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Prevalence of Hepatitis B Virus and HIV Coinfection Among Patients Attending Makeni Regional Hospital, Sierra Leone

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Abstract: Hepatitis B virus and human immunodeficiency virus coinfection continues to pose a significant public health burden in Sub Saharan Africa because both infections share similar routes of transmission and worsen clinical outcomes. This study examined the prevalence of hepatitis B virus infection, human immunodeficiency virus infection, and their coinfection among patients attending Makeni Regional Hospital in Sierra Leone. A hospital based cross sectional study design was employed, using secondary data obtained from blood donor records. A total of one hundred and sixty four participants were randomly selected from records covering the period from January to December two thousand and nineteen. Sociodemographic characteristics and infection status were assessed using descriptive analysis, while associations were explored using inferential statistical testing. The prevalence of hepatitis B virus and human immunodeficiency virus coinfection was found to be fifteen point two percent. Coinfection was more commonly observed among young adults and students, and occupation showed a statistically significant relationship with coinfection status. No significant associations were identified for age, sex, marital status, or blood group. These findings underscore the importance of integrated screening services, focused preventive interventions, and the expansion of hepatitis B vaccination programs in Sierra Leone.

Keywords: *Hepatitis B Virus; Human Immunodeficiency Virus; Coinfection; Prevalence; Sierra Leone*

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I. INTRODUCTION

Hepatitis B virus infection and human immunodeficiency virus infection remain significant contributors to morbidity and mortality worldwide. Hepatitis B virus infection is a major cause of chronic liver disease, including cirrhosis and hepatocellular carcinoma, while human immunodeficiency virus infection continues to impair immune function and increase the risk of opportunistic infections globally (World Health Organization 2023). Sub Saharan Africa carries a disproportionate share of the burden of both infections, largely due to high endemic transmission and ongoing challenges in prevention, screening, and early diagnosis (UNAIDS 2023).

Both hepatitis B virus and human immunodeficiency virus are transmitted through similar routes, including unprotected sexual contact, exposure to infected blood, unsafe medical practices, and mother to child transmission (Thio 2009). Consequently, coinfection with the two viruses is common in regions where both infections are endemic. Human immunodeficiency virus infection alters the natural

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course of hepatitis B virus by promoting higher levels of viral replication and faster progression to chronic liver disease (Puoti et al. 2014). In addition, hepatitis B virus coinfection can complicate the treatment of human immunodeficiency virus due to an increased risk of drug induced liver toxicity (Alter 2006).

West Africa is classified as a region of high hepatitis B virus endemicity, with prevalence estimates exceeding eight percent in several countries (Schweitzer et al. 2015). Sierra Leone is similarly affected; however, routine screening for hepatitis B virus among individuals receiving care for human immunodeficiency virus remains inconsistent. Makeni Regional Hospital serves as a major referral facility for northern Sierra Leone, yet available data on hepatitis B virus and human immunodeficiency virus coinfection among patients attending this hospital are limited.

➢ *Objectives*

The study aimed to:

- Determine the prevalence of hepatitis B virus infection among patients attending Makeni Regional Hospital.
- Determine the prevalence of HIV infection among patients attending Makeni Regional Hospital.
- Determine the prevalence of hepatitis B virus and HIV coinfection and explore its association with sociodemographic characteristics.

➢ *Research Questions*

- What is the prevalence of hepatitis B virus infection among patients attending Makeni Regional Hospital?
- What is the prevalence of HIV infection among patients attending Makeni Regional Hospital?
- What is the prevalence of hepatitis B virus and HIV coinfection, and how is it associated with sociodemographic factors such as age, sex, occupation, and marital status?

II. METHODOLOGY

➢ *Study Design*

A descriptive cross sectional study design was adopted for this research. The study relied on secondary data obtained from the hospital blood donor register. This approach was appropriate for estimating the prevalence of hepatitis B virus and human immunodeficiency virus coinfection and for examining its relationship with selected sociodemographic characteristics at a single point in time.

