



Gender Differences in the Prevalence of Blood-Borne Infectious Diseases Among University Students: A Chi-Square and Risk-Ratio Analysis

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ABSTRACT

Blood-borne infectious diseases — namely Hepatitis B virus (HBV), Hepatitis C virus (HCV), and Human Immunodeficiency Virus (HIV) — remain a significant public health challenge in sub-Saharan Africa. University students represent a particularly vulnerable group owing to their age profile, potential sexual activity, and variable health literacy. This study aimed to determine whether gender-based differences in the seroprevalence of HBsAg, HCV, and HIV are statistically significant among newly admitted students at Federal University Gusau. A cross-sectional analytical design was employed using the complete 2024/2025 serological screening register (N = 1,707; male = 1,230; female = 477). For each infection, a 2×2 contingency table was constructed, and chi-square statistics, relative risk (RR), and odds ratio (OR) were computed analytically. HBsAg prevalence was 8.54% in males and 5.66% in females ($\chi^2[1] = 3.59$, $p = 0.058$; RR = 1.51, 95% CI [1.00, 2.27]; OR = 1.56, 95% CI [1.01, 2.41]). HCV prevalence was 1.22% (male) versus 0.84% (female) ($\chi^2[1] = 0.17$, $p = 0.677$), whilst HIV prevalence was 0.73% (male) versus 1.05% (female) ($\chi^2[1] = 0.12$, $p = 0.725$). HBsAg exhibited a borderline-significant gender disparity in which male students carried a 51% higher relative risk than their female counterparts. No statistically significant gender differences were detected for HCV or HIV. These findings support gender-targeted HBV vaccination campaigns and underscore the need for larger, adequately powered multi-cohort studies.

Keywords: Hepatitis B, Hepatitis C, HIV, gender differences, chi-square test, relative risk, odds ratio, university students, Nigeria, seroprevalence

1.0 INTRODUCTION

1.1 Background

Blood-borne infectious diseases — particularly Hepatitis B virus (HBV), Hepatitis C virus (HCV), and Human Immunodeficiency Virus (HIV) — remain among the most significant contributors to morbidity and mortality in sub-Saharan Africa. The World Health Organisation (WHO) estimated that approximately 254 million people were living with chronic HBV infection worldwide in 2022, with the highest burden in the WHO African and Western Pacific regions (WHO, 2024); a global modelling study produced a similar estimate of 257.5 million (Polaris Observatory Collaborators, 2023). Nigeria harbours an estimated 2 million persons living with HIV/AIDS (Joint United Nations Programme on HIV/AIDS [UNAIDS], 2023). Among Nigerian students, reported anti-HCV prevalence is generally below 1% in several campus surveys (Jemilohun et al., 2014; Omolade & Adeyemi, 2018; Abraham et al., 2023).

University students represent an especially important demographic for disease surveillance. Typically aged between 16 and 25 years, they are entering a period of heightened social interaction, potential initiation of sexual activity, and independence from parental supervision. The heterogeneity of Nigerian university

populations — drawing students from diverse geographic, ethnic, socioeconomic, and cultural backgrounds — creates conditions in which carriers from different endemic regions converge within a shared institutional environment. Nigeria is a high-endemicity setting for HBV: a systematic review and meta-analysis of studies published between 2010 and 2019 reported a pooled prevalence of 9.5% (Ajuwon et al., 2021), and an earlier review of studies from 2000 to 2013 reported 13.6% (Musa et al., 2015).

Federal University Gusau instituted a compulsory serological screening programme through its University Health Services Department, whereby all newly admitted students are tested on admission for HBsAg, HCV, HIV, haemoglobin genotype, and blood group. The 2024/2025 cohort comprised 1,707 students (1,230 male; 477 female). To the best of our knowledge, no previous study has formally reported an inferential gender-comparative analysis of these data.

1.2 Gender as an Epidemiological Variable

Biological, behavioural, and social determinants of gender interact to produce differential infectious disease risks. For HBV, higher male seroprevalence has been attributed to sex differences in immune responses, in which sex hormones influence the course

of HBV infection, with androgens generally immunosuppressive and oestrogens immune-stimulating (Ruggieri et al., 2018). Risky behaviours such as multiple sexual partnerships have been proposed as contributors to the higher male prevalence (Ojerinde et al., 2023); none of these behavioural variables was measured in the present study. Higher HBsAg positivity among male than female students has been reported in several Nigerian student cohorts (Ojerinde et al., 2023; Abraham et al., 2023; Garbati et al., 2024).

