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### Hepatitis B immunity status of Biomedical Students in Usmanu Danfodiyo University Sokoto, North Western Nigeria.

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#### ABSTRACT

The aim of this study was to investigate the Hepatitis B immunity status of Biomedical Students of Usmanu Danfodiyo University Sokoto, North-Western Nigeria. CTK Biotech (USA) Onsite HBsAb ELISA kit was used for the determination of HBsAb status of subjects. We investigated the HBsAb status of 186 biomedical students aged  $\geq 18$  years (mean age  $26 \pm 2.0$  years) made up of 147 males and 39 females. Out of 186 subject analyzed, 69 (37.1%) were Medical, 75(40.3%) were Medical Laboratory Science and 42(22.6%) were Nursing students. Age group distribution among these subject shows that majority 108(58.0%) were in the 21-25 years age group. Subjects were stratified based on marital status. Majority of subjects were single 173(93.1%) compared to married 13 (6.9%). Ethnic distribution of subjects indicated that 104(55.9%) were Hausa, 32 (17.2%) were Yoruba while 20(10.8%), 9(4.8%) and 21(11.3%) were Fulani, Igbo and other ethnic groups respectively. Among the 186 subjects studied, only 13(7.0%) has had prior complete course of hepatitis B vaccination ( $p=0.001$ ). Protective HBsAb titre ( $>10\text{miu/ml}$ ) was evident in 72(38.7%) of the subjects while 114 (61.3%) did not had no protective HBsAb titre ( $<10\text{miu/ml}$ ) ( $p=0.01$ ). Among the biomedical students who have had a previous complete course of hepatitis B vaccination, a significant proportion 61.5% have protective titres ( $<10$ ) while only 38.5% had protective vaccination. The result of this current study has shown that the prevalence of protective hepatitis B titres and the rate of vaccination uptake are low among Biomedical Science Students in Sokoto, Nigeria. There is a high incidence of needle stick injury. We recommend that all students entering into the Biomedical professions be screened for hepatitis B and that those who are negative and have no protective HBsAb status be offered full course of protective hepatitis B vaccination prior to commencement of their training.

**Keywords:** Hepatitis B immunity status, Biomedical Students, Usmanu Danfodiyo University, Nigeria.

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## INTRODUCTION

Hepatitis B infection is a global public health problem. It is estimated that about 30% of the world's population are infected with Hepatitis B virus (HBV)<sup>1</sup> and greater than 350 million people are chronically infected with HBV and at risk of liver pathology presenting as acute hepatitis and chronic complications such as cirrhosis and hepatocellular carcinoma<sup>2</sup>. There are two components to preventing hepatitis B infection; prevention of transmission of the virus and vaccination. The hepatitis B vaccination is recommended particularly for those who may be exposed to blood or blood products through their occupation and training<sup>3</sup>. Hepatitis B surface antibody (anti-HBs) testing is recommended for those at risk of occupational exposure (particularly healthcare, biomedical students and laboratory workers). There is evidence that the hepatitis B vaccine reduces the risk of developing Hepatitis B-related complications (liver cirrhosis and hepatocellular carcinoma)<sup>4</sup>. Hepatitis B surface antibody (anti-HBs) testing allows appropriate decision making with regards to post-exposure prophylaxis (PEP) following known or suspected exposure to the virus. Evidenced-based best practice recommends that antibody responses to hepatitis B vaccination be monitored. It is preferable to achieve anti-HBs levels above 100 mIU/mL. However, levels of 10 mIU/mL or more are generally accepted as enough to protect against infection. Responders with protective anti-HBs levels should receive the reinforcing booster dose at five years. A significant number of people particularly biomedical students and health care workers in developing countries where hepatitis B vaccination has not been integrated into national immunization programme are at risk of hepatitis B virus infection<sup>5</sup>. Hepatitis B has caused epidemics in many parts of Africa and the developing world<sup>6-7</sup>. Nigeria is a high incidence country for hepatitis B virus infection. Hepatitis B prevalence in many parts of Nigeria is higher than 8%<sup>8-10</sup>. The prevalence of Hepatitis B virus infection in most developed economies has declined over the years particularly due to the implementation of the World Health Assembly resolution of provision of life-saving Hepatitis B vaccination<sup>11</sup>. However, despite this evidenced-based best practice, many Biomedical Students and Health Care Workers (HCW) for whom HBV infection is an important occupational hazard in most sub-Saharan African countries are not fortunate enough to access this life saving vaccination. In some developed countries like the United Kingdom, University students entering into medical, dental and nursing courses that are at risk of exposure to patient's body fluid are routinely screened and those found negative are offered protective Hepatitis B vaccination<sup>12</sup>. There is paucity of data on Hepatitis B immunity status of biomedical students in North Western, Nigeria. The aim of this present study was to determine the Hepatitis B immunity

