

# Hepatitis B and C Co-Infection with HIV among Adolescents Living with HIV at the Dalhatu Araf Specialist Hospital Lafia North Central Nigeria

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**Abstract:** ***Background:** The sub-Saharan Africa is bedeviled with a high burden of infectious diseases that includes but not limited to Hepatitis and HIV. Human immunodeficiency virus (HIV), Hepatitis B and C infections can all be acquired through maternal to child transmission, blood transfusion, sexual exposure and use of unsterilized sharps. Both are diseases of public health importance in view of its contribution to childhood morbidity and mortality. These viral co-infections have been shown to lead to faster disease progression, yet the burden is not well known among adolescents in our environment. This study therefore, set out to determine the magnitude of Hepatitis B and C co-infection with HIV among adolescents attending care in our facility. **Methods:** Prospective cross sectional study among HIV infected adolescents at the Paediatric HIV clinic of the Dalhatu Araf Specialist Hospital Lafia were recruited using the simple random sampling methods. Questionnaires were administered, Hepatitis B and C screening were done and data was analyzed using SPSS version 20. Categorical variables were presented in percentages while continuous variables were presented as mean and standard deviation. **Results:** A total of 150 HIV infected adolescents were recruited with a mean age of  $13.88 \pm 2.71$ . Females were 92 accounting for 61.3% of the study population. The prevalence of Hepatitis B and C in this study was 5.3% and 0% respectively. There are more males than females with Hepatitis B and HIV co-infection. Hepatitis B co-infection with HIV was associated with an increased viral load. **Conclusion:** Hepatitis B and C co-infection with HIV was not found. There was a low prevalence of Hepatitis B and HIV (5.3%) and no Hepatitis C and HIV co-infection in this study. Presence of Hepatitis B and HIV co-infection was associated with a higher viral load.*

**Keywords:** Co-infection; Hepatitis B; Hepatitis C; HIV; Prevalence

## 1. Introduction

Hepatitis B and C as well as HIV infections can be acquired through maternal to child transmission, blood transfusion, sexual exposure and use of unsterilized sharps etc.<sup>1,2</sup> Human immunodeficiency virus (HIV) is a viral infection that has a global spread but worse in sub-Saharan Africa.<sup>3</sup> It is a disease of public health importance in view of its contribution to childhood morbidity and mortality.<sup>4</sup> It has a similar route of transmission with some of the blood borne hepatotropic viruses.<sup>2</sup> The sub-Saharan Africa is also a region with high prevalence of hepatitis B.<sup>4</sup> Human immunodeficiency virus and viral hepatitis co-infection have been shown to lead to faster disease progression.<sup>5</sup>

Children delivered to mothers with viral hepatitis and HIV co-infections have also been shown to have increased risk of acquiring hepatitis.<sup>1</sup> The prevalence of hepatitis B and C have been found to be higher among HIV infected children when compared to the HIV un-infected children.<sup>6</sup> Hepatitis B and C are both more infectious than HIV as Hepatitis B is 50 – 100 times more infectious while hepatitis C is 10 times more infectious when compared to HIV.<sup>7</sup> The global burden of hepatitis B, C and HIV are 370 million, 130 million and 40 million respectively.<sup>2,7</sup> This is particularly more in the sub-Saharan African region, probably due to the prevailing ignorant of the risk factors for these infections, extreme poverty and low socio-economic status.

The adolescents are people aged between 10 – 19 years of age, they are known for taking risky behaviours such as smoking, alcohol consumption, involving in drug abuse, gambling, thuggery, sexual abuse and all forms of experimentation due to peer pressure. A study in Cameroon reported a prevalence of HIV co-infection with hepatitis B

and C as 23.7% and 7.2% respectively, the same study found a 2% prevalence of co-infection of the three viruses (HIV, Hepatitis B and C).<sup>8</sup> Few of the available studies on HIV co-infection with either hepatitis B or C were among children and ranges between 0.25% to 24.5%.<sup>1,9</sup>

Audu et al had earlier reported a prevalence of HIV and hepatitis B co-infection as 7.2% and 9.6% for HIV co-infection with hepatitis C among adult patients in Lafia.<sup>10</sup> Eke et al in a cross sectional study reported a 3.1% prevalence of Hepatitis B among adolescents residing at Enugu.<sup>11</sup> The burden of these viral co-infections among adolescents are largely unknown, hence this study set out to determine the prevalence of hepatitis B and C co-infection with HIV among adolescents aged 10 to 19 years assessing HIV care in our hospital. The choice of the adolescents is not unconnected with the risky behavior characterized by this period of their development. Similarly, the antiviral treatment for hepatitis C as currently available can only benefit the adolescents. Besides, knowing the magnitude of the problem or otherwise will guide policy makers in planning. It may also influence the choice of antiretroviral therapy based on the National guidelines.