For HIV in Nigeria, the epidemiological picture is more nuanced. The 2018 national survey (NAIIS) found HIV prevalence to be higher among women than men aged 15–49 years (1.9% versus 0.9%), with young women aged 20–24 years more than three times as likely to be living with HIV as young men of the same age (UNAIDS, 2019). Student screening data are consistent with this direction: of six HIV-positive students identified among 4,623 newly admitted students in south-western Nigeria, five were female (Ojerinde et al., 2023).

1.3 Rationale for Inferential Testing

The chi-square test of independence provides a principled answer to whether an observed gender difference is stable or could arise from sampling variability (Szklo & Nieto, 2019). Descriptive reporting of prevalence proportions — the standard format of most Nigerian university health service annual reports — is necessary but insufficient for evidence-based policy decisions. The relative risk (RR) and odds ratio (OR) are the preferred effect-size measures for binary health outcomes in cross-sectional designs (Zhang & Yu, 1998), reported alongside 95% confidence intervals computed via the Woolf logit method for the OR and the log (Katz) method for the RR (Altman et al., 1998).

1.4 Aim and Objectives

This study aims to determine whether statistically significant gender differences exist in the seroprevalence of HBsAg, HCV, and HIV amongst the 2024/2025 student cohort at Federal University Gusau, and to quantify the magnitude of any detected difference. The specific objectives are:

- To compute and compare HBsAg, HCV, and HIV prevalence rates by gender in the 2024/2025 cohort.
- To test the statistical significance of observed gender differences using Pearson's chi-square test with Yates's continuity correction ($\alpha = 0.05$).
- To compute relative risk and odds ratio estimates with 95% confidence intervals to quantify the direction and magnitude of gender-based disparities.
- To discuss findings within the context of the Nigerian epidemiological literature and their implications for university health policy.

1.5 Research Hypotheses

H_{01} : There is no statistically significant difference in HBsAg positivity rates between male and female students ($\alpha = 0.05$).

H_{02} : There is no statistically significant difference in HCV positivity rates between male and female students.

H_{03} : There is no statistically significant difference in HIV positivity rates between male and female students.

H_{a1} : There is a statistically significant difference in HBsAg positivity rates between male and female students.

H_{a2} : There is a statistically significant difference in HCV positivity rates between male and female students.

H_{a3} : There is a statistically significant difference in HIV positivity rates between male and female students.

2.0 STATEMENT OF THE PROBLEM

Despite the well-documented burden of blood-borne infectious diseases in Nigerian universities, three gaps persist in the published literature. First, most published Nigerian university-based studies report one or two infections rather than simultaneous multi-infection gender comparisons within the same cohort (e.g., Ashaka et al., 2024; Ojerinde et al., 2023), making it difficult to assess relative gender disparities across diseases in a single population; recent exceptions, such as Garbati *et al.*'s (2024) triple screening of HBV, HCV, and HIV among students at the Federal University of Health Sciences, Azare, did not report inferential gender comparisons with confidence intervals. Second, many published studies report prevalence proportions without accompanying confidence intervals for risk estimates, which limits meta-analysts' ability to pool effect sizes across settings. Third, Zamfara State — a north-western Nigerian state with a distinct ethnic composition and historical under-representation in national epidemiological surveys — has produced very limited published serological data; a general-population survey by Abdulrahman *et al.* (2025) reported HBsAg seroprevalence in the state, but, to the best of our knowledge, no published study has reported serological data from an institutional university screening programme in Zamfara State. The present study addresses these gaps, and its principal novelty lies in combining (a) simultaneous, multi-infection (HBsAg, HCV, HIV) gender comparisons, (b) inferential statistics with 95% confidence intervals for both relative risk and odds ratio, and (c) a complete-census cohort from a previously undocumented institutional setting in Zamfara State.

