# Seroprevalence of acute hepatitis C virus infection among mortuary workers and ambulance drivers in Plateau State, Nigeria

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Nigeria is one of the countries highly endemic for viral hepatitis. However, data on the prevalence of hepatitis C virus (HCV) infection among mortuary workers and ambulance drivers has not been documented. Hence, this study sought to determine the seroprevalence of HCV among mortuary workers and ambulance drivers in Plateau State, North Central Nigeria. Between December 2015 and February 2016, a total of 80 blood samples were collected from mortuary workers and ambulance drivers with the view to test for HCV antibody using rapid immunochromatographic test (ICT) and enzyme-linked immunosorbent assay for anti-HCV immunoglobulin M. Three milliliter of blood was collected from each patient and the serum was separated out and used for the screening. A self-administered questionnaire was used to access the patients' sociodemographic variables. Of the 80 samples analyzed, five (6.3%) were positive for HCV using the rapid immunochromatographic assay, while two (2.5%) were positive for anti-HCV immunoglobulin M. There was no statistical association between seroprevalence of HCV with age and sex of patients. However, the seroprevalence of HCV was significantly associated with contact with blood, number of sexual partners, use of gloves, and history of sexually transmitted infections ($P<0.05$). The HCV seroprevalence of 2.5% among mortuary workers and ambulance drivers was relatively low; however, this suggests that the patients are at-risk group for occupational infection due to HCV.

**Keywords:**
hepatitis C, mortuary staff, risk factors, serosurvey

## Introduction

Viral hepatitis is a common infection with variable courses that leads to chronic hepatitis, cirrhosis, and hepatocellular carcinoma (HCC) [1]. Hepatitis C virus (HCV) is one of the six viruses (A, B, C, D, and E), and together account for majority of the cases of viral hepatitis [2].

HCV is a spherical, enveloped, single-stranded hepatotropic RNA virus that belongs to the Flaviviridae family [3]. It was first established in 1975 that the majority of transfusion-associated hepatitis cases were caused by neither hepatitis A virus nor hepatitis B virus (i.e. the only known human hepatitis viruses at that time). The new disease was therefore called non-A, non-B hepatitis (NANBH) and the presumed etiological agent was called NANBH virus. HCV was discovered in 1989 (by some key contributors; Harvey Alter and Daniel Bradley) as the agent responsible for most of the transfusion-associated NANBH [4].

HCV causes both acute and chronic forms of hepatitis. After the initial infection, ~80% of people do not exhibit any symptom [5]. Approximately 75–85% of the newly infected individuals will progress to chronic disease [6]. Approximately 20% of the infected individuals will develop fibrosis and cirrhosis; of these, ~20% will progress to HCC. In 25% of all liver cancer patients, the underlying cause is HCV. It is a viral pandemic agent and a leading cause of chronic liver disease. [7]. The disease is one of the important causes of cirrhosis and HCC and has a tremendous impact on public health worldwide. The severity of the infections ranges from a mild illness lasting a few weeks to a serious lifelong illness. The infection caused by the virus (HCV) is usually asymptomatic, and is only very rarely associated with life-threatening diseases [8].

The most common mode of HCV transmission is through contact with blood, exposure to infectious blood which usually occur through receiving contaminated blood, blood product transfusions and organ transplants, injection given with contaminated

syringes and needles, needle-stick injuries in healthcare settings, intravenous injection drug of abuse, and being born to an HCV infected mother [9].

Mortuary workers and ambulance drivers are at risk of HCV due to their involvement with corpse or death bodies which may pose infectious disease hazards. The postmortem room is a source of potential hazard and risk to workers handling the body after necropsy. Nigeria is one of the countries highly endemic for viral hepatitis. However, data on the prevalence of HCV infection among mortuary workers and ambulance drivers has not been documented. Hence, this study sought to determine the seroprevalence of HCV among mortuary workers and ambulance drivers in Plateau State, North Central Nigeria.

## Materials and methods
### Study design
This cross-sectional prospective study was carried out from December 2015 to February 2016 in mortuaries within the Plateau State, North Central Nigeria.

### Study area/location
Plateau State which is the home of peace and tourism is the 12th largest state in Nigeria (2006 population census result) with a population of 3 178 712 people. It has an area of 30 913 km², with 17 local government council areas. It is bounded by Bauchi State in the; north, Nasarawa State in the south, Kaduna State in the northwest, and Taraba State in the southeast. It is situated along latitude 80° 24N, longitude 80° 32, and 100° 32E of the equator. Its average temperature is in the range 19–22°C and the annual rainfall is about 146 cm (57 inch). The altitude ranges from around 1200 m (about 4000 feet) to a peak of 1829 m above sea level.