## Research questions

What is the prevalence of hepatitis B, hepatitis C and Co-infection among HIV infected adolescents at DASH?

## Aim

To determine the prevalence of Hepatitis B and C co-infection with HIV and its impact on viral load among adolescents at DASH.

**Specific objectives**

- 1) To determine the Prevalence of Hepatitis B infection among HIV infected adolescents at DASH
- 2) To determine the Prevalence of Hepatitis C infection among HIV infected adolescents at DASH
- 3) To determine the Prevalence of Hepatitis B and C co-infection among HIV infected adolescents at DASH
- 4) To determine the impact of the co-infections on viral load

**2. Methods****Study Area**

Lafia is the capital of Nasarawa State. The state shares boundary with Benue, Taraba, Plateau, Kaduna, FCT and Kogi states. The predominant tribes were Kambari, Eggon, Hausa-Fulani, Koro, Nupe, Gwandara and Alago. The major occupation of the people are farming and trading. The adolescent and youth friendly centre in Lafia town is located within the health facility and it is the site of the study. At the site, facilities for confidential counseling, testing and screening are available. Also, there are games such as Ludo, Table Tennis, Snooker, Sewing Machine for relaxation as well as training adolescents to be self reliant and have an improved self worth. There are health worker's such as Doctors, Nurses, Psychologist, Counsellors, Volunteer workers as well as Youth Corp members available at the centre for provision of services and guidance.

**Study Design**

A cross sectional hospital based descriptive study

**Study Site**

Paediatric antiretroviral therapy clinic located within the premises of the youth friendly centre DASH. The clinic is opened to HIV infected adolescents every Tuesday and about twenty to twenty-five adolescents are attended to per clinic. The clinic has 622 adolescents enrolled with 544 currently active.

**Study Population**

Adolescents aged 10 years to 19 years that are HIV infected and assessing antiretroviral care at the Dalhatu Araf Specialist Hospital Lafia. Screening for hepatitis Band C are presently not done routinely in our centre due to dwindling funding from partners who now only support HIV screening (using rapid test kits), polymerase chain reaction, CD4 count estimation and viral load.

**Sample Size**

Sample size was calculated using the formula<sup>11</sup>:

$$n = \frac{Z^2pq}{d^2}$$

n = sample size calculated, P is the prevalence at 3.1%<sup>11</sup> found from previous study among adolescents, q = 1 - p, Z = standard deviate at 95% confidence level = 1.96, d = level of precision at 3%

$$n = \frac{1.96^2 \times 0.031 \times .969}{.03^2}$$

$$n = 128.2.$$

Allowing for 10% attrition rate, the minimum sample size of 150 was used

**Sampling Technique**

A simple random sampling was used to select 150 from the list of adolescents accessing the antiretroviral clinic who meet the set criteria. Sample was drawn from the table of random selection. Drawn subjects were approached, the study was explained to them and an informed consent / assent were taken as appropriate from them and or care-givers. Relevant questionnaire was then administered and screening for the viral infections done, the cost of these were borne by the researchers.

**Inclusion Criteria**

All HIV infected adolescents aged 10 years to 19 years who gave assent / consent.

**Ethical Approval**

Ethical approval was sought and obtained from the Hospital Ethical Research Committee (ERC). The children and their parents / care-givers / guardian were approached. The purpose for the study was explained to them (Appendix I), written informed consent (Appendix II) were obtained from the parents / care-givers / guardian and children aged 18 years and above. Assent was sought (Appendix III) and obtained from children aged 10 years and above but less than 18 years. Those with hepatitis B, C or both co-morbidities were counseled and referred to the appropriate clinic for further screening and treatment. Confidentiality was strictly adhered to.

**Data collection procedure**

Questionnaire was administered (Appendix IV) by the researcher to get the patient biodata and risk factors. It is made up of open ended, structured interviewer administered questionnaire. The selected patient's medical records were retrieved to derive data such as mode of acquiring HIV, viral load as well as verify other information provided by the participants.

**3. Methods**

Two milliliter of blood was drawn from the cubital fossa using vacutainer needle after sterilizing the site with cotton wool soaked in methylated spirit and allowed to dry. The blood collected using standard venipuncture techniques in an ethylenediaminetetraacetic acid (EDTA) bottle. A dry cotton wool was firmly applied to the site where the blood was drawn from, till clotting is achieved. The samples were stored at -20°C until time for testing.

