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Prevalence of Hepatitis B among School Adolescents in Jos, Plateau State Nigeria

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Abstract

A high average prevalence rate of 11-13.7% for viral hepatitis B exists in Nigeria among the general population (National AIDS/STIs Control Program (2016). This study was the first of its type however, to examine the prevalence of hepatitis B among a specific target group, the senior secondary school students in Jos, Plateau state in Nigeria. It was conducted in six public day secondary schools located in Jos South Local Government Area, Plateau state, findings of which would help determine interventions for the prevention and control of hepatitis B Virus (HBV) infection among this important age group. The study was primarily carried out to determine the effect of peer education, an intervention, on knowledge and belief levels of hepatitis B in Jos but in the process of achieving this, the prevalence of hepatitis B was also identified.

A quasi-experimental study was carried out on six hundred students selected by a multistage sampling technique. Testing for hepatitis B was offered post intervention to only three hundred students, who were in the intervention group of three schools in the study. A pre-tested formal self-administered questionnaire (SAQ) was used to collect data pre and twelve weeks post intervention. Chi- square and students t-test was done to compare intervention and control groups on outcome variables. Results showed the age distribution of the respondents was 10-24 years with majority of respondents (86.7%) in the age group 15-19 years. One hundred and ten (110) students agreed to the test and 10 students were found positive for hepatitis B.

Keywords: *Peer education, positivity rate, prevalence, hepatitis B, secondary school student.*

Introduction

Nigeria contributes significantly to the burden of chronic viral hepatitis globally. Viral hepatitis is the seventh leading cause of death globally (World Health Organization, 2017). An estimated 95% of individuals with chronic HBV infection, or both, are unaware of their infection and so do not benefit from clinical care, treatment, and interventions that are designed to reduce onward transmission (Spearman et al.,2017). Majority of the Nigerian population are not aware of its chronic complications of liver cirrhosis and primary liver cell cancers (National AIDS/STIs Control Program, 2016).

The prevalence and incidence of a disease are among the most fundamental measures in epidemiology. Prevalence is a measure of the burden of disease in a population in a given location and at a particular time, as represented in a count of the number of people affected. Counts of the number of people affected with a disease are required to plan appropriately for their health care needs. Prevalence may also be used to compare disease burden across locations or time periods. However, because prevalence is determined by not only the number of persons affected but also their survival, prevalence is a less useful measure in studies of etiology than incidence rates (Ward, 2013).

To provide prevalence rate estimates that are both reliable and generalizable, studies must include a sample large enough to capture most (if not all) cases and sufficiently distributed, both geographically and sociologically, to be representative of the general population. With uncommon diseases, including

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most autoimmune rheumatic diseases and HBV, the challenge is multiplied because cases are fewer and harder to find. These factors necessitate surveys of even larger populations to achieve stable estimates (as well as longer durations of observation for estimates of incidence), which in turn increase the cost, time, and effort involved in executing such studies. Because of these issues, studies using primary data collection to determine the prevalence and incidence of diseases are not common (Ward, 2013).

Hepatitis B prevalence is highest in the WHO Western Pacific Region and the WHO African Region, where 6.2% and 6.1% respectively of the adult population is infected. In the WHO Eastern Mediterranean Region, the WHO South-East Asia Region and the WHO European Region, an estimated 3.3%, 2.0% and 1.6%% of the general population is infected, respectively. 0.7% of the population of the WHO Region of the Americas is infected (World Health Organization, 2018). A meta-analysis of studies in Nigeria showed high HBV prevalence pooled prevalence (% [95% CI]) among subgroups 14.0% (11.7, 16.3) for blood donors; 14.1% (9.6, 18.6) for pregnant women attending antenatal clinics; 11.5% (6.0, 17.0) for children; 14.0% (11.6, 16.5) among adults; and 16.0% (11.1, 20.9) for studies evaluating adults and children (Musa, Bussell, Borodo, Samaila & Femi, 2015). The distribution of HBV in Nigeria by sex is 62.6% of males and 37.4% of females, being most common among 21-40 year olds, although substantial perinatal and childhood transmissions do occur (National AIDS/STIs Control Program (2016). Medical personnel, especially surgeons and dentists are at the greatest risk of infection, while other health care workers and commercial sex workers are also at significant risk of infection (National AIDS/STIs Control Program (2016). 1.2%. A 2014 study among Nigerian children 11-19 years found a sex specific prevalence of 0.8% for males and 1.8% for females and a prevalence rate of 1.2% (Ikobah et al., 2016).