### Study participants
A total of 80 samples were collected from mortuary workers and ambulance drivers between the age of 19 and 50 years in the three regions (North, South, and Central) of the Plateau State. Mortuary workers in this study include porters, attendants, and others working in mortuary, but excluding doctors (pathologists). These patients were sourced from Jos University Teaching Hospital in Jos, MRS Hospital in Bassa Local Government, Air-Force Base Hospital in Jos, Plateau State Hospital in Jos, Our Lady of Apostle Hospital in Jos, and Mangu General Hospital in Mangu Local Government in Plateau State.

### Specimen collection, processing, and storage
A sample of 3 ml of blood was collected from each participant using the standard venipuncture procedure. The blood was carefully and gently dispensed into sterile, plain, sample containers. The tubes were labeled appropriately with the participants' identification numbers. Sera from these blood samples were separated by allowing the blood to clot at room temperature before centrifuging at 2500 rpm for 10 min. Thereafter, the retracted sera were dispensed into serum aliquot containers and stored at –10°C pending laboratory analyses.

### Laboratory analysis
HCV was tested with serum sample collected using HCV One Step Rapid Strip (rapid immunochromato graphic assay) and second-generation enzyme-linked immunosorbent assay (ELISA) method (AccuDiag HCV IgM ELISA kit; Diagnostic Automation, Inc., California, USA). These tests were done based on manufacturers' instructions.

### Statistical analysis
Frequency distribution and prevalence of HCV status were determined. Differences in proportions were determined by $\chi^2$-tests using the statistical package for the social sciences (SPSS), version 21.0 software, IBM Corp., New York, USA. Findings from these analyses were statistically analyzed using the $\chi^2$-test to determine the association between HCV seroprevalence with patients' sociodemographic variable. $P$ values less than 0.05 were considered statistically significant.

### Ethical approval and informed consent
Ethical clearance was obtained from the research and ethics committee from various hospitals where the samples were collected after being scrutinized by the ethics committee of the various hospitals within the Plateau State, Nigeria. All participants gave their written informed consent for inclusion before they voluntarily participated in the study. The purpose of this work was explained to patients before they voluntarily consented to participate in the research. All data were analyzed anonymously throughout the study.

## Results
Of the total samples, five (6.3%) were positive for HCV Antibody using the RDT, while two (2.5%) were positive for the HCV antibody using AccuDiag HCV immunoglobulin M (IgM) ELISA Kit. A total of 54 male samples were tested with one (1.9%) tested positive for HCV using HCV IgM ELISA kit. From among the total number of 26 female samples

collected, one (3.8%) tested positive for HCV using HCV IgM ELISA kit. There was no statistical association between HCV seroprevalence and the sex of patients ($P>0.05$). In the age range of 31–36, one (3.6%) was positive out of the total of 28. In the age range of 37–42, one (3.0%) was positive out of the total of 33 ($P>0.05$) which shows that the distribution is statistically insignificant. Of the total number of 80 respondents, 63 were mortuary workers in which two (2.5%) were positive, 17 were ambulance drivers in which none was positive. There was statistical association between HCV seroprevalence and nature of work of patients ($P<0.05$). Among the total number of 80 respondents, 72 were married in which two (2.5%) were positive, eight were single in which none was positive. There was no statistical association between HCV seroprevalence and marital status of patients ($P>0.05$). Among the total number of 80 respondents, 10 often have contact with blood in which 2 (2.5%) were positive; 70 rarely have contact with blood in which none was positive. There was statistical association between HCV seroprevalence and the nature of contact with blood ($P<0.05$). A total number of 80 respondents were grouped into four based on their number of sexual partners. Respondents with one and two sexual partners were 68 and eight, respectively, in which none was positive. Respondents with more than one sexual partners were four with only two (2.5%) testing positive. There was statistical association between HCV seroprevalence and the numbers of sex partners of patients ($P<0.05$). Of the total of 80 screened patients, 80 use gloves and adhere to the use of personal protective equipment in which two (1.3%) among them were positive. There was statistical association between HCV seroprevalence and the use of gloves by patients ($P<0.05$). A total number of 80 respondents were screened, two (2.5%) was positive and had no STIs. There was statistical association between HCV seroprevalence and presence of STIs in the patients ($P<0.05$) (Table 1).

## Discussion

This study was carried out to determine the health and safety of mortuary workers and ambulance drivers to risk of contracting HCV due to their occupation. Unfortunately, they are often an underestimated category of workers. In this study, 5 (6.3%) respondents screened for HCV antibody using ICT were seropositive. The five (6.3%) respondents tested positive for the ICT to confirm to be two (2.5%) anti-HCV IgM using ELISA.