3.0 LITERATURE REVIEW

3.1 HBV Epidemiology Among Nigerian University Students



Nigeria is a high-endemicity country for HBV: a systematic review and meta-analysis of 47 studies published between 2010 and 2019 reported a pooled prevalence of 9.5%, with the highest regional estimate in the North West (12.1%) (Ajuwon *et al.*, 2021). Among students, a screening of 4,623 newly admitted students at Federal University Oye-Ekiti (2015–2017) reported an HBsAg prevalence of 2.23%, with HBV more common in males (Ojerinde *et al.*, 2023), and a serosurvey of 1,000 students and residents of the surrounding area at Federal Polytechnic Idah reported HBV, HCV and HIV prevalences of 2.8%, 0.2% and 0.3%, with more male than female participants HBsAg-positive (Abraham *et al.*, 2023). More recently, Garbati *et al.* (2024) screened students at the Federal University of Health Sciences, Azare, and likewise found that most HBsAg-positive students were male (9 of 12), with no HCV or HIV detected, while Ashaka *et al.* (2024) detected HBsAg only among males (2 of 38) in a small sample of 90 students in a Lagos university community, with anti-HCV found in one male and one female student. In Zamfara State specifically, the only identified published serological estimate is a general-population survey by Abdulrahman *et al.* (2025), which reported an HBsAg prevalence of 6.7% but did not focus on a university population or examine gender-stratified inferential statistics.

The mechanisms underlying higher male HBsAg prevalence are multifactorial. Ruggieri *et al.* (2018) reviewed how sex hormones and immune responses interact to shape the outcome of HBV and HCV infection, noting that oestrogens generally have immune-stimulating effects whereas androgens tend to be immunosuppressive. Risky behaviours such as multiple sexual partnerships have been proposed as further contributors to male exposure risk (Ojerinde *et al.*, 2023); these variables were not directly measured in the present cohort. Nigeria introduced the HBV vaccine into its National Programme on Immunisation only in 2004 (Abraham *et al.*, 2023), meaning that students aged 21 or older at the time of screening may not have received full immunisation coverage.

3.2 HCV Epidemiology in University Settings

HCV seroprevalence among Nigerian university students is generally lower than HBV seroprevalence, with reported anti-HCV prevalence of 0.2% to 0.7% in several student surveys (Jemilohun *et al.*, 2014; Omolade & Adeyemi, 2018; Abraham *et al.*, 2023) and 2.2% in a small Lagos sample (Ashaka *et al.*, 2024). Gender disparities in HCV are less consistently documented. Jemilohun *et al.* (2014) found no significant gender difference in anti-HCV positivity among undergraduates in Ogbomoso (0.37% male versus 0.40% female), and Omolade and Adeyemi (2018) likewise reported no difference between male and female students, consistent with HCV's predominantly parenteral transmission route, which

lacks the strong gender-differentiation seen with sexually transmitted HBV.

3.3 HIV Among Nigerian University Students

HIV seroprevalence in Nigerian student cohorts is low: 0.13% among 4,623 newly admitted students in Ekiti State (Ojerinde *et al.*, 2023), 0.3% in the Federal Polytechnic Idah survey (Abraham *et al.*, 2023), and no cases among 300 students at the Federal University of Health Sciences, Azare (Garbati *et al.*, 2024). The 2018 national survey reported an HIV prevalence of 1.4% among adults aged 15–49 years (UNAIDS, 2019); the 0.82% overall prevalence in the present cohort is below this adult figure, in keeping with the younger age profile of entrants, but higher than in the student cohorts cited above. The role of age-disparate sexual partnerships — whereby younger women engage sexually with older, higher-prevalence male partners — as a driver of female HIV risk in young adult populations in sub-Saharan Africa has been widely hypothesised, although cohort evidence is mixed (Harling *et al.*, 2014).

3.4 Statistical Methodology in Epidemiological Comparisons

The chi-square test of independence remains the canonical tool for testing whether two categorical variables are statistically associated in cross-sectional epidemiological studies (Szklo & Nieto, 2019). For 2×2 tables with a single degree of freedom, Yates's (1934) continuity correction reduces the risk of Type I error inflation by adjusting for the discrete nature of the chi-square distribution. The relative risk and odds ratio are the standard effect-size measures for binary health outcomes; confidence intervals for both were computed on the log scale, using the Woolf logit method for the odds ratio and the Katz log method for the relative risk (Altman *et al.*, 1998; Zhang & Yu, 1998).

4.0 MATERIALS AND METHODS

4.1 Study Design

A cross-sectional, descriptive-analytical design was employed. Because the serological screening register represents a complete census of all newly registered students rather than a probability sample, results describe true population parameters for the 2024/2025 registered cohort; inferential tests address whether observed patterns would generalise to future cohorts drawn from the same source population.

