology clinic of the LTH Ogbomoso is manned by a specialist gastroenterologist and a group of resident doctors on clinical rotation. The clinic is run once a week to cater for gastroenterology referrals from within and outside the hospital.

Definitions of terms

Last clinic visit: the last time the patient ever attended clinic.

Last clinic appointment: the appointment date given to the patient during the last clinic visit.

Clinic Default: failure to attend the clinic for 2 months or more following the due date of the last clinic appointment. All patients who did not attend clinic two months since their last appointment date were categorized as defaulters. There is currently no standard definition for CHB clinic attendance default. We settled for two months after the last clinic appointment as the cutoff because we believed that the time frame, in addition to the interval between the last clinic visit and the last clinic appointment, was enough for the patient to revisit the clinic if the patient was truly interested in attending.

Study design

The study was a combined retrospective and prospective hospital based descriptive survey.

Sample size

Case files of all patients with CHB that attended the gastroenterology clinic from July 2011 till December 2015 were requested from the medical record department of the hospital. We excluded all CHB patients with proven diagnosis of cirrhosis, liver failure and hepatocellular carcinoma. Patients with HBV and HIV coinfection were also excluded as they are usually enrolled for free treatment with other HIV patients on a national program. A total of 87 case files in all were available for retrieval. All the cases retrieved were included in the study since the size was small. More so that there was no available similar study to use as a reference.

Data collection

Retrospective data

Patient's identifier, date at first presentation, age, gender, occupation, marital status and level of education were documented by means of data sheets. Retrospective analysis of data from hospital notes was

done to identify and categorize the participants into regular clinic attendees and clinic defaulter groups.

Prospective data

The prospective aspect of the study involved administration of a predesigned questionnaire to both the regular clinic attendees and the defaulters by telephone interview.

The instrument consisted of 4 sections: (1) Other sociodemographic variables like current place of residence and monthly family income that were not captured in the retrospective data. The monthly family income was used as a measure of financial capability because healthcare is often financed out of pocket in Nigeria. For the student or the dependent, the summation of the monthly incomes of both of his/her parents was used whereas the summation of the monthly income of the independent adult and his/her spouse was used. (2) Knowledge of chronic hepatitis B. This consisted of 9 questions on the general knowledge of HBV that we considered could motivate the patient to seek medical attention. One question under this section tested a common local unscientific health-related belief the patient may have been holding. The patients' total scores were categorized into 3 groups [Poor (0-3), Fair (4-6) and Good (7-9)]. (3) Reasons for clinic attendance default. This consisted of 11 items. (4) What could be done to make the patient keep clinic appointments? This consisted of 5 items. One question under this section tested a common local unscientific health-related belief the patient may be holding.

All the questions were carefully selected and agreed upon by the investigators after several deliberations. The interview was conducted by three of the investigators.

Statistical analysis

Data were analyzed with the IBM- Statistical Package for Social Sciences (SPSS), version 20. Continuous variables were presented as median and interquartile range (IQR). Categorical variables were expressed as frequencies, percentages and ratios. Univariate analysis was initially done to determine the unadjusted odds ratios of the possible predictors of clinic attendance. Adjustment for potential confounders through multivariate logistic regression analysis was done for the risk factors that were found significant during univariate analysis. Variables with odds ratio (OR) > 1 and *p* value > 0.05 were considered significant.

Ethical consideration

Ethical clearance was obtained from the Ethics Review Committee of the LTH, Ogbomoso. Informed consent was obtained from participants. Only the essential study staff members had access to the information obtained from the participants. All information and data obtained from the participants were treated with utmost confidentiality.

RESULTS

A total of 87 patients participated in the study. The median age of participants was 25 years (IQR = 22-30) and the age range was 18-55 years (Table 1). Of the total participants, 53 (60.90%) were male while 34 (39.10%) were females. Sixty-three (70.10%) participants were unmarried while 24 (27.6%) were married. Majority (94.3%) of the participants had at least some tertiary education while the remaining (5.7%) had secondary education. In regard to the employment status of the participants, 54(62.0%) were students, 30 (34.5%) were gainfully employed while 3(3.5%) were unemployed. The monthly family income (MFI) of the participants in United States

Dollar (USD) equivalence varied widely from 25 to 938 USD with a median of 207 USD (IQR = 156-233 USD). Slightly above one-third of the participants (35.6%) had less than 200 USD MFI, 60.9% had between 200-399 USD MFI while 3.5% had ≥ 400 USD MFI.

