



Prevalence and Molecular Detection of Hepatitis C Virus Infection among Inmates in Jos Correctional Centre, Plateau State, Nigeria


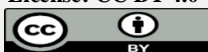
Ocheme J. Okojokwu^{1,2*}, Jennifer M. Nyigba¹ and Joseph A. Anejo-Okopi³

¹Department of Microbiology, Faculty of Natural Sciences, University of Jos, Jos-Nigeria.

²Department of Biological Sciences, Faculty of Science & Computing, Karl Kumm University, Vom, Plateau State, Nigeria.

³Department of Microbiology, Faculty of Science, Federal University of Health Sciences, Otukpo, Benue State, Nigeria

*Corresponding author email: okojokwu@gmail.com; okojokwu@unijos.edu.ng; Tel.: +234(0)8065874666

Abstract	Article History
<p>Background: Hepatitis C virus (HCV) poses a significant global health burden, with prevalence in correctional facilities far exceeding that of the general population. Data on HCV in Nigerian prisons are scarce, hindering public health planning. Objective: This study aimed to determine the seroprevalence, active infection rate, and risk factors for HCV among inmates in Jos Correctional Centre, Nigeria. Methods: In a cross-sectional study, 184 inmates were randomly selected. Serum samples were tested for anti-HCV antibodies using a rapid diagnostic test. Active infection was confirmed through HCV RNA detection by real-time PCR. Associations with demographic and behavioural factors were analysed using chi-square and logistic regression. Results: The overall seroprevalence was 12.0% (22/184); while the active infection rate was 8.2% (15/184). Active infection was significantly higher in males (8.4%) than females (5.9%) ($p = 0.045$). In multivariate analysis, being divorced or widowed was the strongest independent predictor of active infection (Adjusted Odds Ratio = 7.51, 95% CI: 1.09-51.82, $p = 0.041$). Trends of increased odds were observed for informal employment and needle sharing, though these were not statistically significant. Traditional risk factors like injection drug use and sexual behaviours showed no significant association. Conclusion: We found a moderate but significant burden of active HCV infection in this Nigerian prison, driven more by sociodemographic factors like marital status than traditional risk behaviours. These findings advocate for targeted screening, treatment, and health education within correctional facilities as a key strategy for HCV micro-elimination in Nigeria.</p> <p>Keywords: Hepatitis C Virus, Prevalence, Molecular detection, Correctional Centre, Nigeria, Inmates, Risk factors</p>	<p>Received: 15 Oct 2025 Accepted: 04 Nov 2025 Published: 07 Nov 2025</p>  <p>Scan QR code to view*</p> <p>License: CC BY 4.0*</p>  <p>Open Access article.</p>
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Introduction

Hepatitis C virus (HCV) remains a major global public health challenge, with an estimated 58 million people living with chronic infection and over 290,000 deaths annually from related liver complications (World Health Organization [WHO], 2024). The virus is primarily transmitted through exposure to infected blood, most commonly through unsafe injection practices, un-screened blood transfusions, and, less frequently, sexual contact (Polaris Observatory HCV Collaborators, 2017).

Correctional facilities are recognised as high-risk environments for the transmission of blood-borne viruses. Overcrowding, a high prevalence of substance use, limited access to harm reduction services, and often inadequate healthcare create conditions where infections like HCV can

thrive (Akiyama *et al.*, 2021; Dolan *et al.*, 2016). Globally, HCV prevalence among prison populations is dramatically higher than in the general community, with reported rates ranging from 10% to 50% (Larney *et al.*, 2013). In Nigeria, the general population HCV prevalence is estimated at 2.1% (Adekanmbi *et al.*, 2022), but data on the incarcerated population are critically limited. This is a significant gap, given Nigeria's large prison population and the presence of unique socio-cultural risk factors, such as the sharing of sharp objects for tattooing or traditional scarification (Akiyama *et al.*, 2021).

The high prevalence of HCV in prisons has implications that extend beyond the prison walls, contributing to ongoing community transmission upon inmate release and undermining global elimination efforts (Stone *et al.*, 2021). The World

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Health Organization has set ambitious targets to eliminate viral hepatitis as a public health threat by 2030 (WHO, 2024). However, recent analyses indicate that most countries are not on track, with key populations like prisoners often overlooked in national strategies (Hajarizadeh *et al.*, 2022). In Nigeria, this challenge is compounded by a lack of routine screening and limited capacity for molecular confirmation of active infection, which is essential for prioritising treatment with direct-acting antivirals (Grebely & Dore, 2011; Lazarus *et al.*, 2023).