4.2 Study Population and Sampling

All 1,707 students registered at Federal University Gusau in 2024/2025 who attended the compulsory screening clinic were included. No exclusion criteria were applied. Males comprised 1,230 (72.0%) and females 477 (28.0%), reflecting the male-dominated enrolment pattern typical of Nigerian federal

universities in science, technology, engineering, and mathematics disciplines.

4.3 Diagnostic Procedures

Serological screening was conducted by qualified medical laboratory scientists using standard rapid-test procedures. HBsAg was detected using a rapid immunochromatographic assay (sensitivity $\geq 98\%$; specificity $\geq 99\%$). HCV antibody status was determined using a third-generation anti-HCV rapid test. HIV status was assessed using the Nigerian National HIV Testing Algorithm: initial screening (Determine HIV-1/2), confirmation of reactive results (Uni-Gold), and resolution of discordant results with a tiebreaker assay.

4.4 Variables

Dependent variables: Binary disease status (positive/negative) for HBsAg, HCV, and HIV.

Independent variable: Gender (male/female), recorded from university application data.

Derived measures: Prevalence proportions, RR, OR, and their 95% confidence intervals.

4.5 Statistical Methods

4.5.1 Chi-Square Test with Yates's Continuity Correction

Pearson's chi-square test of independence, with Yates's (1934) continuity correction, was selected as the primary inferential test because each 2×2 table in this study has $df = 1$, the setting for which the Yates correction was specifically derived to reduce the tendency of the uncorrected chi-square statistic to overstate significance when applied to discrete count data. Fisher's exact test, which computes an exact hypergeometric p-value rather than relying on the chi-square distribution as an approximation, was considered as an alternative and is generally recommended when expected cell frequencies are small. The validity of the chi-square approximation was therefore checked directly: the conventional criterion requires an expected frequency of at least five in every cell. For HBsAg, the minimum expected cell count was 36.9, comfortably satisfying this criterion. For HCV, the minimum expected count was 5.3, at the conventional threshold. For HIV, the minimum expected count was 3.9, below the conventional threshold, indicating that the chi-square approximation is less reliable for this disease. Fisher's exact test was therefore additionally computed for all three diseases as a robustness check. The exact test yielded results consistent with the Yates-corrected chi-square in every case (HBsAg: OR = 1.56, $p = 0.055$; HCV: OR = 1.46, $p = 0.614$; HIV: OR = 0.70, $p = 0.552$), supporting the substantive conclusions reported in Section 5.5 regardless of which test is preferred.

The expected frequency for each cell was calculated as:

$$E_{ij} = (R_i \times C_j) / N \quad (1)$$

The Yates-corrected chi-square statistic was then computed as:

$$\chi^2_Y = \sum [(|O_{ij} - E_{ij}| - 0.5)^2 / E_{ij}] \quad (2)$$

where $df = 1$; critical value $\chi^2(1, \alpha = 0.05) = 3.841$ (Yates, 1934).

4.5.2 Relative Risk

$$RR = [a / (a + b)] / [c / (c + d)] \quad (3)$$

$$95\% CI = \exp\{\ln(RR) \pm 1.96 \times \sqrt{[b/[a(a+b)] + d/[c(c+d)]]}\} \quad (4)$$

4.5.3 Odds Ratio

$$OR = (a \times d) / (b \times c) \quad (5)$$

$$95\% CI = \exp\{\ln(OR) \pm 1.96 \times \sqrt{(1/a + 1/b + 1/c + 1/d)}\} \quad (6)$$

4.5.4 Post-Hoc Power Analysis

A post hoc power analysis was conducted for HBsAg using Cohen's w , evaluated against the noncentral chi-square distribution at $\alpha = 0.05$ with $df = 1$.

4.6 Ethical Considerations

The screening programme is a mandatory component of student registration and is conducted in accordance with the Federal Ministry of Health guidelines. All individual records are stored in password-protected clinical files. Approval for secondary analysis and publication of the de-identified, aggregate 2024/2025 screening register was obtained from the Federal University Gusau, University Health Services Department. Because the analysis used only fully anonymised, aggregate counts derived from a routine, mandatory clinical screening programme, and no individual-level identifying information was accessed or disclosed by the research team, the ethics committee classified the study as exempt from individual informed consent for secondary use, consistent with institutional policy on de-identified aggregate health data. This paper reports aggregate data only; no individual identifying information is disclosed.