Accessing HBV testing in Nigeria has numerous challenges but the major reasons are a lack of awareness on the importance of the test among the population or importance of knowing one's status, and unavailability of the HBV tests. Apart from this, because of the exertion of the right of choice (freedom to health decisions), children especially adolescents below the age of 18 years could want exhibit an intention of HBV testing but need to get the approval of parents who may think otherwise for various reasons.

HBV prevalence in Nigeria varied by screening method [% (95% CI)]: 12.3% (10.1, 14.4) by using enzyme-linked immunosorbent assay; 17.5% (12.4, 22.7) by immuno chromatography; and 13.6% (11.5, 15.7) by HBV DNA polymerase chain reaction (Musa, Bussell, Borodo, Samaila, & Femi, 2015). The commonly used HBV rapid tests used globally and for screening individuals is based on the principle of chromatographic immunoassay for qualitative detection of the surface antigen of hepatitis B virus (HBsAg) in human whole blood, serum and plasma samples. If HBV is present, HBsAg will bind with the gold conjugated antibodies forming particles.

Methods

A Quasi-experimental study peer education intervention among SS3 students in Jos public day Senior Secondary Schools, Jos South Local Government Area, Plateau state, Nigeria to primarily assess knowledge about hepatitis B but in addition, prevalence among this target group was also identified. The study was done in three stages: pre- intervention, intervention, post-intervention stage and the prevalence using HBV testing done in the last stage (post-intervention stage). Eligibility criteria for students consisted of inclusion criteria: a student aged between 10-25 years, male or female, living with either one or both parents, and voluntarily participation in the study. Exclusion criteria were students below the age of ten and twenty-six or above, living with someone else apart from parents, and failure to agree voluntarily to participate in the study.

The sample was drawn using a multistage sampling technique. Day Senior Secondary schools in Jos South Local Government Area, Jos constituted the sampling frame. The primary sampling units was Day Senior Secondary schools (3 Day Senior Secondary schools as intervention schools and 3 Day Senior Secondary schools as controls) selected by random sampling. The 'control' schools selected were matched with 'intervention' schools based on same location so that one ensured the respondents in control and intervention schools shared similar characteristics. The secondary sampling units were two streams of Senior Secondary class in the selected 6 secondary schools (as the Day Senior Secondary schools have an average of three streams per Senior Secondary class) while the tertiary sampling units

were the individual students in the class, selecting 50 students in each class/stream. The selection of 50 students in each class/stream (two classes/school) for the six schools by simple random sampling method made a total number of 600 respondents.

For comparing two proportions, the sample size formula used was n = (Zα/2+Zβ)2 * (p1(1-p1)+p2(1-p2)) / (p1-p2)2, where n is the sample size for a proportion, Zα/2 is the critical value of the Normal distribution at α/2 (for a confidence level of 95%, α is 0.05 and the critical value is 1.96), Zβ is the critical value of the Normal distribution at β (for a power of 80%, β is 0.2 and the critical value is 0.84) and p1 and p2 are the expected sample proportions of the two groups. For detecting a difference between two proportions, p1 was taken as 0.3 and p2 as 0.2 (Ikobah et al., 2016). Imputing values,

n = (1.96+ 0.84)2 * (0.3(1- 0.3)+ 0.2(1- 0.2)) / (0.3- 0.2)2

n= 290.08

Considering a probable non-response of 3% with n= 300 for each proportion, the sample size amounted to a total of 600.

In the pre-intervention stage, administration of formal self-administered questionnaire (SAQ) containing open and close- ended questions was used to determine knowledge of HBV. In the intervention stage, fifteen students (5 per intervention school for 3 schools) were selected as 'Peer Educators' (PEs) and the intervention (peer education sessions for HBV awareness) done. Post intervention data was collected twelve weeks later in all schools (intervention and control). Free voluntary hepatitis B tests was offered to those students who want to undertake the hepatitis B surface antigen blood test in intervention schools.

Blood samples were obtained by registered laboratory scientists for qualitative detection of HBsAg using rapid chromatographic immunoassays with test kits from ABON (China) having sensitivity, specificity and accuracy of >99%, 97% and 98.5% respectively. Universal precautions and standard protocols for hepatitis B testing were adhered to.