Investigating HCV in Nigerian correctional facilities is therefore a public health imperative. Prisons represent strategic venues for "micro-elimination"-focused, intensive interventions in high-prevalence settings that can significantly impact the overall epidemic (Lazarus *et al.*, 2023). The Jos Correctional Centre, serving a diverse inmate population in Nigeria's Middle Belt region, provides an ideal setting to generate this crucial local evidence. This study aimed to determine the seroprevalence and active infection rate of HCV among inmates in Jos using both serological and molecular techniques, and to identify the key demographic and behavioural factors associated with infection to inform effective, targeted public health interventions.

Materials and Methods

Study Area

This study was conducted in Jos, Plateau State, Nigeria. Jos, the capital of Plateau State, is situated in the Middle Belt region of Nigeria at approximately 9°56'N 8°53'E and an altitude of 1,217 m, giving it a cooler climate relative to much of Nigeria. The city has an estimated population exceeding 900,000, while the broader Plateau State has about 3.5 million inhabitants. Jos is historically known for its tin mining industry, diverse cultural composition, and agricultural productivity, and is served by multiple correctional facilities managed by the Nigerian Correctional Service (NCOS). The study specifically took place at the Jos Correctional Centre.

Study Design and Population

A cross-sectional survey design was employed. Participants comprised consenting male and female inmates aged 18 years and older, serving jail terms at the Jos Correctional Centre. Inmates who withdrew consent were excluded.

Sample Size Determination

The sample size was calculated using the formula for prevalence studies (Naing *et al.*, 2022): with an assumed HCV prevalence of 10.1% (Alvarez *et al.*, 2014); a 95% confidence level, and a 5% margin of error. This yielded a minimum sample size of 140. Ultimately, 184 inmates were randomly selected from 517 eligible individuals who provided informed consent.

Ethical Considerations

Ethical approvals were secured from the Nigerian Correctional Service, Plateau State Command, and the Jos University Teaching Hospital Health Research Ethics Committee with reference number JUTH/DCS/IREC/12/XXXI/396. All

participants provided written informed consent, with strict assurances of confidentiality and anonymity.

Data Collection

A structured questionnaire was administered by trained research assistants to collect socio-demographic and behavioural data. For literate inmates, questionnaires were self-completed, while illiterate participants received assistance limited to clarification of questions. Identifiers were minimised by using unique serial numbers to link questionnaires and laboratory results.

Sample Collection and Processing

Approximately 5 mL of venous blood was collected aseptically from each participant into plain serum tubes following WHO guidelines (WHO, 2010; Oladeinde *et al.*, 2017). The blood was allowed to clot at room temperature and then centrifuged at 1,000 rpm for 5 minutes to separate the serum, which was stored at -20°C at the Plateau State Human Virology Research Centre (PLASVIREC) until analysis.

Serological Testing for Anti-HCV Antibodies

Serological screening for anti-HCV antibodies was performed using the Aria HCV Ab plus combo rapid diagnostic test (RDT); a qualitative immunochromatographic assay detecting IgG, IgM, and IgA antibodies. Tests were conducted at room temperature. A 50 µL serum sample was added to the test cassette, followed by one drop of buffer. Results were read within 15–20 minutes. The appearance of colored lines at both the test (T) and control (C) regions indicated a positive result; a line only at the C region indicated a negative result. Tests lacking a C line were deemed invalid and repeated.

Nucleic Acid Extraction and Real-Time PCR

Viral RNA was extracted using the Zymo Quick DNA/RNA Viral kit. The procedure involved incubating samples with internal controls and Proteinase K, followed by binding, washing, and elution steps. Extracted nucleic acids were stored at -20°C.

Detection and quantification of HCV RNA were performed using the Bosphore HCV Quantification Kit (Anatolia Geneworks, Turkey) on a Biorad CFX96 real-time PCR platform. Each 40 µL reaction contained 24 µL PCR master mix and 16 µL of sample or controls. The amplification protocol included reverse transcription at 50°C for 30 min, initial denaturation at 95°C for 14 min 30 s, followed by 45 cycles of denaturation at 97°C for 30 s, annealing at 55°C for 1 min 20 s (with data collection): and extension at 72°C for 15 s. Positive samples were defined by the detection of an amplification signal in the FAM channel. Absence of signals in both FAM and HEX channels indicated an invalid run, necessitating repeat testing.