Testing for Hepatitis B and Hepatitis C was carried out at the Dalhatu Araf Specialist Hospital by the investigators at the Immunology Laboratory. Using the Diaspot screening kit for Hepatitis B and another Diaspot specific screening kit for Hepatitis C, all based on immunochromatographic principles for the qualitative detection of Hepatitis B surface Antigen (HBsAg) and Hepatitis C Antibodies. Those with positive result for either Hepatitis B and or C were counseled and referred to Pediatric gastroenterologist for further testing and management. HIV viral load testing was carried out at the regional Laboratory in Jos supported by Institute of Human Virology Nigeria. Post test counseling was done in all subjects.

### Data Analysis

The data were entered into a Microsoft excel sheet with the variables coded before transferring into a statistical package for social sciences SPSS version 20.0. Categorical variables were presented with tables of frequency distribution. Mean and standard deviation of continuous variables were calculated. The association between two mean was calculated using student T test, while that between two categorical variables was calculated using chi square. The significant p value was  $p < 0.05$ .

### Outcome

Hepatitis B and C

## 4. Results

### General Characteristics of the Study Population

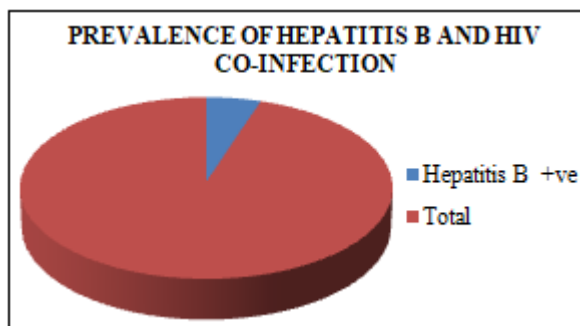
A total of 150 HIV infected adolescents were recruited in this study and were screened for both Hepatitis B and C. The mean age of the study population was  $13.88 \pm 2.71$ . The early adolescents (10 – 13 years) constitute more than 50% of the recruited subjects, while females accounted for 61.3% of the subjects in this study as seen on Table I below.

**Table I:** General Characteristics Of The Study Population

Variables	Frequency	Percentage
Age range (years)		
10 – 13	76	50.7
14 – 16	44	29.3
17 – 19	30	20.0
Gender		
Males	58	38.7
Females	92	61.3

The mean age of the study was  $13.88 \pm 2.71$

### Prevalence of Hepatitis B and Hiv Co-Infection among Adolescents



**Figure 1:** Prevalence of Hepatitis B and HIV Co-Infection among Adolescents.

The burden of Hepatitis B and HIV co-infection in this study is 5.3%. None of the responder in this study had Hepatitis C infection (Figure 1 above).

### Distribution of Hepatitis B among HIV Infected Adolescents

Fifty percent of adolescents with hepatitis B and HIV co-infection were of the mid adolescents (14 – 16 years) age groups. There was a significant difference in the age groups with hepatitis B and HIV co-infection  $p = 0.043$ . The early

and late adolescents accounted for 25% respectively. There were more males with hepatitis B compared with the females and that was significant  $p = 0.024$ . **Table II**

**Table II:** Distribution of Hepatitis B among HIV Infected Adolescents

	Hepatitis B			
	Positive	Negative	$\chi^2$	p value
Age range (years)				
10 – 13	2	74	15.85	<b>0.043</b>
14 – 16	4	40		
17 – 19	2	28		
Gender				
Males	6	52	12.99	<b>0.024</b>
Females	2	90		

p is significant at value  $< 0.05$

### Distribution of Hepatitis C among HIV Infected Adolescents

None of the HIV infected adolescents in this study, had co-infection with Hepatitis C i.e the prevalence of Hepatitis C and HIV co-infection is 0%. **Table III**

**Table III:** Distribution of Hepatitis C among HIV Infected Adolescents

	Hepatitis C			
	Positive	Negative	$\chi^2$	p value
Age range (years)				
10 – 13	-	76	0.00	1.000
14 – 16	-	44		
17 – 19	-	30		
Gender				
Males	-	58	0.00	1.000
Females	-	92	0.00	1.000

### Relationship between Virological Load and Hepatitis B Status

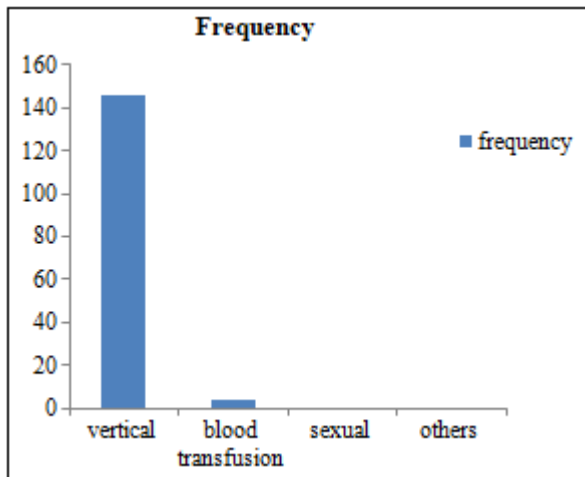
There are more subjects with HIV and Hepatitis B co-infection with a higher viral load and this was statistically significant ( $p = 0.001$ ) as depicted in Table IV below.