status of biomedical students attending Usmanu Danfodiyo University Sokoto (UDUS), North Western Nigeria.

## MATERIALS AND METHOD

### Study area

This present study was carried out in Sokoto State. The State is located in the North Western zone of Nigeria. It has a land mass of about 28,232.37sq kilometre. The State had a population of 4.2 million as at 2006 census and the metropolis is estimated to have a population of 427,760 people<sup>13</sup>. The main occupation of the indigenous people is grain production and animal husbandry. The inhabitants are predominantly Muslims.

### Study setting

The study was conducted in the Department of Haematology and Blood Transfusion Science in the Faculty of Medical Laboratory Science of Usmanu Danfodiyo University.

### Study subjects

The study included one hundred and eighty six (186) consecutively –recruited biomedical students (Medicine, Medical Laboratory Science and Nursing Students) of African descent attending Usmanu Danfodiyo University Sokoto. All students completed a structured questionnaire. The questionnaire consisted of socio-demographic and academic characteristics of subjects. Prior to the distribution of the questionnaire, the aims and objectives of the study were explained to prospective subjects and verbal informed consent was obtained.

### Inclusion criteria

Inclusion criteria included; age ( $\geq 18$  years), willingness to give a verbal informed consent, registered biomedical students of UDUS and no previous history of blood transfusion.

### Exclusion criteria

The following individuals were excluded from this study; students  $< 18$  years, non-registered students of UDUS, non-consenting, non-biomedical students and students who have had a previous blood transfusion.

### Statistical Analysis

Data from subjects was entered and analyzed using the Statistical Package for Social Science (SPSS) version 20.0 (SPSS, Chicago, IL, USA). Ethical approval for this study was obtained from the Ethical Review Board of Usmanu Danfodiyo University in Sokoto, Nigeria.

### Sample collection

Three millilitres of whole blood was collected using a sterile syringe into a plane container.

Samples were allowed to clot and centrifuged at a 1000rpm for five minutes. The serum was separated and used for HBsAb testing. HBsAb testing was carried out using the CTK Biotech HBsAb ELISA Test (CTK Biotech, U.S.A.). The test is a solid phase enzyme linked immunosorbent assay based on the principle of the double antigen sandwich technique for the detection of antibodies to hepatitis in human serum or plasma.