➢ *Study Area*

The study was conducted at Makeni Regional Hospital, which is situated in the Northern Province of Sierra Leone. The hospital serves as a major referral center for the region and provides a wide range of health services, including blood donation, laboratory screening, and testing for transfusion transmissible infections.

➢ *Population and Sample*

The study population included all patients who donated blood at the hospital from January 1 to December 31, 2019. Using simple random sampling, 164 participants were selected from 1,150 registered blood donors.

➢ *Sample Size Calculation*

Using the Cochran formula for a finite population:

$n= Z^2 \times p \times (1 – p)/e^2 \div (1 + Z2 \times p \times (1 – p))/e^2N$

Where:

- Z=1.96 (95% confidence level)
- p=0.15 (estimated prevalence based on previous studies)
- e=0.05 (margin of error)
- N=1150 (total population)

This gave a sample size of 164 participants**,** ensuring adequate statistical power.

➢ *Data Collection and Variables*

Secondary data were extracted from the hospital blood donor register. Variables included:

- Age
- Sex
- Occupation
- Marital status
- Blood group
- HBV, HIV, and HBV-HIV coinfection status

➢ *Eligibility Criteria*

- *Inclusion Criteria*

✓ Patients aged eighteen years and above
✓ Patients attending Makeni Regional Hospital during the study period
✓ Individuals who provided informed consent
✓ Patients with documented HIV and hepatitis B surface antigen test results

- *Exclusion Criteria*

✓ Patients who declined consent
✓ Patients with incomplete sociodemographic or laboratory data

➢ *Sample Size Determination*

Sample size was calculated using the single population proportion formula described by Lwanga and Lemeshow (1991). A conservative prevalence estimate of fifty percent was used due to lack of recent local data. Although the calculated minimum sample size was three hundred and eighty four, a total of 164 participants were enrolled based on feasibility and availability of eligible participants during the study period.

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➢ *Sampling Technique*

A consecutive sampling technique was employed, whereby all eligible patients presenting during the study period were recruited until the target sample size was achieved.

➢ *Data Collection Procedure*

Data were collected using a structured and pretested tool. Sociodemographic and clinical information were obtained through patient interviews and review of medical and laboratory records.

➢ *Laboratory Procedures*

Venous blood samples were collected using standard aseptic techniques. HIV testing was conducted according to the national HIV testing algorithm. Hepatitis B virus infection was determined by detection of hepatitis B surface antigen using approved rapid diagnostic test kits or enzyme linked immunosorbent assay, following national laboratory guidelines (World Health Organization, 2017).

➢ *Data Analysis*

Data were analyzed using Excel and SPSS version 25. Descriptive statistics summarized demographic characteristics and infection prevalence. Associations between categorical variables and HBV-HIV coinfection were analyzed using Chi-square tests, with significance set at $p<0.05$.

➢ *Ethical Consideration*

Ethical approval was obtained from the hospital ethics committee. Participant confidentiality was maintained, with no personal identifiers included in the dataset.

➢ *Limitations*

This hospital based cross sectional study may not be generalizable to the wider community. In addition, the data were collected in 2019, and changes in screening practices or treatment guidelines since then may influence the current prevalence of hepatitis B virus and HIV coinfection.

III. FINDINGS AND DISCUSSION

A. Overview of Empirical Findings

➢ *Sociodemographic Characteristics*

Table 1 Sociodemographic Characteristics of Participants (N=164)

Variable	Frequency (n)	Percent (%)
Sex		
Male	124	76.0
Female	40	24.0
Age group (years)		
16–20	20	12.2
21–25	45	27.4
26–30	43	26.2
31–35	15	9.1
36–40	21	12.8
41–45	11	6.7
46–50	7	4.3
51–55	1	0.6
56–60	1	0.6
Marital status		
Married	107	65.2
Single	57	34.8
Occupation		
Farmer	28	17.1
Skilled Worker	59	36.0
Student	39	23.8
Trader	38	23.2

Table 1 summarizes the sociodemographic characteristics of the study participants. Of the 164 participants included in the analysis, the majority were male 124 (76.0%), while females accounted for 40 (24.0%). Participants were predominantly young adults, with those aged 21–25 years forming the largest age group 45 (27.4%), followed by those aged 26–30 years 43 (26.2%). Participants aged above 40 years constituted a relatively small proportion of the study population.