Seventy-six (87%) had defaulted clinic at the time of the study (Figure 1). Only 11(13%) were attending the clinic regularly at the time of the survey. As depicted in Figure 2, 47 (61.8%) of the total number of participants who defaulted (76) did so after the first clinic appointment while 29 (38.2%) defaulted after attending clinic two or more times.

Only 29 (33.3%) of the participants knew the disease resulted from infection by a microorganism (Table 2). Seven (8.0%) believed the disease was due to a spiritual attack. With respect to the route of transmission of the disease, more than 90% of the participants knew that the disease could be transmitted by sharing of sharps, from mother to child, and through sexual intercourse, however, only 41.4% knew the disease could be transmitted by sharing of toothbrush. In regard to the outcome of the disease, 75 (86.2%) believed the disease could lead to death, 45 (51.7%) believed it is a treatable disease while only 29 (33.3%) believed that it is possible for an HBV patient to live a healthy life without treatment. Concerning the correctness of participants' responses to the questions on HBV, 36 (41.4%) answered 7-9 questions correctly, 49 (56.3%) got 4 to 6 questions correctly, while 2 participants got less than 4 questions correctly.

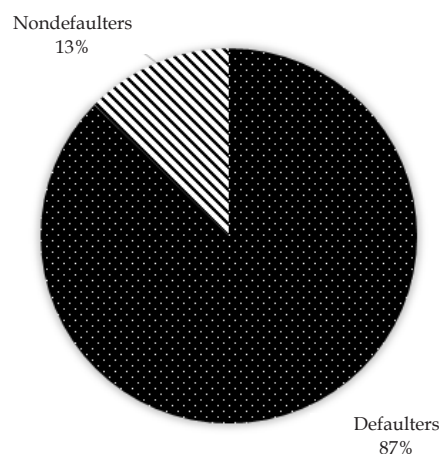


Figure 1 Clinic attendance default rate among participants.

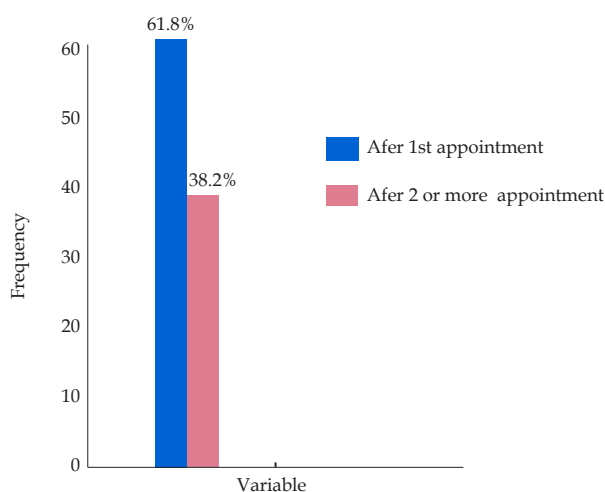


Figure 2 Time of default.

Table 1 Socio-demographic characteristics of participants (n = 87).

Variable	Frequency (%)
Age in years	
≤ 29	63 (72.4)
≥ 30	24 (27.6)
Gender	
Male	53 (60.9)
Female	34 (39.1)
Marital status	
Married	24 (27.6)
Unmarried	63 (72.4)
Educational attainment	
Tertiary Secondary	82 (94.3)
Secondary	5 (5.7)
Employment status	
Student	54 (62.0)
Employed	30 (34.5)
Unemployed	3 (3.5)
MFI	
≤ 199	31 (35.6)
200-399	53 (60.9)
≥ 400	3 (3.5)

MFI: Monthly family income in US Dollar equivalence.

Table 2 Knowledge of Hepatitis B among participants (n = 87).