Statistical Analysis

Data were analysed using IBM SPSS Statistics for Windows, Version 25.0. Descriptive statistics were used to summarise the data. The Chi-square test was employed to assess associations between HCV infection (both seroprevalence and active infection) and various demographic and risk factors. Logistic regression analysis was used to calculate crude and

adjusted odds ratios (OR) with 95% confidence intervals (CI) to identify independent predictors of active HCV infection. A *p*-value of less than 0.05 was considered statistically significant.

Results

A total of 184 inmates participated in the study, with a male predominance (167, 90.8%) reflecting the general gender distribution in the prison population. The overall seroprevalence (evidence of past or present infection) was 12.0% (22/184). The prevalence of active, confirmed viraemic infection was 8.2% (15/184). The detailed breakdown by demographic characteristics is presented in Table 1.

Notably, while the 30-39 age group had the highest seroprevalence (16.1%): the highest rate of active infection was found in inmates aged 40 years and above (12.2%). A significant gender disparity was observed for active infection, with males having a higher rate (8.4%) compared to females (5.9%) ($\chi^2 = 4.006$, $p = 0.045$). Marital status also showed a significant association with active infection ($\chi^2 = 7.904$, $p = 0.048$): with strikingly high rates among widowed (50.0%) and divorced (16.7%) inmates. Educational level and occupation did not show statistically significant associations with active infection in the bivariate analysis.

Table 1: Seroprevalence of HCV and active HCV infection among Correctional Centre inmates in Jos

	Total	Anti-HCV Positive (%)	HCV RNA Positive (%)
Overall	184	22 (12.0)	15 (8.2)
Age			
<20 Years	7	1(14.3)	0(0.0)
20-29 Years	72	8(11.1)	4(5.6)
30-39 Years	56	9(16.1)	5(8.9)
40 Years and above	49	4(8.2)	6(12.2)
χ^2		1.655	2.411
<i>p</i> -value		0.647	0.492
Gender			
Female	17	1(5.9)	1(5.9)
Male	167	21(12.6)	14(8.4)
χ^2		0.656	4.006
<i>p</i> -value		0.418	0.045*
Marital Status			
Divorced	6	1(16.7)	1(16.7)
Married	83	12(14.5)	9(10.8)
Single	93	9(9.7)	4(4.3)
Widowed	2	0(0.0)	1(50.0)
χ^2		1.350	7.904
<i>p</i> -value		0.717	0.048*
Educational Level			
No Formal Education	16	2(12.5)	3(18.8)
Primary	43	10(23.3)	3(7.0)
Secondary	97	9(9.3)	7(7.7)
Tertiary	28	1(3.6)	2(7.1)
χ^2		7.751	2.631
<i>p</i> -value		0.051	0.452
Occupation			
Formal Employment	24	1(4.2)	2(8.3)
Informal Employment	73	10(13.7)	7(9.6)
No Response	1	0(0.0)	1(100.0)
Unemployed	86	11(12.8)	5(5.8)
χ^2		1.787	1.787
<i>p</i> -value		0.618	0.618

* denotes statistical significance at $p \leq 0.05$

Behavioural and Exposure Risk Factors

A wide range of risk factors were investigated, as detailed in Table 2. Contrary to expectations, most traditional risk factors were not significantly associated with active HCV infection in this population. Variables including sexual debut, condom use, and the number of lifetime sexual partners showed no significant associations (all $p > 0.05$). A history of injection drug use (IDU)

was reported by 13.6% (25/184) of inmates but was not significantly associated with active infection ($p = 0.612$). However, those who reported sharing needles had a higher rate of active infection (12.8%) compared to those who did not (6.6%) ($p = 0.180$). Other potential bloodborne exposures, including history of blood transfusion, tattoos, or surgery, also showed no significant associations.