With respect to occupation, skilled workers comprised the largest group 59 (36.0%), followed by students 39 (23.8%), traders 38 (23.2%), and farmers 28 (17.1%). Most participants were married 107 (65.2%), while single participants accounted for 57 (34.8%). These characteristics indicate that the study population was largely composed of economically active adults.

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➢ *Prevalence of HBV, HIV, and Coinfection*

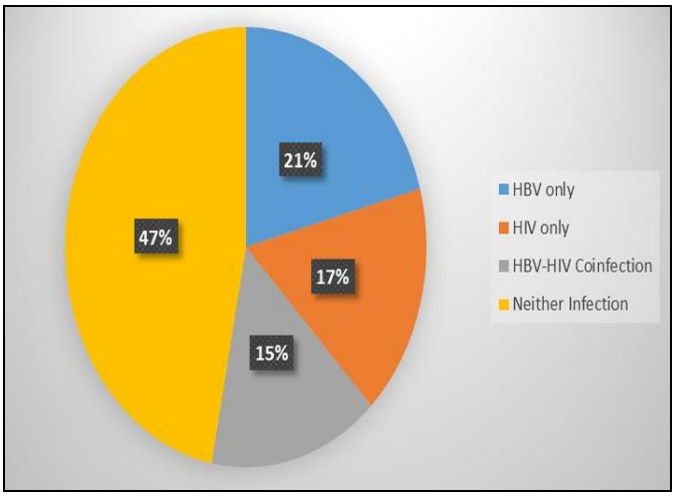

Fig 1 Prevalence of HBV, HIV, and HBV-HIV Coinfection (N=164)

Figure 1 shows that the overall prevalence of HBV-HIV coinfection among the study participants was 25 (15.2%). Participants infected with HBV alone accounted for 34 (20.7%), while those infected with HIV alone were 28 (17.1%). Nearly half of the participants 77 (47.0%) tested negative for both infections.

The observed prevalence demonstrates a substantial burden of transfusion transmissible infections within the hospital population. The relatively high proportion of coinfected individuals reflects the overlapping transmission routes of HBV and HIV and underscores the importance of routine dual screening in hospital and blood bank settings.