**Table IV:** Relationship between Virological Load and Hepatitis B Status

Variables	Positive	Negative	$\chi^2$	p value
< 20 copies/ml	4	70	103.99	<b>0.001</b>
20 – 1000 copies/ml	2	65		
>1000 copies/ml	2	7		
Total	8	142		

p is significant at value  $< 0.05$

### Modes of Transmission of HIV



**Figure 2:** Modes of Transmission Of HIV

Most HIV infection among the subjects was transmitted via mother to child transmission as shown in the figure above.

## 5. Discussion

The mean age of this study was  $13.88 \pm 2.71$ , this is similar to the  $14.26 \pm 2.02$  reported by Eke et al<sup>11</sup> in Enugu and the  $14.8 \pm 2.10$  reported by Aupibul et al<sup>12</sup> in Thailand. There were more females than males in this study, similar to earlier findings from Lafia, Keffi and Thailand.<sup>9,12,13</sup> But in contrast with the report from Enugu where males and females were equal.<sup>11</sup> This may be due to the difference in the sampling methods used.

The overall prevalence of hepatitis B co-infection with HIV in this study was 5.3%, this is higher than the 3.3% reported by Aupibul et al<sup>12</sup> in Thailand, the 3.1% reported by Eke et al<sup>11</sup> in Enugu and the 3.0% found by Pennap et al<sup>13</sup> in Lafia. Finding from this study is similar to the finding of 5.3% by Patel among adult HIV infected Botswana patients.<sup>14</sup> It is also similar to the 5.8% reported by Nwolsa et al<sup>4</sup> in Owerri using the same study population. Our finding is lower than the 7.7% reported in Benin by Sadoh et al<sup>2</sup> using a wider age group compared to this study which was strictly among the adolescents. It was lower than the 23.7% reported by Noubiap in Cameroon.<sup>8</sup> The population difference may explain the variation observed.

There are more males compared to females with HIV and Hepatitis B co-infection in this study, similar to the findings of Eke et al<sup>11</sup> in Enugu, Pennap et al<sup>13</sup> in Keffi. The reason for this observation is not very clear but may be due to the higher likelihood of males taking part in risky behaviours compared to their female counterpart.<sup>11</sup>

There was no HIV co-infection with hepatitis C in this study. Other authors who have found Hepatitis C have reported low prevalence such as the 0.25% reported by Ogboghodo et al<sup>1</sup> in Benin. Durowaye et al<sup>1</sup> in Ilorin also found only a subject positive with Hepatitis C and a prevalence of 1.7%.<sup>15</sup> These finding of rare hepatitis C co-infection with HIV may be in agreement with global findings of reduction of Hepatitis C transmission to mother to child.<sup>1</sup> This is in contrast from studies by Sadoh et al<sup>2</sup> that found 5.2% in Benin and that of Pennap and Oti et al that

reported 11.0% in Lafia and 13.5% in Keffi respectively.<sup>9,13</sup> The difference may be due to differences in methodology.

There is no one co-infected with the three viruses (HIV, Hepatitis B and Hepatitis C) in this study. This is similar to the finding by Sadoh et al<sup>2</sup> in Benin and Pennap et al<sup>13</sup> in Lafia but in contrast to the report from Lagos by Balogun et al who found 3.9% prevalence of triple co-infection.<sup>16</sup>

Almost all risk for HIV transmission and possibly Hepatitis B transmission were vertical from this study, similar to the findings from Benin.<sup>2</sup> This is similar to the age long knowledge of predominant mother to child transmission among children and adolescents.

This study found a significant association between Hepatitis B co-infection with HIV and a higher viral load level and by extension the immunological status. This implies that Hepatitis B co-infection with HIV worsens patient immune status since a higher viral load is associated with a lower C4 count. Similar to the report by Noubiap and Hoffmann et al among adult subjects in Cameroon and South Africa respectively.<sup>8,17</sup>

## 6. Conclusions

- 1) The prevalence of Hepatitis B and HIV co-infection among adolescents is 5.3%.
- 2) No Hepatitis C co-infection with HIV among adolescents in this study (0% prevalence).
- 3) There is no adolescent with the triple infection (HIV, Hepatitis B and C) in this study.
- 4) The predominant route of transmitting HIV and probably Hepatitis B are through mother to child transmission (MTCT).
- 5) Hepatitis B co-infection with HIV among adolescents is associated with a higher viral load.

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