## RESULTS AND DISCUSSION

This study investigated the HBsAb status of 186 biomedical students of UDUS aged  $\geq 18$  years (mean age  $26 \pm 2.0$  years) made up of 147 males and 39 females. Out of 186 subject analysed, 69 (37.1%) were Medical, 75(40.3%) were Medical Laboratory Science and 42(22.6%) were nursing students. Age group distribution among these subject shows that majority 108(58.0%) were in the 21-25 years age group compared to 58(31.2%) and 18(9.7%) respectively for those in the 26-30 years and 15-20 years age group. Subjects were stratified based on marital status and ethnicity. Majority of subjects were single 173(93.1%) compared to married 13 (6.9%). Ethnic distribution of subjects indicated that 104(55.9%) were Hausa, 32 (17.2%) were Yoruba while 20(10.8%), 9(4.8%) and 21(11.3%) were Fulani, Igbo and other ethnic groups respectively. Among the 186 subjects studied, only 13(7.0%) has had prior complete course of hepatitis B vaccination ( $p=0.001$ ). Table 1 show the socio-demographic characteristics of our cohort of Biomedical Science students. Protective HBsAb titre ( $>10\text{miu/ml}$ ) was evident in 72(38.7%) of the subjects while 114 (61.3%) had no protective HBsAb titre ( $<10\text{miu/ml}$ ) ( $p=0.01$ ). Table 2 show the distribution of protective HBsAb titres among subjects. Among the biomedical students who have had a previous complete course of hepatitis B vaccination, a significant proportion 61.5% did not have protective titres ( $<10$ ) while only 38.5% had protective vaccination. Table 3 show the relationship between vaccination and protective titres.

**Table 1: The Socio demographic characteristics of subjects.**

| <b>Characteristics</b> | <b>Number (%) Tested</b> |
|------------------------|--------------------------|
| <b>Course of Study</b> |                          |
| Medicine               | 69(37.1%)                |
| Biomedical Science     | 75(40.3%)                |
| Nursing                | 42(22.6%)                |
| <b>Age Groups</b>      |                          |
| 15-20                  | 18(9.7%)                 |
| 21-25                  | 108(58.0%)               |
| 26-30                  | 58(31.2%)                |
| Above 30               | 2(1.1%)                  |
| <b>Marital Status</b>  |                          |
| Single                 | 173(93.1%)               |

|                                       |            |
|---------------------------------------|------------|
| Married                               | 13(6.9%)   |
| <b>Ethnic Group</b>                   |            |
| Hausa                                 | 104(55.9%) |
| Fulani                                | 20(10.8%)  |
| Yoruba                                | 32(17.2%)  |
| Igbo                                  | 9(4.8%)    |
| Others                                | 21(11.3%)  |
| <b>HBV vaccination uptake</b>         |            |
| Yes                                   | 13(7.0%)   |
| No                                    | 173(93%)   |
| <b>History of Needle Stick Injury</b> |            |
| Yes                                   | 40(21.5%)  |
| No                                    | 146(78.5%) |

**Table 2: Distribution of protective HBsAb titres among subjects.**

| <b>Titre(mIU/mL)</b> | <b>Total (%)</b> | <b>X<sup>2</sup></b> | <b>df</b> | <b>p value</b> |
|----------------------|------------------|----------------------|-----------|----------------|
| <10 (%)              | 114 (61.3%)      | 6.28                 | 1         | 0.01           |
| ≥10 (%)              | 72 (38.7%)       |                      |           |                |
| Total (%)            | 186 (100%)       |                      |           |                |

**Table 3: Relationship between vaccination and protective titres.**

| <b>HBsAb Titre (mIU/mL)</b> | <b>Vaccinated Number (%)</b> | <b>Non-vaccinated Number (%)</b> | <b>p value</b> |
|-----------------------------|------------------------------|----------------------------------|----------------|
| <10                         | 8 (61.5%)                    | 173 (100%)                       | 0.01           |
| >10                         | 5 (38.5%)                    | 0(0%)                            |                |
| Total                       | 13 (100)                     | 173(100%)                        |                |