Table 2: Risk factors associated with HCV infection among the inmates in Jos

	Total	No. Positive (%)	χ^2	p-value
Sex Debut				
No	2	0(0.0)	0.179	0.672
Yes	182	15(8.2)		
Age and Sex Debut				
<20 Years	95	6(6.3)	0.467	0.926
20-29 Years	75	7(9.3)		
30-39 Years	2	0(0.0)		
Times of sex				
<5 Times	23	0(0.0)	1.465	0.833
5-9 Times	17	1(5.9)		
10-14 Times	4	0(0.0)		
15 Times and above	132	13(9.8)		
Sex with Condom				
No	102	9(8.8)	0.210	0.900
Yes	81	6(7.4)		
Sex Partners in the past 3 Months				
<5 Times	13	1(7.7)	5.215	0.266
5-9 Times	3	0(00.0)		
10-14 Times	2	1(50.0)		
None	158	12(7.6)		
Sex Partners in the past 1 Year				
<5 Times	36	4(11.1)	1.754	0.781
5-9 Times	3	0(0.0)		
10-14 Times	21	1(4.8)		
None	116	10(8.6)		
Sex Partners in Life Time				
<5 Times	49	5(10.2)	4.006	0.405
5-9 Times	21	0(0.0)		
10-14 Times	99	10(10.1)		
None	3	0(0.0)		
Sex Partner Relationship				
Casual Partner	15	0(0.0)	11.735	0.068
Friend	74	3(4.1)		
Husband/Wife	71	10(14.1)		
Multiple Partners	13	0(0.0)		
No Partner	1	0(0.0)		
Sex Worker				
IDU				
No	156	14(9.0)	0.983	0.612
Yes	25	1(4.0)		
Share needle with Friends?				
No	137	9(6.6)	1.795	0.180
Yes	47	6(12.8)		
Age of IDU				
Adult Age	7	1(14.3)	2.028	0.731
Teen Age	8	0(0.0)		
Young Age	6	0(0.0)		
None	127	10(7.9)		
Number of Times of IDU				
<5 Times	8	1(12.5)	1.959	0.743
5-9 Times	1	0(0.0)		
10-14 Times	13	0(0.0)		
None	127	10(7.9)		
Needle in Public Place				
No	170	14(8.2)	0.094	0.954
Yes	13	1(7.7)		
Blood Transfusion				
No	153	11(7.2)	1.354	0.508
Yes	30	4(13.3)		
Sharps objects with friends				
No	129	13(10.1)	2.234	0.327
Yes	50	2(4.0)		

Table 2 (Cont'd)

Tribal Marks				
No	113	11(8.3)	2.516	0.294
Yes	47	4(8.5)		
Tattoo				
No	137	14(10.2)	3.066	0.216
Yes	46	1(2.2)		
Surgery				
No	153	13(8.5)	0.329	0.848
Yes	28	2(7.1)		
HCV Family				
No	163	13(8.0)	0.855	0.652
Yes	16	2(12.5)		
Tooth Brush with someone				
No	178	14(7.9)	1.045	0.593
Yes	5	1(20.0)		

* denotes statistical significance at $p \leq 0.05$

To quantify the strength and independence of these associations, a logistic regression analysis was performed (Table 3). After adjusting for potential confounders (age, gender, education, occupation, needle sharing, and family history): marital status emerged as the only statistically significant independent predictor. Inmates who were divorced or widowed had over seven-fold higher odds of active HCV infection compared to

single inmates (Adjusted OR = 7.51, 95% CI: 1.09 - 51.82, $p = 0.041$). While not statistically significant, trends of increased odds were observed for inmates engaged in informal employment (Adjusted OR = 1.92, $p = 0.285$) and those with a history of needle sharing (Adjusted OR = 2.22, $p = 0.188$).

Table 3: Crude and Adjusted Odds Ratios for Factors Associated with Active HCV Infection

Factor	Crude OR (95% CI)	p-value	Crude OR (95% CI)	p-value
Age group (year)				
< 30	Ref		Ref	
30–39	1.65 (0.42–6.49)	0.473	1.41 (0.32–6.16)	0.645
≥ 40	2.50 (0.68–9.21)	0.169	2.05 (0.49–8.55)	0.326
Sex				
Female	Ref		Ref	
Male	1.46 (0.18–11.97)	0.725	1.21 (0.13–11.52)	0.867
Marital status				
Single	Ref		Ref	
Married	2.72 (0.80–9.26)	0.110	2.45 (0.67–8.93)	0.173
Divorced/Widowed	6.88 (1.12–42.18)	0.037*	7.51 (1.09–51.82)	0.041*
Education				
Tertiary/Secondary	Ref		Ref	
Primary/None	1.21 (0.41–3.57)	0.732	1.05 (0.32–3.44)	0.937
Sharing Needle				
No	Ref		Ref	
Yes	2.08 (0.70–6.19)	0.187	2.22 (0.68–7.24)	0.188
Family History of HCV				
No	Ref		Ref	
Yes	1.63 (0.33–8.06)	0.547	1.58 (0.29–8.68)	0.601