Variable	Frequency (%)
Disease is cause by microorganism	29 (33.3)
Disease is caused by spiritual attack*	7 (8.0)
Disease is transmitted by sharing of sharps	84 (96.6)
Disease can be transmitted from mother to child	81 (93.1)
Disease is transmitted by sexual intercourse	79 (90.8)
Disease is transmitted by sharing toothbrush	36 (41.4)
Disease can lead to death	75 (86.2)
Disease is treatable	45 (51.7)
Patient can live healthy life without treatment	29 (33.3)
Total score	
Poor (0-3)	2 (2.3)
Fair (4-6)	49 (56.3)
Good (7-9)	36 (41.4)
Median score = 6 (IQR= 5-7); Range =2-9	

*Reversed score was used in computation of total score; IQR: interquartile range.

Table 4 Possible factors influencing clinic attendance among participants (n = 87).

Factor	Non-defaulters (%)	Unadjusted Odds Ratio	P-value	Adjusted Odds Ratio	P-value 2
Age in years	11 (12.6)	1.04 (0.98-1.10)	0.22		
Gender					
Female (n = 34)	2 (5.9)	1 (reference)			
Male (n = 53)	9 (17.0)	3.27 (0.66-16.18)	0.146		
Marital Status					
Unmarried	6 (9.5)	1 (reference)			
Married (n = 24)	5 (20.8)	2.50 (0.68-9.13)	0.166		
Employment status					
Student/Unemployed (n = 57)	5 (8.8)	1 (reference)			
Employed	6 (20.0)	2.60 (0.72-9.37)	0.144		
MFI	11 (12.6)	1.01 (1.00 - 1.01)	0.024	1.01 (1.00 - 1.02)	0.008
HBV Knowledge	11 (12.6)	5.02 (2.00 - 12.59)	0.001	9.10 (2.33 - 35.63)	0.002

MFI: Monthly family income in US Dollar equivalence, HBV: hepatitis B virus.

Table 3 depicts the various reasons clinic defaulters adduced to their discontinuation of clinic attendance. Lack of financial wherewithal to perform the recommended laboratory test was the most important reason for default (67.1%). Other important reasons included relocation to another town (38.2%), not feeling sick (36.8%) and healthcare facility related issues such as distant location from patient’s residence, unfavorable clinic appointment and negative staff attitude (13.2%). Of note is the fact that none of the defaulters stopped attending clinic because of medication side effect.

Univariate analysis was conducted to test the association between clinic attendance and the factors that may have influenced the participants (Table 4). Among the five factors considered (age, gender, marital status, employment status, monthly family income and HBV knowledge), HBV knowledge was found to be highly statistically significant [OR =5.02 (95% CI 2.00 -12.59), p = 0.001] while monthly family income was marginally significant [OR = 1.01(95% CI 1.00 -1.01), p =0.024]. The other factors were not found to be significantly associated.

Multivariate logistic regression analysis (MLRA) included the two variables with a P value less than 0.05 and Odds ratio greater than 1 (HBV knowledge and monthly family income). HBV knowledge remained highly statistically significant [OR = 9.10 (95% CI 2.33 -35.63), p = 0.002] and monthly family income also remained marginally significant [OR = 1.01(95% CI 1.00 -1.02), p = 0.008].

Table 5 shows defaulters’ responses to suggested measures that could improve their clinic attendance. Close to 90% of the defaulters wanted the cost of treatment to be either free or subsidized. About a third of the defaulters (32.9%) desired more education on HBV, 13.2% said text message reminder from the healthcare facility would help while 10.5% wanted their appointments to be more flexible.

Table 3 Reasons for clinic attendance default (n = 76).

S/N	Variable	Frequency (%)
1	I am seeing another specialist	7 (9.2)
2	I don't feel sick	28 (36.8)
3	I need spiritual intervention	2 (2.6)
4	I feel ashamed I have the disease	3 (3.9)
5	No money to do tests	51 (67.1)
6	I relocated to another town	29 (38.2)
7	Medication side effect	0 (0)
8	I need private consultation	6 (7.9)
9	Healthcare facility related issues*	10 (13.2)

*Hospital is too far, unfavorable clinic appointment and negative staff attitude.

Table 5 Measures to improve clinic attendance (*n* = 76).

S/N	Variable	Frequency (%)
1	I need more education	25 (32.9)
2	Subsidize or make treatment free	68 (89.5)
3	Send SMS reminder for clinic appointment	10 (13.2)
4	Make appointment flexible	8 (15.5)

SMS: short message service.