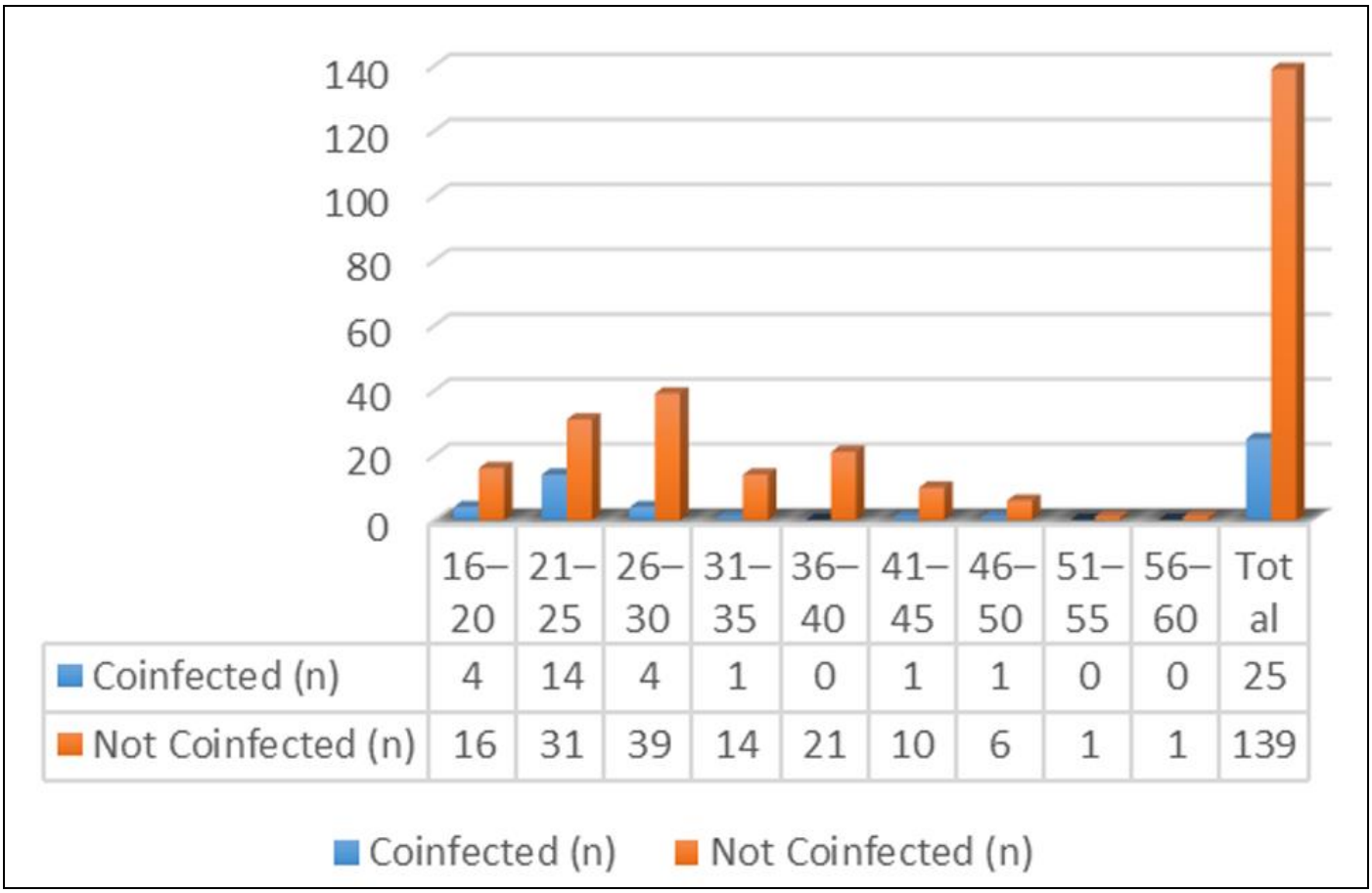

Fig 2 HBV-HIV Coinfection by Age Group of Participants (N=164)

Figure 2 shows the distribution of HBV-HIV coinfection across age categories. The highest prevalence of coinfection was observed among participants aged 21–25 years 14 (8.5%), followed by those aged 26–30 years 4 (2.4%). Lower prevalence was recorded among participants aged 31–35 years 1 (0.6%) and 41–45 years 1 (0.6%), while no coinfection was observed in participants aged 36–40 years and those aged above 50 years.

Although coinfection appeared more common among younger age groups, statistical analysis showed that the association between age and HBV-HIV coinfection was not statistically significant at the 5% level ($p > 0.05$). This suggests that while age related differences were observed, they may be due to random variation within the sample.