5.0 RESULTS

5.1 Cohort Profile

The 2024/2025 cohort comprised 1,707 students: 1,230 males (72.0%) and 477 females (28.0%). All participants were screened for HBsAg, HCV, and HIV; no missing outcome data were recorded. Figure 1 illustrates the gender composition of the cohort, confirming the 2.6:1 male-to-female ratio that is characteristic of Nigerian federal universities with strong STEM representation.

Cohort Gender Composition — 2024/2025 (N = 1,707)



Figure 1. Gender Composition of the 2024/2025 Screening Cohort (N = 1,707).

Note. Male students (n = 1,230) constitute 72.0% of the cohort; female students (n = 477) constitute 28.0%. The unequal composition creates asymmetric statistical power across gender subgroups.

5.2 HBsAg Results

Table 1 presents the HBsAg screening results by gender. Of the 1,230 male students screened, 105

(8.54%) tested positive, compared with 27 of 477 female students (5.66%), giving an overall cohort prevalence of 7.73%.

Table 1
HBsAg Screening Results by Gender — Federal University Gusau, 2024/2025

Gender	N Screened	Positive	Negative	Prevalence (%)
Male	1,230	105	1,125	8.54
Female	477	27	450	5.66
Total	1,707	132	1,575	7.73

Note. Prevalence = (positives/total) × 100.

5.3 HCV Results

Table 2 summarises the HCV screening findings. 15 of 1,230 male students (1.22%) were seropositive for HCV, compared with 4 of 477 female students

(0.84%), yielding a total cohort prevalence of 1.11%. The small absolute numbers of positive cases are relevant to the interpretation of inferential statistics presented in Table 4.

Table 2
HCV Screening Results by Gender — Federal University Gusau, 2024/2025

Gender	N Screened	Positive	Negative	Prevalence (%)
Male	1,230	15	1,215	1.22
Female	477	4	473	0.84
Total	1,707	19	1,688	1.11

Note. Prevalence = (positives/total) × 100.

5.4 HIV Results

Table 3 presents the HIV retroviral screening results. Nine of 1,230 male students (0.73%) were HIV-positive, compared with five of 477 female students (1.05%), producing an overall cohort prevalence of 0.82%. Notably, female prevalence marginally

exceeded male prevalence, a directional pattern discussed in Section 6.3. All 14 HIV-positive students were counselled and referred to accredited HIV treatment centres in line with the national HIV response framework (NACA, 2019).

Table 3
HIV Retroviral Screening Results by Gender — Federal University Gusau, 2024/2025

Gender	N Screened	Positive	Negative	Prevalence (%)
Male	1,230	9	1,221	0.73
Female	477	5	472	1.05
Total	1,707	14	1,693	0.82

Note. Prevalence = (positives/total) × 100. All 14 HIV-positive students were counselled and referred to accredited HIV treatment centres.

5.5 Inferential Statistics

Table 4 presents the chi-square test statistics, relative risk estimates, and odds ratios with their 95% confidence intervals for each of the three diseases. For HBsAg, the Yates-corrected chi-square approached but did not reach the conventional significance threshold ($\chi^2[1] = 3.59$, $p = 0.058$). The lower limits of the RR (1.00) and OR (1.01) confidence intervals lie at the null value, in line with the uncorrected chi-square ($\chi^2[1] = 3.99$, $p = 0.046$) and the exact test ($p = 0.055$); the

HBsAg result is therefore borderline and sensitive to the choice of test. Neither HCV nor HIV returned a significant chi-square, with both p-values well above 0.05. Because the minimum expected cell count for HIV (3.9) fell below the conventional threshold of five (Section 4.5.1), Fisher's exact test was computed for all three diseases as a robustness check; it produced materially identical conclusions (HBsAg: $p = 0.055$; HCV: $p = 0.614$; HIV: $p = 0.552$).

Table 4
Chi-Square Tests, Relative Risk, and Odds Ratio by Disease — 2024/2025 Cohort

Disease	Male Prev.	Female Prev.	χ^2 (Yates)	p	RR	95% CI (RR)	OR	95% CI (OR)
HBsAg	8.54%	5.66%	3.59	0.058	1.51	[1.00, 2.27]	1.56	[1.01, 2.41]
HCV	1.22%	0.84%	0.17	0.677	1.45	[0.49, 4.36]	1.46	[0.48, 4.42]
HIV	0.73%	1.05%	0.12	0.725	0.70	[0.24, 2.07]	0.70	[0.23, 2.09]

Note. χ^2 with Yates's (1934) continuity correction, $df = 1$. Critical value = 3.841. RR = male prevalence ÷ female prevalence. 95% CIs via the Woolf logit method (OR) and the Katz log method (RR) (Altman *et al.*, 1998). Two-tailed p-values reported.

