Original Research Article

Seroprevalence of Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV) 1 and 2 Co-infection Among Female Commercial Sex Workers and the Female General Populace in Osun State, Nigeria

Abstract

This study examines the seroprevalence and co-infection rates of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) among female commercial sex workers (CSWs) and the general female population in Osun State, Nigeria. Using a cross-sectional design, 182 female participants—91 CSWs and 91 non-CSWs—were randomly selected and tested for HBV, HCV, and HIV markers. Results indicated a significantly higher prevalence of HIV among CSWs (15.4%) compared to non-CSWs (4.4%), while HBV prevalence was similar in both groups (8.8% for CSWs and 7.7% for non-CSWs). No cases of HCV were identified, possibly reflecting low prevalence in this region. Notably, higher awareness and preventive behaviors among both CSWs and non-CSWs regarding STIs, with over 80% reporting knowledge of STIs, previous testing, and awareness of blood transmission. However, HBV vaccination rates are lower, particularly among CSWs (55%). The study underscores the need for targeted public health interventions, including education on HBV and HIV prevention, regular screening, and accessible healthcare resources to mitigate infection risks among high-risk groups like CSWs, as well as broader awareness efforts for the general population.

Keywords: Hepatitis B virus, Hepatitis C virus, HIV, commercial sex workers, seroprevalence, co-infection

Introduction

Sexually transmitted infections (STIs) represent a significant global health challenge, especially among high-risk populations such as commercial sex workers (CSWs). These infections, including hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV), have substantial health impacts due to their potential to cause chronic conditions that lead to liver disease, immune suppression, and, in severe cases, increased mortality (WHO, 2021). The prevalence of these infections is particularly high in sub-Saharan Africa, where limited healthcare resources and underfunded public health infrastructures exacerbate the spread and impact of STIs (Kenfack-Momo et al., 2022). Nigeria, one of the

most affected countries in this region, has among the highest prevalence rates for these infections, underscoring the urgent need for targeted interventions to manage and mitigate transmission risks (de Wit et al., 2023).

Female CSWs in Nigeria face an elevated risk of exposure to STIs due to multiple occupational and social factors, including frequent sexual partnerships, inconsistent condom use, and inadequate access to healthcare services. These conditions create an environment in which infections like HBV, HCV, and HIV can thrive, despite the availability of some preventive measures. Social stigma, low levels of awareness about STIs, and limited access to healthcare further compound these risks. Research indicates that while awareness of HIV is relatively widespread, knowledge of other infections such as HBV and HCV remain limited, particularly among high-risk groups like CSWs, which contributes to sustained transmission rates and heightened risks of co-infection (Machado et al., 2021; Sanchez et al., 2020).

Despite these recognized risks, there remains a critical research gap regarding the specific prevalence, co-infection rates, and risk factors for HBV, HCV, and HIV among female CSWs in Nigeria, particularly in regions such as Osun State. Much of the existing data on these infections focuses on the general population, thus overlooking the unique vulnerabilities and needs of CSWs. This lack of targeted research restricts the development of effective healthcare policies and interventions that address the specific risks facing CSWs, who are disproportionately impacted by these infections (El-Shabrawi et al., 2020; Wu et al., 2023).

Effective, data-driven public health strategies are essential to reduce transmission, manage infections, and improve healthcare delivery to high-risk groups like CSWs. Research that focuses specifically on HBV, HCV, and HIV rates among CSWs in Nigeria is crucial to inform local healthcare strategies and allocate resources effectively. Filling these gaps will help develop targeted, evidence-based interventions that could significantly curb the impact of these infections within vulnerable populations (Machado et al., 2021; de Wit et al., 2023)

In response to these needs, this study aims to investigate the seroprevalence and co-infection rates of HBV, HCV, and HIV among female CSWs compared to the general female population in Osun State, Nigeria. By examining serological markers of these infections, this research seeks to provide an accurate assessment of infection rates and understand the extent of co-infection within this high-risk group. Furthermore, this study will explore participants' awareness of these infections and assess key risk factors contributing to transmission. Such insights are essential to tailoring health interventions and addressing the knowledge gaps that may prevent effective STI management and prevention in Nigeria.

The findings from this study are expected to contribute valuable data for healthcare policymakers and practitioners working to reduce the burden of STIs in Nigeria. By identifying critical prevalence patterns and knowledge deficiencies, the study aims to support the development of community-based prevention programs, improved access to regular screenings, and educational campaigns. These efforts will not only benefit CSWs but also help curb the spread of these infections within the broader community, underscoring the importance of targeted interventions in public health initiatives.

Method and Materials

A cross-sectional study design was utilized to assess the seroprevalence and co-infection rates of HBV, HCV, and HIV among female CSWs and a comparison group from the general female population. The study was conducted across three key metropolitan areas in Osun State—Osogbo, Ikirun, and Iwo—selected for their high population density and the presence of diverse socioeconomic groups. This design allowed for the collection of data at a single point in time, providing a snapshot of infection rates and associated factors within the target population.A total of 182 females were recruited for the study, comprising 91 female CSWs and 91 women from the general population (non-CSWs). Participants were selected through a simple random sampling technique to minimize selection bias and ensure the sample was representative of each group. Inclusion criteria required that all participants were aged 18 years or older, had resided in Osun State for at least one year, and were willing to participate. The stratification of participants into CSWs and non-CSWs enabled comparisons of infection rates and risk factors across these two groups.