Out of the five (6.3%) tested positive with strip, four (7.2%) were men while one (1.9%) was a woman. Two (2.5%) were positive for the HCV antibody (IgM), one (1.9%) out of the 54 men was positive, while one (3.9%) out of 26 women was positive. The difference in these results could be as a result of false-positive results from the test strip [10]. Antibody positivity by ICT may have been due to cross-reactivity with similar plasma protein or infectious agents or it may be due to previous HCV (chronic hepatitis) [11].

The anti-HCV IgM prevalence rate of 2.5% recorded among mortuary workers and ambulance drivers is lower than that found in Jos, Nigeria, which has a prevalence rate of 5.56% 12 but in a different location and lower than the range reported in Nigeria [13]. This prevalence is lower than the prevalence recorded in other regions such as Makurdi and Benin City with a seroprevalence of 5.4 and 12.3% [12,14]. This suggests that Benin City is an area of higher prevalence, compared with Makurdi and Jos. The relatively lower seroprevalence from our study may be attributed to the sample size and differences in endemicity of HCV from previous studies and possibly to good personal protective measures undertaken by the patients in our study [15].

The anti-HCV IgM positivity was more among the young adults between 25 and 40 years. A similar report was provided by McQuillan *et al.* [16] People between these ages are more involved in several risk factors of hepatitis virus infection such as having more than one sexual partners, having casual sex, and being involved in social vices [16]. Statistic on the prevalence of HCV in Nigeria showed a high prevalence in youths between 25 and 40 years [16]. This is related to the age group with the highest cases of anti-HCV IgM study among mortuary workers and ambulance drivers. None of the patients between 19–24 and 49–54 years had HCV IgM positive result. This could be because of the relatively few patients recruited from this group. The findings from this study have shown that men had a prevalence of 1.9% and women with 3.8% which showed that women have a higher prevalence than men. But there were more of men in this work group than women. High prevalence among the women may be as a result of increase in sexual activities which predispose them to HCV infection. It could also be that they had contact with blood and due to irregular use of gloves.

The study also showed a high prevalence of HCV of 3.2% among the mortuary workers and 0% among ambulance drivers. Mortuary workers like other health workers are

**Table 1 Distribution of hepatitis C virus seroprevalence by sociodemographic variable of patients**

| Sociodemographic | Number of participants tested | Number of positive (%) | $\chi^2$ | $P$-value |
|---|---|---|---|---|
| Age (years) | | | | |
| 19–24 | 1 | 0 (0.0) | 3.419 | 0.331 |
| 25–30 | 10 | 0 (0.0) | | |
| 31–36 | 28 | 1 (3.6) | | |
| 37–42 | 33 | 1 (3.0) | | |
| 43–48 | 5 | 0 (0.0) | | |
| 49–54 | 3 | 0 (0.0) | | |
| Total | 80 | 2 (2.5) | | |
| Sex | | | | |
| Male | 54 | 1 (1.9) | 0.286 | 0.593 |
| Female | 26 | 1 (3.8) | | |
| Total | 80 | 2 (2.5) | | |
| Nature of work | | | | |
| Mortuary workers | 63 | 2 (3.2) | 0.684 | 0.408 |
| Ambulance drivers | 17 | 0 (0.0) | | |
| Total | 80 | 2 (2.5) | | |
| Sexually transmitted disease | | | | |
| No | 80 | 2 (2.5) | 55.55 | 0.000 |
| Yes | 0 | 0 (0.0) | | |
| Total | 80 | 2 (2.5) | | |
| Use of gloves | | | | |
| No | 0 | 0 (0.0) | 55.55 | 0.000 |
| Yes | 80 | 2 (2.5) | | |
| Total | 80 | 2(2.5) | | |
| Number of sex partner(s) | | | | |
| 1 | 68 | 0 (0.0) | 38.974 | 0.000 |
| 2 | 8 | 0 (0.0) | | |
| ≥3 | 4 | 2 (50.0) | | |
| Total | 80 | 2 (2.5) | | |
| Contact with blood | | | | |
| Often | 10 | 2 (25.0) | 14.359 | 0.000 |
| Rarely | 70 | 0 (0.0) | | |
| Total | 80 | 2 (2.5) | | |
| Marital status | | | | |
| Single | 8 | 0 (0.0) | 0.228 | 0.633 |
| Married | 72 | 2 (2.8) | | |
| Total | 80 | 2 (2.5) | | |

exposed to the hazards of blood-borne pathogens in their workplace due to their involvement in activities such as embalming, and corpse bathing and preparation [10,17]. This practice routinely carried out in mortuaries predisposed them to the risk of acquiring infections such as HCV.

## Conclusion

The HCV seroprevalence of 2.5% among mortuary workers and ambulance drivers was relatively low; however, this suggests that the patients are at-risk group for occupational infection due to HCV.

**Conflicts of interest**
There are no conflicts of interest.

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