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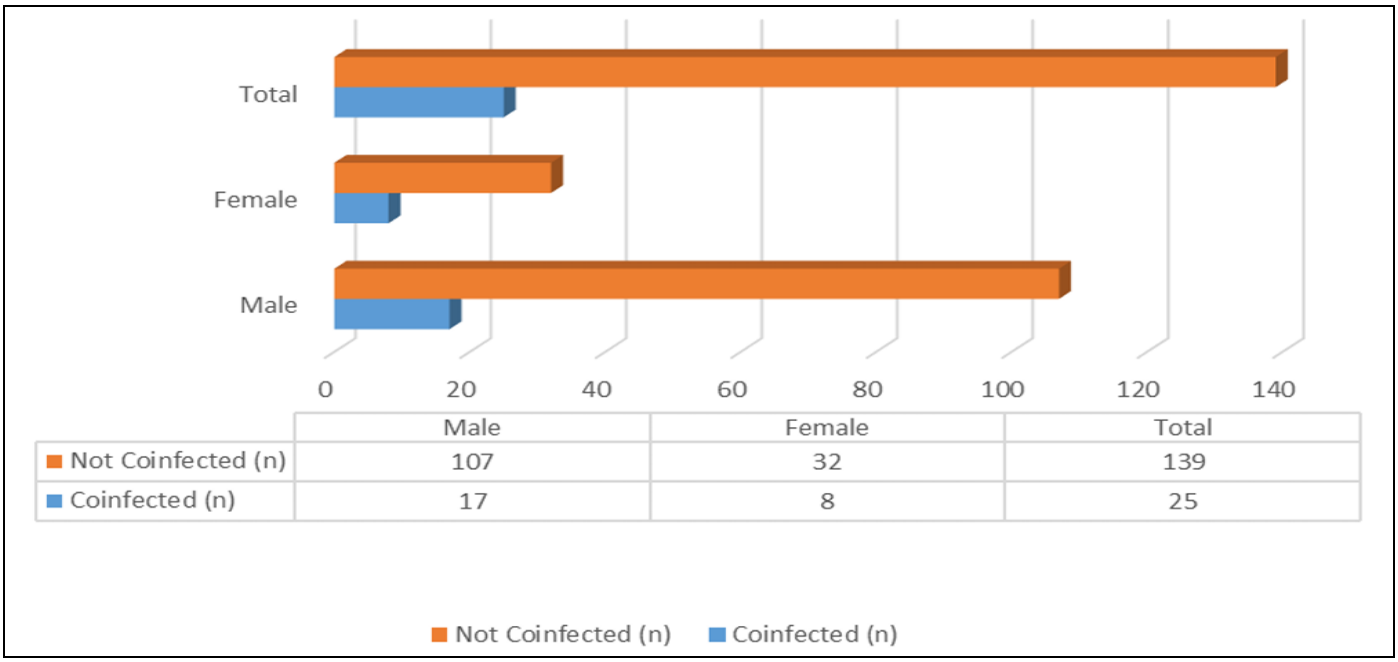
➢ *HBV-HIV Coinfection by Sex*