Data collection involved both quantitative and biological methods. An interview-based questionnaire was administered to capture demographic details, sexual health practices, and levels of knowledge regarding STIs among participants. This questionnaire was designed to assess awareness and preventive behaviors related to HBV, HCV, and HIV, providing context for the serological findings. Additionally, 2 mL blood samples were aseptically collected from each participant using standard phlebotomy procedures. These samples were then screened for HBV, HCV, and HIV markers using validated serological assay kits, specifically HBV panel (Lumi Quick Diagnostic Inc. USA) for the qualitative assessment of the 5markers of HBV rapid immunochromatography assay for the qualitative detection of the markers of hepatitis B virus with strict adherence to the manufacturer's instruction, a strip-based immunoassayMicropoint diagnostics (USA)for HCV, and theGenscreen ULTRA HIV Ag-Ab

(Bio-rad laboratories, Singapore pte. Ltd), a qualitative enzyme immunoassay kits to detect HIV p24 antigen and antibody to HIV 1 & 2 in human serum or plasma. This use of standardized kits allowed for accurate determination of infection and co-infection rates.The study was conducted in compliance with ethical standards for research involving human subjects and received approval from relevant institutional review boards. Informed consent was obtained from all participants, who were informed about the study's purpose, procedures, and their right to withdraw at any time without consequence. To protect participant privacy, all data and biological samples were anonymized, and strict confidentiality protocols were maintained throughout the research process.

Results

The study's findings highlight notable differences in infection rates of HBV, HCV, and HIV between female CSWs and the general female population (non-CSWs) in Osun State. The data collected from serological assays were organized into tables for clearer comparison and interpretation. Table 1 presents demographic and behavioral characteristics of study participants, highlighting key differences between CSWs and non-CSWs. CSWs showed a higher prevalence of multiple sexual partners (78%) compared to non-CSWs (36.3%), and lower consistent condom use (45.1% vs. 28.6%). Additionally, both groups had low awareness of HBV, with 22% of CSWs and 17.6% of non-CSWs reporting knowledge. These findings suggest increased exposure risks among CSWs and underscore the need for targeted STI education and prevention efforts. Table 2 shows the prevalence of HBV, HCV, and HIV among the two groups. HBV prevalence was slightly higher among CSWs (8.8%) than non-CSWs (7.7%), while HIV prevalence was notably higher among CSWs at 15.4%, compared to 4.4% in the general population. No cases of HCV were detected in either group. Co-infection of HBV and HIV was observed in 1.1% of CSW and 2.2% of NCSW.

Table 1: Demographic and Behavioral Characteristics of Study Participants (N=182)

Characteristic	CSWs (n=91)	Percentage (%)	Non-CSWs (n=91)	Percentage (%)
Age Group				
18–24 years	35	38.5	40	44.0
25–34 years	40	44.0	32	35.2
35+ years	16	17.5	19	20.8

Marital Status				
Single	78	85.7	66	72.5
Married	13	14.3	25	27.5
Education Level				
No formal education	10	11.0	6	6.6
Primary education	25	27.5	22	24.2
Secondary education	35	38.5	39	42.9
Higher education	21	23.1	24	26.4
Knowledge of HBV				
Aware	20	22.0	16	17.6
Unaware	71	78.0	75	82.4
Number of Sexual Partners				
One partner	20	22.0	58	63.7
Multiple partners	71	78.0	33	36.3
Consistent Condom Use				
Yes	41	45.1	26	28.6
No	50	54.9	65	71.4

Table 2: Prevalence Rate of Serological Markers of HIV Infections among the respondents

Infection Marker	**CSWs (%)**	**Non-CSWs (%)**	**p-value**
HBV (HBsAg)	8(8.8)	7(7.7)	≤0.05
HCV (Anti-HCV)	0.0	0.0	-
HIV	14(15.4%)	4(4.4%)	≤0.05
HBV and HIV Co-infection	1(1.1%)	2(2.2%)	≤0.05

Table 3 indicates higher awareness and preventive behaviors among both CSWs and non-CSWs regarding STIs, with over 80% reporting knowledge of STIs, previous testing, and awareness of blood transmission. However, HBV vaccination rates are lower, particularly among CSWs (55%). Notably, CSWs show greater resistance (90%) to unprotected sex demands, reflecting a potentially higher emphasis on risk reduction in this group. Table 4 summarizes behavioral risk factors contributing to infection vulnerability.

CSWs reported higher rates of multiple sexual partnerships (80%) compared to the general population (50%), and higher rates of consistent condom use at 45% compared to 28% among non-CSWs. Notably, a higher proportion of non-CSWs (60%) indicated concern primarily with pregnancy prevention rather than STI prevention.