* denotes statistical significance at $p \leq 0.05$

Discussion

This study provides a critical assessment of the HCV burden within a Nigerian correctional facility, revealing a seroprevalence of 12.0% and a confirmed active infection rate of 8.1%. These figures place the Jos Correctional Centre at a moderate level of HCV prevalence compared to the wide global range reported in prisons (Larney *et al.*, 2013). The rate is, however, substantially higher than Nigeria's general

population estimate of 2.1% (Adekanmbi *et al.*, 2022): firmly underscoring prisons as high-priority venues for public health intervention and aligning with the concept of these settings being hotspots for transmission (Dolan *et al.*, 2016).

The distinction between seroprevalence (indicating exposure) and active infection (requiring treatment) is a key strength of our study. The 4% gap between the two measures represents

individuals who have successfully cleared the virus. This aligns with the current global focus on using molecular testing to accurately identify the viraemic population, thereby ensuring that scarce resources like direct-acting antivirals (DAAs) are allocated to those who will benefit most, a crucial step towards elimination (Grebely & Dore, 2011; WHO, 2024).

The most robust finding from our analysis was the significant independent association between marital status and active infection. Logistic regression confirmed that inmates who were divorced or widowed had over seven-fold higher odds (AOR = 7.51) of active HCV infection compared to their single counterparts, even after controlling for other factors. This profound vulnerability may point to complex socio-behavioural dynamics. It could reflect intra-household transmission from an infected partner prior to incarceration, a hypothesis supported by the elevated prevalence in the 'husband/wife' partner category. Alternatively, it may be a marker for broader psychosocial distress, economic instability, or engagement in high-risk behaviours that are not fully captured by traditional risk factor questionnaires (Trickey *et al.*, 2019; Omland *et al.*, 2013). This finding underscores the need for risk assessments in correctional facilities to include social and marital histories.

The lack of significant association with classic risk factors like IDU is instructive and reflects Nigeria's unique epidemiological context, where injection drug use is a less common transmission route than in Western prisons (Nelson *et al.*, 2011). However, the elevated, though not significant, odds associated with needle sharing (AOR = 2.22) and informal employment (AOR = 1.92) are notable trends. This suggests that risk may be rooted in informal practices such as unregulated tattooing, sharing of razors, or other non-sterile personal grooming activities that are common in overcrowded settings (Kinner *et al.*, 2019; Akiyama *et al.*, 2021). These factors may have a meaningful impact that a larger study could detect. This aligns with a growing recognition that HCV transmission pathways can be highly localised and context-specific (Lazarus *et al.*, 2023).

Our findings have clear and actionable implications. The confirmed burden of active infection confirms that micro-elimination of HCV in Nigerian prisons is a feasible and critical goal. As demonstrated by successful models like the JAILFREE-C Project, which utilised telemedicine to achieve high treatment uptake, well-structured interventions in prisons can yield dramatic results (Akiyama *et al.*, 2021). We recommend the implementation of routine, opt-out HCV screening upon entry into correctional facilities, with a focus on high-yield groups such as older inmates, those who are divorced or widowed, and those with a history of informal employment or needle sharing. Confirmation with PCR is essential to guide treatment. Coupled with this, comprehensive health education programmes that address local transmission risks, such as the dangers of sharing personal items, are urgently needed.

Conclusion

This study reveals a significant burden of active HCV infection among inmates at the Jos Correctional Centre. Using molecular and statistical methods, we identified that being divorced or widowed is a strong, independent predictor of infection, moving beyond traditional risk factor paradigms. The findings highlight the need for context-specific interventions within Nigerian prisons. By implementing targeted screening, confirmatory molecular testing, and treatment within a micro-elimination framework, Nigerian correctional services can make a substantial contribution to the well-being of a vulnerable population and to the national and global goal of eliminating viral hepatitis by 2030.

Conflict of Interests

No conflict of interest

Funding

No funding was received for this study

Ethical Approval

Ethical approval was sought and obtained from the ethical committee of the Jos University Teaching Hospital (JUTH) under the reference number JUTH/DCS/IREC/127/XXXI/396

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