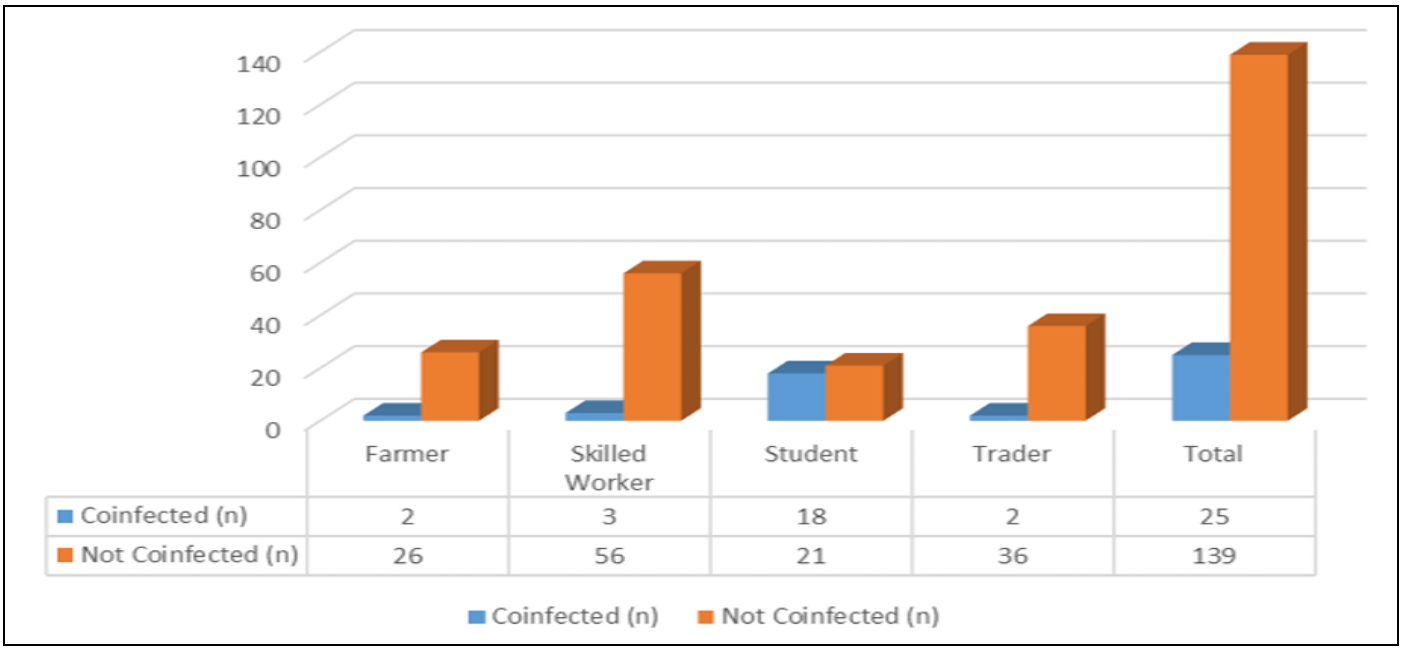


	Male	Female	Total
Not Coinfected (n)	107	32	139
Coinfected (n)	17	8	25

Fig 3 HBV-HIV Coinfection by Sex of Participants (N=164)

As presented in Figure 3, male participants accounted for a greater proportion of coinfected cases 17 (10.4%) compared to females 8 (4.9%). Despite this observed difference, chi square analysis indicated that the association between sex and HBV-HIV coinfection was not statistically significant ($p > 0.05$).

This finding suggests that although males appeared to have a higher prevalence of coinfection, sex alone was not a strong predictor of HBV-HIV coinfection within the study population.



	Farmer	Skilled Worker	Student	Trader	Total
Coinfected (n)	2	3	18	2	25
Not Coinfected (n)	26	56	21	36	139

Fig 4 HBV-HIV Coinfection by Occupation of Participants (N=164)

Figure 4 illustrates the relationship between occupation and HBV-HIV coinfection. Students recorded the highest prevalence of coinfection 18 (11.0%), followed by skilled workers 3 (1.8%), farmers 2 (1.2%), and traders 2 (1.2%).

Statistical testing demonstrated a statistically significant association between occupation and HBV-HIV coinfection ($p < 0.05$). This indicates that occupation, particularly student status, was significantly associated with the likelihood of coinfection in this study. HBV-HIV Coinfection by Marital Status