Figure 2 presents the gender-specific seroprevalence rates for all three diseases, illustrating the pattern of higher male rates for HBsAg and HCV and a slightly higher female rate for HIV. The asterisk on the HBsAg bars denotes the borderline-significant result ($p =$

0.058). Figure 3 displays the relative risk estimates with 95% confidence intervals for each disease; the RR for HBsAg (1.51) has a lower confidence limit of 1.00, essentially at the null value, consistent with the borderline p-value.

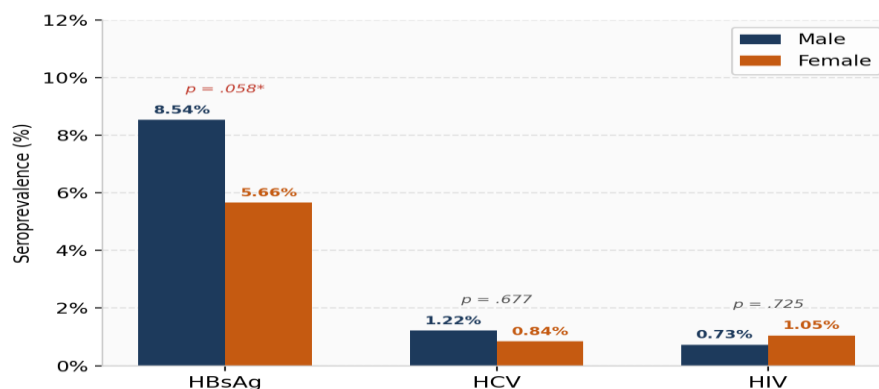


Figure 2. Gender-Specific Seroprevalence (%) for HBsAg, HCV, and HIV — Federal University Gusau, 2024/2025 (N = 1,707).

Note. Bars represent gender-specific prevalence rates. Significance annotations refer to Yates-corrected chi-square tests (Table 4). n.s. = not significant ($p > 0.05$). *Borderline significant ($p = 0.058$).

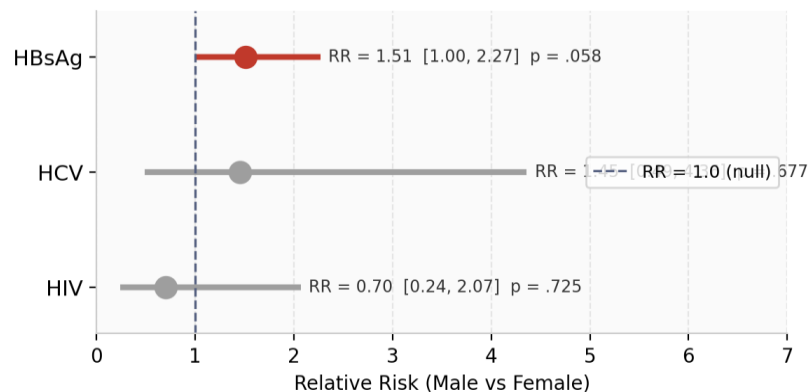


Figure 3. Relative Risk (Male vs Female) with 95% Confidence Intervals — HBsAg, HCV, and HIV.
Note. Horizontal lines represent 95% CIs (Altman et al., 1998). Dashed vertical line at RR = 1.0 represents equal risk.

5.6 Post-Hoc Power Analysis

Cohen's $w = 0.048$. At $\alpha = 0.05$, $df = 1$, $N = 1,707$, the observed power was approximately 0.51. Achieving 80% power for an effect size of this magnitude would require a cohort of approximately $N = 3,400$. The

borderline $p = 0.058$ is therefore compatible with limited statistical power rather than a true absence of effect, although post-hoc power is determined by the observed p -value and should be interpreted cautiously.