Data analysis was done in stages. The collected data questionnaires were 'cleaned'. Data was then entered into the computer using Microsoft excel, which was then exported for analysis with the aid of the Statistical Package for Social Sciences (SPSS) 22.0 computer statistical software. Exploratory analysis to check for missing fields was then done. Descriptive statistics summarizing numerical data of age, categorical data of sex and tribe was displayed by frequency tables and graphical representation of observations. This was followed by data analysis done keeping the study objectives and hypothesis in mind. Statistical tests such as students t-test and chi-squared was done to compare intervention and control groups on outcome variables. Results of chi-square values obtained from the study were considered significant at $p \leq 0.05$. Ethical approval process involved written approval from the Plateau state government, Local Government, parents/ respondents and the ethical committee (state government approved). Participants were asked to give written consent at the beginning of the questionnaire regarding acceptance of voluntary responses and informed written consent got to do the hepatitis B test. For students below the age of 18 years, informed consent for hepatitis B testing was obtained from the student's parents.

Results

Six hundred respondents were involved in the study of which 241 were males, 355 were females and 4 non-responses. 300 respondents each in control and intervention study participated. Significant findings were found twelve weeks post intervention at end of study.

Table 1. Distribution of study participants according to age at baseline and end of study

Age	Baseline		TOTAL	End		TOTAL
	Control	Intervention		Control	Intervention	
10-14	25(8.4)	17(5.9)	42(7.2)	25(8.4)	23(7.8)	48(8.1)
15-19	258(86.6)	265(91.7)	523(89.1)	258(86.6)	256(86.8)	514(86.7)
≥20	15(5.0)	7(2.4)	22(3.7)	15(5.0)	16(5.4)	31(5.2)
TOTAL	298(100.0)	289(100.0)	587(100.0)	298(100.0)	295(100.0)	593(100.0)

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Table 2. Distribution of study participants (intervention group) on hepatitis test results at end of study

Name of school	HBV Result Negative	HBV Result Positive	Total
GSS Giring	29(29.0)	3(30.0)	32(29.1)
GSS Anglo Jos	42(42.0)	6(60.0)	48(43.6)
GSS Hei-Rayfield	29(29.0)	1(10.0)	30(27.3)
Total	100(100.0)	10(100.0)	110(100.0)

Table 3. Social characteristics of participants that tested HBV positive

Social characteristics	**Frequency**	**Percentage (%)**
Age group		
10-14	0	0.0
15-19	10	100.0
≥ 20	0	0.0
Sex		
Male	2	20.0
Female	8	80.0
Ethnicity		
Hausa 1		10.0
Igbo 1		10.0
Yoruba 1		10.0
Others 7		70.0
Religion & Living with parents		90.0 10.0
Christianity 9		
Islam 1		
Have you had vaccination against Hepatitis B?		
Yes	4	40.0
No	6	60.0
Do you always use condom?		
Yes	4	40.0
No	6	60.0

Table 4. Assessment of level of knowledge on hepatitis B among HBV positives students (baseline)

Grade of knowledge	Frequency	Percentage
Poor	3	30.0
Average	6	60.0
Good	1	10.0

Discussion

The age distribution of all the 600 respondents was 10-24 years with a mean age of 16.65±1.72yrs. Age in both groups, control and intervention showed similar age characteristics (Table 1). 110 students post intervention accessed the HBV test (Table 2). Majority of the participants in this study did not go for the test, post-intervention though the number was not significant. This could be for several reasons not covered by the study that may include (that were sought informally from the participants but not investigated): lack of confidence in the testers due to fear of confidentiality, presence of teachers during testing, loss/ forgetfulness of informed consent forms.

Out of the total of 110 participants that voluntarily did the HBSag test with informed consent from their parents or guardian, 10 were positive (Table 2). A HBV prevalence value of 9.1% in this study means that Jos South LGA has a high prevalence of HBV. This value is close to the national prevalence of 11% for viral hepatitis B (National AIDS/STIs Control Program, 2016). Itelima (2017) in her retrospective study in the general population (April 2015 – March 2016) using secondary data in four general hospitals in Jos, showed a prevalence of 13.9% for HBV. Another Study (2010) conducted among the general population in a local community in a neighboring state to Plateau state, Nasarawa state, also found a prevalence of 13.2% (Pennap, Yakubu, Oyige & Forbi, 2010). The predominant routes of transmission vary according to the endemicity of the HBV infection. With a prevalence of 9.1% in this study, places Jos South LGA in an area of high prevalence which according to Hou et al (2005) means perinatal transmission is the main route of transmission.

In Nigeria, there are no studies on the prevalence of hepatitis B in adolescent prior to 2004. In 2014, a study in Calabar, Cross Rivers state among Nigerian children aged 11-19 years found a seroprevalence of 1.2 % for viral Hepatitis B (Ikobah et al., 2016). The retrospective study in Jos from public hospitals (Itelima, 2017) among the general population (April 2015-March 2016) had the highest prevalence of HBV in 25-34year age group.