DISCUSSION

There is a paucity of information on the clinic attendance default rates and the timing of default among CHB patients from both the developed and the developing worlds. Our finding of a default rate of 87% among CHB patients without HIV coinfection is quite worrying. More alarming is the fact that 61.8% of the defaulters did so after the first clinic attendance. Although these figures could have been lower if we had included patients with HBV and HIV coinfection in the study, they are nonetheless important because of the staggering statistics connecting chronic HBV to cirrhosis, liver failure, and hepatocellular carcinoma^[1-4]. It has been estimated that 15-40% of individuals infected with HBV will develop cirrhosis, liver failure, or hepatocellular carcinoma (HCC), and 500,000 to 1.2 million people die of HBV infection annually^[1,2]. Chronic HBV infection is technically incurable because the viral DNA integrates into the host hepatocytes' genome^[13,14]. Though the current recommended first-line nucleos(t)ide analogues (NA), entecavir and tenofovir, for the treatment of CHB significantly reduce the risk of development of HCC in both cirrhotic and non-cirrhotic patients, they do not completely eliminate it.^[14] The annual HCC incidence among CHB patients on treatment with the NAs ranges from 0.01% to 1.4% in non-cirrhotic patients, and from 0.9% to 5.4% in those with cirrhosis. Although majority of individuals with CHB are inactive carriers who have good prognosis in the disease spectrum, with low rates of hepatocellular carcinoma and progression to cirrhosis, approximately 20 to 30% may experience spontaneous reactivation of hepatitis B during follow-up. Sustained or multiple episodes of reactivation could then cause progressive hepatic damage and decompensation^[15]. Therefore, all patients with CHB require lifelong follow-up whether they are on treatment or not because of their increased risk of HBV-associated liver diseases, including HCC.

Though it is delightful that more than 90% of the participants had a good understanding of the major routes of transmission of the disease, the fact that only a third of the participants knew the disease is caused by an infectious agent and barely above 50% knew that the disease is treatable despite that majority of them had some tertiary education is a source of concern and a pointer to important knowledge gap in their understanding of the disease. More so that about a third of the clinic defaulters averred that they needed more education on the nature of the disease. Notwithstanding that only a few of the participants held on to unscientific beliefs that could have prevented them from attending the clinic, it could be reasoned that wrong illness perception was partly responsible for clinic nonattendance by some of them as 36.8% of the defaulters claimed they stopped attending clinic because they did not feel sick. Again, the fact that a good knowledge of chronic HBV was found to be highly statistically significantly associated with regular clinic attendance is a clear indication that more needs to be done in order to increase the awareness of HBV infection in the general populace and among patients with CHB in particular. It is imperative that all doubts in the minds of the patients regarding the etiology, treatment and prognosis of the disease are clarified because those who hold on to the thought that the disease is

incurable could be demotivated considerably from seeking medical attention.

Since over 95% of the study participants had less than 400 USD MFI and none had up to a thousand dollars MFI, it is not farfetched why majority of the clinic defaulters (89.5%) desired free or subsidized treatment. This may also be the reason why the monthly family income was observed to be weakly associated with clinic attendance as all the participants could be regarded as poor.

Bearing in mind the high prevalence rate of CHB in Nigeria and devastating consequences that could attend to untreated active cases, it is pertinent that the Nigerian government intervenes in the active detection, investigation and treatment of the disease in the country. The government, relevant professional associations and nongovernmental organizations need to collaborate in order to facilitate more public awareness campaigns about the disease. It is good enough that HBV vaccination has been incorporated into the Nigerian National Program on Immunization, a well-organized national program for the treatment and control of the disease is urgently needed to take care of those that are already infected and further curb the spread of the infection. Such program could be incorporated into the National Agency for the Control of AIDS (NACA) for ease of administration since the two diseases share some similarities.

CONCLUSION

There is a high rate of clinic attendance default among the population of CHB patients we studied. Inadequate disease knowledge and lack of financial wherewithal stand as two major factors that need to be addressed in order to tackle this problem.