6.0 DISCUSSION

6.1 HBsAg: A Borderline-Significant Male Excess

The chi-square test for HBsAg yielded $p = 0.058$, with $RR = 1.51$ (95% CI [1.00, 2.27]), indicating that male students are approximately 51% more likely to be HBsAg-positive than female students. These findings are directionally consistent with reports of higher HBsAg positivity among male students in other Nigerian student cohorts (Ojerinde et al., 2023; Abraham et al., 2023; Garbati et al., 2024). The immunological effects of sex hormones reviewed by Ruggieri et al. (2018) provide a plausible, though untested, biological basis for the observed disparity. The observed (post-hoc) power was only 0.51, so the study may have been underpowered to detect an effect of this size; this should be interpreted cautiously because post-hoc power is a direct function of the observed p -value.

Targeting male students for HBV vaccination catch-up — particularly those born before 2004 who may not have received the birth-dose vaccine — represents a direct, evidence-based intervention. Globally, only an estimated 46% of infants received a timely HBV birth dose in 2022 (Polaris Observatory Collaborators, 2023), so incomplete early-life protection among older entrants is plausible.

6.2 HCV: Underpowered and Inconclusive

The HCV chi-square returned $p = 0.677$, with an extremely wide RR confidence interval [0.49, 4.36] reflecting only 19 total positive cases. Post-hoc power for the observed effect size ($w \approx 0.016$) is approximately 0.10. The finding should be

characterised as an inconclusive result from an underpowered test rather than evidence of gender equality in HCV risk (Jemilohun et al., 2014; Omolade & Adeyemi, 2018).

6.3 HIV: A Pattern Worthy of Monitoring

Female HIV prevalence (1.05%) marginally exceeded male prevalence (0.73%), though the difference was non-significant ($p = 0.725$) given only 14 positive cases. The pattern is compatible with the hypothesised role of age-disparate sexual partnerships in elevating female HIV risk, although cohort evidence for this mechanism is mixed (Harling et al., 2014) and with the predominance of females among HIV-positive students reported by Ojerinde et al. (2023) in south-western Nigeria. All 14 positive students were counselled and referred to HIV treatment centres, consistent with the national HIV response framework (NACA, 2019).

6.4 Policy Implications

The most direct policy implication concerns HBV. An institutional catch-up vaccination programme targeting unvaccinated male students warrants consideration, given the documented borderline excess risk, and follows the logic of vaccinating susceptible individuals identified through serological screening; no formal economic evaluation was conducted in the present study, so cost-effectiveness claims cannot be made on the basis of these data alone. For HCV and HIV, the priority is ensuring timely, confidential referral of all identified cases to appropriate treatment services (NACA, 2019).

6.5 Limitations



The cross-sectional design precludes causal inference. No information was collected on potential confounders — age, vaccination status, sexual history, or geographic origin. The 2.6:1 male-to-female ratio creates an asymmetric distribution of statistical power. The study was conducted at a single university, limiting the generalisability of these findings to students at other Nigerian universities, which may differ in regional origin, socioeconomic composition, and disciplinary mix. Future studies should enrol larger, more gender-balanced, multi-institutional cohorts and apply multivariate logistic regression to isolate the independent effect of gender.

7.0 CONCLUSION

To the best of our knowledge, this study provides the first formally reported inferential gender-comparative analysis of blood-borne infectious disease seroprevalence from Federal University Gusau. HBsAg prevalence is borderline significantly higher in male students (8.54% versus 5.66%; RR = 1.51; $p = 0.058$), directionally consistent with reports of male excess in other Nigerian student cohorts (Ojerinde et al., 2023; Abraham et al., 2023) and with the sex-hormone and immune mechanisms reviewed by Ruggieri et al. (2018). HCV and HIV do not show statistically significant gender differences; however, both tests are underpowered given the small number of positive cases. Female HIV prevalence marginally exceeded male prevalence, a direction consistent with the female predominance among HIV-positive students reported in south-western Nigeria (Ojerinde et al., 2023).

Key institutional responses include gender-targeted HBV vaccination catch-up for male students, gender-differentiated HIV risk counselling for female students (NACA, 2019), and investment in larger, adequately powered multi-cohort studies. Future research should extend this analytical framework to multi-institutional, gender-balanced cohorts across different Nigerian regions; incorporate behavioural, vaccination-history, and socioeconomic covariates through multivariate logistic regression to isolate the independent effect of gender; and, where feasible, conduct formal economic evaluations of targeted vaccination and counselling interventions before cost-effectiveness claims are made. The analytical framework demonstrated here provides a replicable template for any Nigerian university health services department.

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