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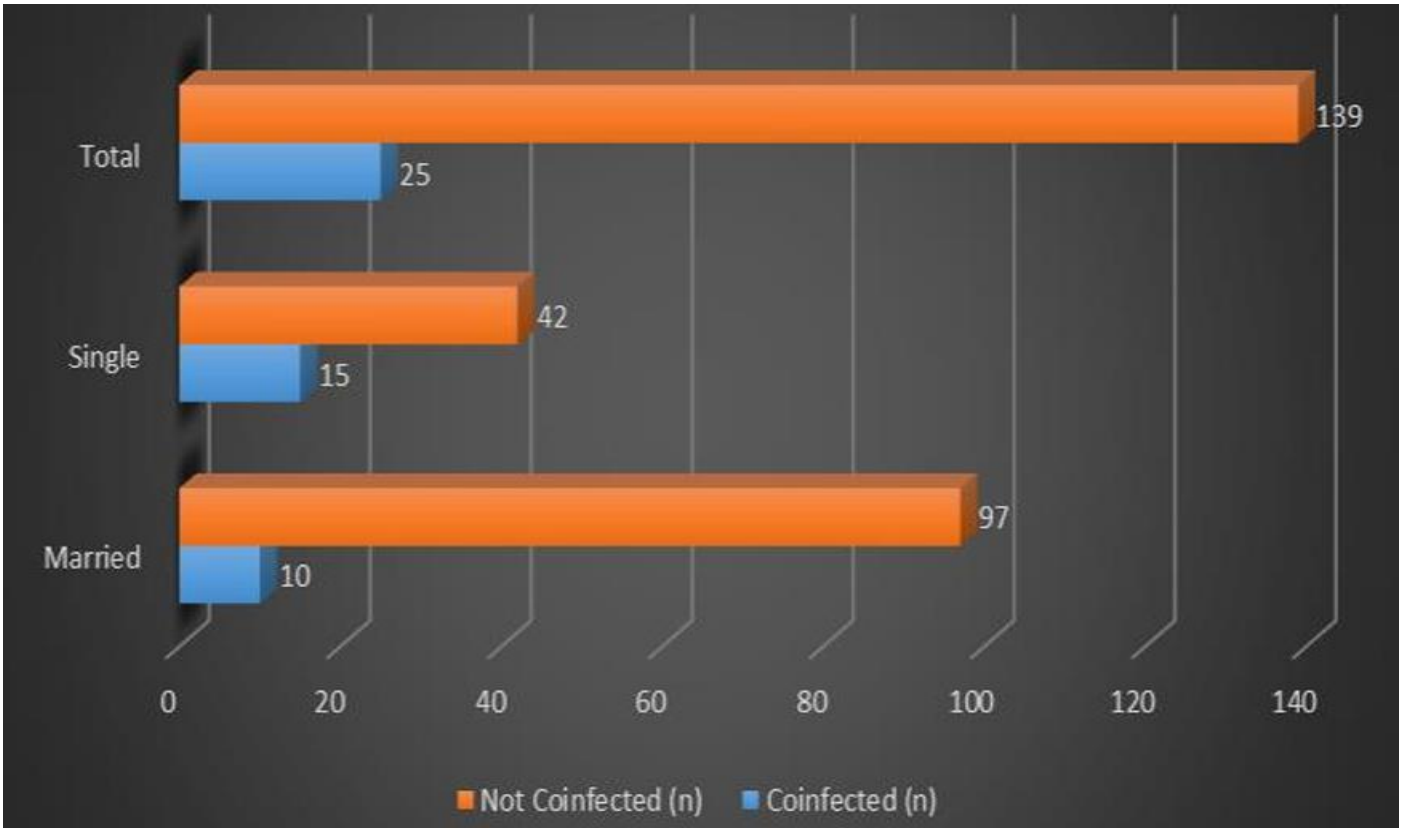

Fig 5 HBV-HIV Coinfection by Marital Status of Participants (N=164)

As shown in Figure 5, coinfection was more prevalent among single participants 15 (9.1%) compared to married participants 10 (6.1%). However, the difference in prevalence between marital status groups was not statistically significant ($p > 0.05$).

This finding suggests that marital status alone does not adequately explain differences in HBV-HIV coinfection risk among participants.