REFERENCES

1. Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. *J Viral Hepat.* 2004; **11**: 97-107. [PMID: 14996343]; [DOI: 10.1046/j.1365-2893.2003.00487.x]
2. Hou J, Liu Z, Gu F. Epidemiology and Prevention of Hepatitis B Virus Infection. *Int J Med Sci.* 2005; **2**: 50-7. [PMCID: PMC1142225]; [DOI: 10.7150/ijms.2.50]
3. Papatheodoridis G, Buti M, Cornberg M, Janssen H, Mutimer D, Pol S, Raimondo G, Dusheiko G, Lok A, Marcellin P. EASL clinical practice guidelines: Management of chronic hepatitis B virus infection. *J Hepatol.* 2012; **57**: 167-85. [PMID: 22436845]; [DOI: 10.1016/j.jhep.2012.02.010]
4. Lin X, Robinson NJ, Thursz M, Rosenberg DM, Weild A, Pimenta JM, Hall AJ. Chronic hepatitis B virus infection in the Asia-Pacific region and Africa: review of disease progression. *J Gastroenterol Hepatol.* 2005; **20**: 833-43. [PMID: 15946129]; [DOI: 10.1111/j.1440-1746.2005.03813.x]
5. The World Factbook [homepage on the internet]. [updated 2017 June 15; cited 2017 June 28]. Available from: <https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html>
6. Nwokediuko SC. Chronic hepatitis B: management challenges in resource-poor countries. *Hepat Mon.* 2011; **11**: 786-93. [PMCID: PMC3234575]; [DOI: 10.5812/kowsar.1735143X.757]
7. Kramvis A, Kew MC. Epidemiology of hepatitis B virus in Africa, its genotypes and clinical associations of genotypes. *Hepatol Res.* 2007; **37(Suppl 1)**: 9-19. [PMID: 17627641]; [DOI: 10.1111/j.1872-034X.2007.00098.x]
8. Musa BM, Bussell S, Borodo MM, Samaila AA, Femi OL. Prevalence of hepatitis B virus infection in Nigeria, 2000-2013: a systematic review and meta-analysis. *Niger J Clin Pract.* 2015; **18**: 163-72. [PMID: 25665986]; [DOI: 10.4103/1119-3077.151035]

9. Owolabi LF, Ibrahim A, Musa BM, Gwaram BA, Dutse AI, Hamza M, Yakasai AM, Habib AG, Borodo MM. Prevalence and Burden of HIV and HBV coinfection in Nigeria: A Systematic Review and Meta-Analysis. *J AIDS Clin Res.* 2014; **5**: 1-9. [DOI: 10.4172/2155-6113.1000308]
10. Nigeria: WHO and UNICEF estimates of immunization coverage: 2016 revision. 2017 [cited 2017 Aug 11]; Available from: http://www.who.int/immunization/monitoring_surveillance/data/nga.pdf
11. Sadoh AE, Eregie CO. Age at presentation for infant immunization in Nigeria: implications for hepatitis B immunization. *Public Health.* 2008; **122**: 1318-20. [PMID: 18706664]; [DOI: 10.1016/j.puhe.2008.06.003]
12. Sadoh AE, Ofili A. Hepatitis B infection among Nigerian children admitted to a children's emergency room. *Afr Health Sci.* 2014; **14**: 377-83. [PMID: 25320587]; [DOI: 10.4314/ahs.v14i2.13]
13. El-Serag HB. Epidemiology of viral hepatitis and hepatocellular carcinoma. *Gastroenterol.* 2012; **142**: 1264-1273. [PMID: 22537432]; [DOI: 10.1053/j.gastro.2011.12.061]
14. Papatheodoridis G V., Chan HL-Y, Hansen BE, Janssen HLA, Lampertico P. Risk of hepatocellular carcinoma in chronic hepatitis B: Assessment and modification with current antiviral therapy. *J Hepatol.* 2015; **62**: 956-67. [PMID: 25595883]; [DOI: 10.1016/j.jhep.2015.01.002]
15. Pita I, Horta-Vale AM, Cardoso H, Macedo G. Hepatitis B inactive carriers: An overlooked population? *GE Port J Gastroenterol.* 2014; **21**: 241-9. [DOI: 10.1016/j.jpge.2014.08.003]

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