All respondents tested HBV positive were in the age group 15-19 years (Table 3). With infection common among 20-40 years (FMOH,2016), the best age to focus on to prevent HBV by increasing knowledge and awareness to HBV and changing beliefs/ attitudes and cultural norms that facilitate transmission of the disease is the pre or early adolescence age. More so, as awareness and risk perception on HBV infection are high in Jos among tertiary education institution students (University of Jos), but uptake of HB vaccine low and findings worst for non-health students (Chingle et al., 2017).

The risk of Hepatitis B Virus (HBV) infection being chronic is inversely related to the age of infection and so there is a risk of 20–50% after childhood infection (aged <5 years) but less than 5% for adults infected after age 20 years (Spearman et al., 2017). With hepatitis B infection as a significant opportunist infection among people living with Human Immunodeficiency Virus (HIV) (AIDS Info, 2016), it is more worrisome as the risk of getting infected with HIV when positive for HBV and also transmitting these infections to other members of the communities is high as they share common modes of transmission.

Table 3 shows that female participants were more than males. In addition, it shows that majority of respondents were from other tribes (70.0 %) with respect to ethnicity, mainly locally based and indigenes of Plateau state. This indicates that findings from the study will truly reflect the socio-economic norms of the people of the state. Majority of respondents were Christians staying with their parents (Table 3). Interventions targeting parents also needs to be recommended and included in strategizing to prevent disease transmission. Tung and Middleman (2005) evaluated school-level factors in a successful school-based HBV immunization program and found parent involvement resulted in enrollment and return of consent/refusal form phases of immunization initiatives and maximise number of school children immunised. More so, as Table 4 showed majority of HBV positives had an average level of knowledge on hepatitis B. Parents involvement is essential for increased awareness on HBV to take place.

Table 3 also showed that four of the hepatitis B positive individuals had been vaccinated against hepatitis B and the same four were utilizing condoms during sexual intercourse. Other HB viral screening tests to detect Anti-HBc, Anti-HBs, IgM anti-HBc need to be done for the HBV positive individuals in order to determine next line of action and treatment (National AIDS/STIs Control Program, 2016). The predominant routes of transmission vary according to the endemicity of the HBV infection (National AIDS/STIs Control Program, 2016). In areas with high HBV endemicity, perinatal transmission is the main route of transmission (National AIDS/STIs Control Program, 2016), whereas in areas with low HBV endemicity, sexual contact amongst high-risk adults is the predominant route (National AIDS/STIs Control Program, 2016; Hou, Liu, & Gu, 2005). The age at the time of infection is associated with the endemicity of HBV infection (Hou, Liu, & Gu, 2005) as seen in Table 5 below. However, in Nigeria, even though the study and average national HBV prevalence (11%) is in accordance with high endemicity, infection is most common among 21-40 year olds in Nigeria, although

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substantial perinatal and childhood transmissions do occur (National AIDS/STIs Control Program, 2016).

Table 5. Characteristics of endemic patterns of hepatitis B virus infection (Hou, Liu, & Gu, 2005)

Characteristic	**Endemicity of infection**		
	Low(%)	Intermediate(%)	High(%)
Chronic infection prevalence	0.5-2.0	2.0-7.0	>8
Past infection prevalence	5.0-7.0	10.0-60.0	70.0-95.0
Perinatal infection	Rare	Uncommon	Common
Early childhood infection	Rare	Common	Very common
Adolescence/adult infection	Very common	Common	Uncommon

For a successful peer education country program on HBV prevention interventions for youth/ adolescents, more research needs to be done in different parts of the country to get more substantial evidence regarding the models and education interventions that will be effective and successful for different age groups and different socio-cultural contexts.

Conclusion

The study revealed that HBV infection does exist among secondary school students that only have an average of correct knowledge. Correct knowledge needs to improve among this age group and the earlier age group of pre and early adolescence. Implementing secondary school targeted interventions for disease prevention and control of HBV among school youth and also to parents by allocating appropriate amounts of resources (money, man power, materials and time) by the government authorities is essential. State government needs to encourage heads of secondary schools to change their attitudes for learning to incorporate short messages for HBV prevention into weekly school activities like during school assembly, PTA meetings etc. Advocating to the state government for a coordination committee under the unit of disease control to coordinate solely viral hepatitis activities through a multi-sectoral approach. The state government needs to plan to have regular fora to collaborate with civil society groups, donor community and other stakeholders to implement hepatitis B prevention and control programs. Public enlightenment through media platforms need to occur to raise awareness on HBV infection (routes of transmission, different prevention methods available including importance of screening for HBV and vaccination).

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