➢ *HBV-HIV Coinfection by Blood Group*

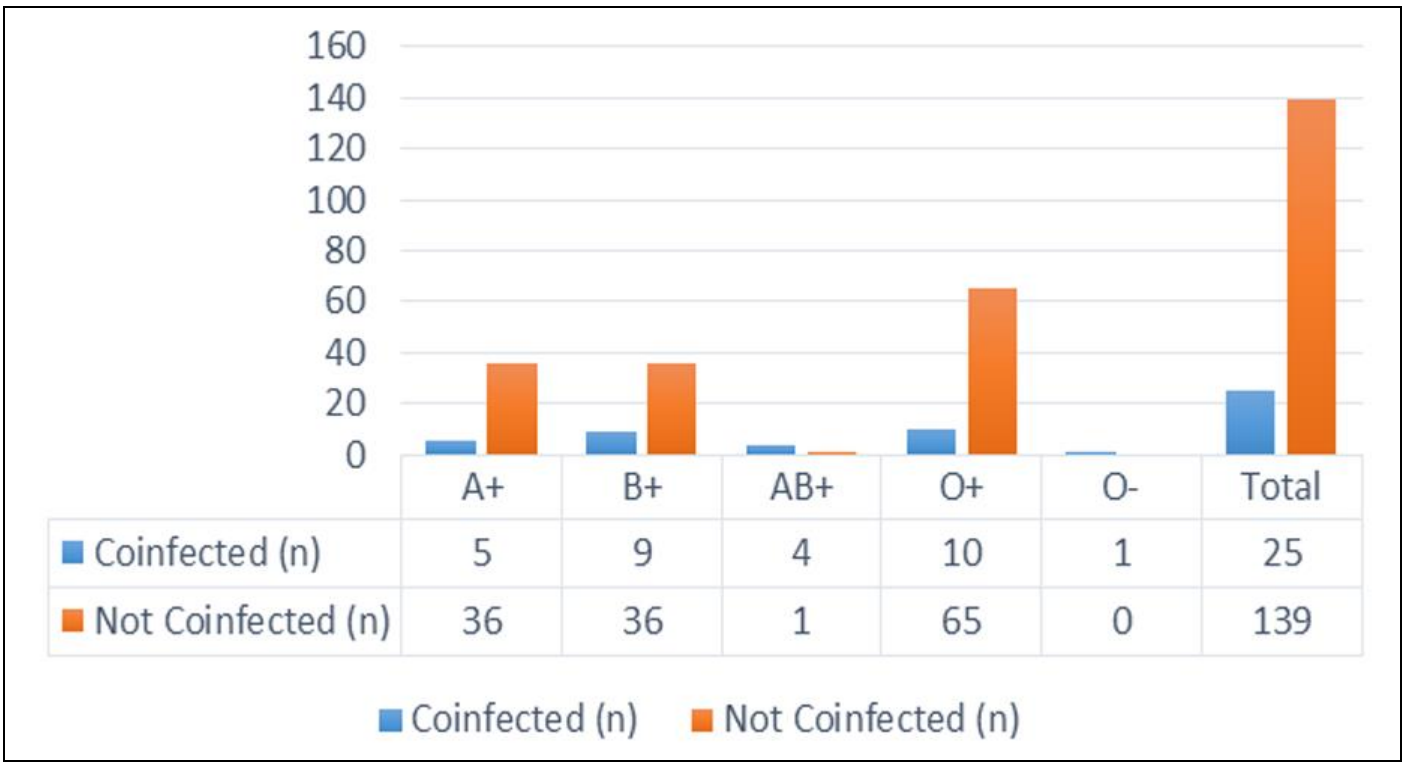

Fig 6 HBV-HIV Coinfection by Blood Group of Participants (N=164)

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Figure 6 presents the distribution of coinfection across blood groups. The highest prevalence was observed among participants with blood group O positive 10 (6.1%) and B positive 9 (5.5%), while lower prevalence was recorded among A positive 5 (3.0%) and AB positive 4 (2.4%) blood groups.

Chi square analysis showed no statistically significant association between blood group and HBV-HIV coinfection ($p > 0.05$). This suggests that the observed variation is likely attributable to the distribution of blood groups within the population rather than a biological association.

IV. CONCLUSION

This study demonstrates that hepatitis B virus and human immunodeficiency virus coinfection represents a notable burden among patients attending Makeni Regional Hospital. The prevalence observed indicates ongoing exposure to shared transmission risk factors, particularly among younger adults and students. Occupation was significantly associated with coinfection, while other demographic variables showed no significant relationship. These findings support the need for routine dual screening, strengthened hepatitis B vaccination coverage, and targeted preventive interventions within hospital and community health services. Despite limitations related to secondary data and single facility design, the study provides useful baseline evidence to inform public health planning and future research in Sierra Leone.

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