In this present study, we observed that among the 186 subjects investigated; only 38.7% had detectable protective anti HB-S titre. Our finding is consistent with a previous study<sup>13</sup> in Lagos, Nigeria which investigated hepatitis B serologic immune status among 104 healthcare workers and observed that only 39 (37.5%) had detectable anti HB-S. Our finding is also consistent with reports from other parts of Nigeria which observed a low hepatitis B serologic immunity among Medical students<sup>14,15</sup>. In this present study, the history of vaccination uptake observed among our cohort of biomedical students was 7%. Previous reports in Nigeria indicates that there is a high rate of needle stick injury among health care workers, non-availability of post exposure prophylaxis, that a significant number of healthcare workers in Nigeria have not been vaccinated for HBV nor do they have detectable and protective anti HB-S titres<sup>13-15</sup>. Previous studies in other developing countries; Kenya<sup>16</sup>, Ethiopia<sup>17</sup>, Egypt<sup>18</sup>, Cameroon<sup>19</sup>, Pakistan<sup>20</sup> and Dominican Republic<sup>21</sup> all indicated a low rate of hepatitis B vaccination, lack of post exposure prophylaxis and access to personal protective equipment (PPE) among medical students health workers. However report from studies in developed countries show a significantly higher immunity status and high

vaccination uptake as well as availability of post exposure prophylaxis<sup>22-25</sup>. Our finding is also consistent with previous report<sup>26</sup> among medical students in Vientiane, Lao PDR which indicated that vaccination coverage against hepatitis B is dramatically low among students of health professions in Laos, largely due to poor knowledge and awareness of mode of transmission and prevention. There is increasing advocacy that biomedical students upon admission to the University should receive information about the occupational risks of blood-borne viruses and be vaccinated against hepatitis B<sup>26</sup>. Similarly, our finding is also consistent with finding from a previous report in India which indicated that 28% HCWs in India are unvaccinated and 17% are unaware of their vaccination status<sup>27</sup>. We observed that 61.5% of biomedical students who has had HBV vaccination did not have protective hepatitis B titres. Active immunization with one of the recombinant HBsAg vaccines should include three dose series at 0, 1, and 6 months. Three doses induce a protective response in more than 90% of healthy adults and children<sup>28</sup>. Non responders have peak anti HBs of less than 10 IU/L and lack protection. Low responders have peak anti- HBs levels of 10-100 IU/L and generally lack detectable anti-HBs levels within 5-7 years and they may respond to a further booster of double the dose of the vaccine. Good responders have peak anti-HBs >100 IU/L and usually have long term immunity<sup>29</sup>. In this present study we observed that 21.5% of our cohort of biomedical students has had a needle stick injury. Our finding is consistent with previous reports in Nigeria<sup>30-31</sup> which indicated that healthcare workers are prone to needle stick injury which put them potentially at risk of hepatitis B infection. Similarly, previous reports in Cameroon<sup>32</sup> and Syria<sup>33</sup> indicated that there is a high rate of accidental exposure to blood and a very low HBV vaccination uptake among medical students and HCWs in Cameroon and Syria leading to a high occupational risk of HBV infection. A new recommendation for the prevention of viral hepatitis in HCWs in South Africa includes; pre-employment screening for Hepatitis based on self-selection criteria, universal anti-HBs screening with HBV booster vaccination<sup>34</sup>. Pre-employment and pre-admission awareness program for HCWs and biomedical students is recommended to address the following; blood-borne diseases transmitted occupationally, standard precautions to prevent occupationally transmitted blood borne infection<sup>35</sup>. Finding from this present study highlights the need to implement the internationally recommended measures to protect HCWs and biomedical students from blood borne infections<sup>36</sup>. Previous reports recommend that hepatitis B immune globulin be mandatory for HCWs and students<sup>37-41</sup>.

## CONCLUSION

The result of the current study has shown that the prevalence of protective hepatitis B titres and the

rate of vaccination uptake are low among Biomedical Science Students in Sokoto, Nigeria. There is a high incidence of needle stick injury. We recommend that all students admitted to biomedical courses be screened for Hepatitis B virus infection prior to enrolment and those found negative be offered protective hepatitis B vaccination. There is need for the implementation of World Health Assembly recommendation that vaccination against Hepatitis B be included in the national vaccination programme in Nigeria. There is need to educate students enrolled into biomedical courses on the mode of transmission, infection control measures, importance of protective vaccination and universal precaution to reduce the risk of HBV infection.

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