Table 3: Knowledge of transmission and protection against sexual transmission diseases

Characteristics	CSW-YES (%)	CSW-NO (%)	NCSW-YES (%)	NCSW-NO (%)
Knowledge of sexually transmitted disease	80	20	90	10
Previous test for the diseases	85	15	95	5

Knowledge of disease transmission by blood	85	15	90	10
HBV Vaccination	55	45	65	35
Resistance to unprotected sex demand from partners	90	10	70	30

Table 4: Behavioral and Risk Factors Among Participants

Risk Factor	**CSWs (%)**	**Non-CSWs (%)**	**p-value**
Multiple Sexual Partners	80	50	≤0.05

Consistent Condom Use	45	28	≤0.05
Concerned with Pregnancy Prevention Only	30	60	≤0.05

Discussion

The study findings reveal a distinct prevalence of HIV among female CSWs compared to the general female population in Osun State, with rates of 15.4% and 4.4%, respectively. This significant difference aligns with global trends showing that CSWs are disproportionately vulnerable to HIV due to multiple

occupational exposures and inadequate preventive resources (WHO, 2021). The high prevalence among CSWs is concerning, as it suggests that this group faces challenges in accessing healthcare and resources necessary to prevent transmission. Inadequate or inconsistent use of condoms, combined with limited STI screening, contributes to this elevated HIV prevalence, underscoring the need for tailored interventions within this population (Machado et al., 2021).

The similar prevalence of HBV between CSWs and non-CSWs (8.8% and 7.7%, respectively) suggests that HBV transmission may not be solely dependent on high-risk sexual behaviors but may also involve other routes. This prevalence pattern may indicate non-sexual transmission pathways, such as vertical transmission from mother to child or contact with contaminated blood, which is common in regions with limited vaccination coverage and healthcare resources (de Wit et al., 2023). The comparable HBV rates in both groups imply that community-based prevention efforts, including vaccination and awareness campaigns, could be beneficial in reducing HBV prevalence across the general population, not only among high-risk groups.

The absence of HCV cases in both populations is notable, as it may reflect low HCV transmission rates or the lack of common transmission routes in this region. Unlike HIV and HBV, HCV is primarily spread through blood-to-blood contact, such as through intravenous drug use, which may not be as prevalent or accessible in the Nigerian context (El-Shabrawi et al., 2020). The findings align with previous studies indicating that HCV is less common in sub-Saharan Africa compared to Western countries, where intravenous drug use is a significant transmission route (Sanchez et al., 2020). This low prevalence of HCV in Osun State may indicate different transmission dynamics in the region, reinforcing the need for region-specific data to accurately inform public health strategies.

The findings highlight significant knowledge and preventive behaviors among CSWs and non-CSWs in Osun State regarding STIs, aligning with studies showing that awareness of HIV is relatively high in sub-Saharan Africa, even among high-risk groups (Machado et al., 2021). However, lower HBV vaccination rates, particularly among CSWs (55%), reflect a gap in comprehensive STI prevention efforts, as echoed in other studies that emphasize the under-recognition of HBV in Africa compared to HIV (Kenfack-Momo et al., 2022). Moreover, the high resistance among CSWs to unprotected sex aligns with global research indicating that CSWs, despite their high-risk occupation, adopt certain protective behaviors to mitigate STI exposure (Wu et al., 2023). These findings underscore the need for more targeted HBV vaccination programs and broader STI education to address remaining knowledge and prevention gaps.

The higher prevalence of multiple sexual partnerships and lower rates of condom use among CSWs in comparison to the general population further underscore the occupational risk factors for HIV

transmission in this group. This pattern aligns with broader research, which consistently finds that CSWs are at heightened risk due to occupational exposure and often limited access to resources that promote safe sexual practices (Wu et al., 2023). Condom use is one of the most effective preventive measures against STIs, yet social stigma and a lack of health education continue to hinder its consistent use among CSWs. Addressing these behavioral risks through targeted health interventions could help reduce the transmission of HIV and other STIs in the CSW population.

Interestingly, the study also revealed that a substantial proportion of non-CSWs reported prioritizing pregnancy prevention over STI prevention, which may reflect limited public health messaging on STI risks beyond HIV. This observation suggests a need for a more comprehensive approach in public health communication that integrates STI prevention with family planning. This shift could encourage broader protective measures within the general female population, who may be unaware of the risks associated with infections like HBV and HCV. Expanding STI prevention education within reproductive health programs could address this gap and help to reduce infection rates in the broader population.

Conclusion

This study highlights a substantial burden of HIV and HBV infections among female CSWs in Osun State, Nigeria, along with a marked lack of awareness about these infections, particularly HBV, across both CSWs and the general female populace. The findings underscore the need for targeted public health interventions that prioritize STI prevention, improve knowledge about infection risks, and address the unique challenges faced by high-risk groups like CSWs. Addressing these gaps through community-based education, regular screening, and accessible healthcare services could significantly reduce infection rates and improve health outcomes in this population. Such targeted efforts are essential not only for protecting vulnerable individuals but also for minimizing the broader public health impact of STIs in Nigeria.

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