Serological Prevalence of Hepatitis C Virus among Febrile Patients Attending a General Hospital in Emohua LGA, Rivers State, Nigeria

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Keywords: Antibodies; HCV; Prevalence; Febrile Patients; Nigeria

Article

Serological Prevalence of Hepatitis C Virus among Febrile Patients Attending a General Hospital in Emohua Lga, Rivers State, Nigeria

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Abstract: This study was to determine the prevalence of hepatitis C virus (HCV) among febrile patients attending a General Hospital in Emohua LGA, Rivers State, Nigeria. Eighty-nine patients, including 31 males and 58 females, aged 2 to 60 years, were recruited for this study. Blood samples were screened for antibodies to hepatitis C virus (HCV) using a commercially available anti-HCV-Ab enzyme-linked immunosorbent assay (ELISA) based kits following the manufacturer's description. The results showed an overall prevalence of 5.6%. Higher prevalence of HCV was observed among females (6.9%), age groups ≥41 years (11.1%), singles (7.9%) and patients with primary education (33.3%). Among all the variables evaluated, only education ($p = 0.007$) was significantly associated with the prevalence of HCV. Age ($p = 0.21$), sex ($p = 0.47$) and marital status ($p = 0.42$) were not associated with the prevalence of HCV among the studied population. This study showed a prevalence rate (5.6%) that is slightly alarmingly well above several other studies done in the past in Nigeria. The seropositivity of HCV among febrile patients remains a great danger to public health. Therefore, HCV screening by ELISA methods in all patients is recommended. Planned prevention, screening and treatment are needed to reduce further transmission.

Keywords: antibodies; HCV; prevalence; febrile patients; nigeria

1. Introduction

Viruses are the most common cause of hepatitis, which is an inflammation of the liver (CDC, 2019, 2020, 2022). Hepatitis A, B, and C are the three most prevalent viral hepatitis. While certain hepatitis viruses can cause similar symptoms, each one affects the liver differently, infects people differently, and affects typically distinct populations (CDC, 2019, 2020, 2022).

The RNA virus known as the hepatitis C virus (HCV) is a member of the Flavivirus family. It primarily spreads through parental contact, though it can also be acquired vertically or through sexual contact (CDC, 1998; Abeni et al., 2020). Compared to the human immunodeficiency virus, HCV is more contagious and requires less contact to infect a person (Te & Jensen, 2001). Because it persists in about 85% of infected people, HCV infection is clinically significant because it presents a serious risk of chronic liver damage (Omolade & Adeyemi, 2018). The Hepatitis C virus, unlike the hepatitis B virus, cannot be prevented by vaccination, although it is treatable (Kesson, 2002; Ernest Nwagwu, 2021).

Injection drug use (IDU) is the leading risk factor for infection and the most effective method of hepatitis C virus (HCV) transmission (CDC, 2019; Abeni et al., 2020). Rates of HCV infection nearly doubled among women who gave birth to live children between 2009 and 2014 as the number of new HCV infections among individuals of reproductive age (Patrick et al., 2017). Mothers with hepatitis C delivered 0.38% of live babies in 2015 (Schillie et al., 2018, 2020). This report updates and augments earlier CDC recommendations for adult hepatitis C testing in the United States, released in 1998 and 2012 (CDC, 1998; Smith et al., 2012).

Hepatitis C infection is estimated to affect between 2.6% and 3.1% of the world's population. However, a precise global estimate is impossible due to the high number of undiagnosed patients

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and improper data collection (Syed-Mohammed & Stuart, 2018). Hepatitis C infection rates differ from area to region and even across communities within a nation. Local differences in each area, such as the culture and habits of the local population and the predominance of hazardous behaviours, may cause a disparity in HCV prevalence. The World Health Organization reported hepatitis C virus prevalence as follows: Africa 5.3%, America 1.7%, and South-East Asia. 2.15%, Western Pacific 3.9%, Europe 1.03%, and the Eastern Mediterranean 4.6% (Karoney & Siika, 2013; Ernest Nwagwu, 2021).

HCV endemicity in Nigeria has long been established, although epidemiological data are scarce (Riou et al., 2016). Nigeria has a sizable population with a wide range of seroprevalence for HCV infection. Nigeria's prevalence rate ranges from 0.4% to 18.3%, or 1 to 30 million people, and the Federal Ministry of Health claims a prevalence of 2.2%, or 4 million Nigerians, who have the hepatitis C virus (Riou et al., 2016; Ernest Nwagwu, 2021).

Thankfully, hepatitis A and B may both be prevented with reliable immunizations. Hepatitis C has no vaccine but can be cured with life-saving medicine (CDC, 2019, 2020, 2022). It poses a substantial risk to public health, claims thousands of lives each year, and is a significant factor in liver cancer (CDC, 2019, 2020, 2022). Unfortunately, there is a lack of data regarding the incidence of the hepatitis C virus in Nigerian patients who visit public healthcare facilities. Hepatitis C prevalence in Nigeria has not been surveyed; however, studies indicate that it fluctuates between 0.4% and 14.7%, depending on the population segment being considered (Adesina et al., 2016). The study aims to determine the prevalence of HCV antibodies among patients attending a General Hospital in Emohua LGA, Rivers State, Nigeria.

2. Materials and Methods

2.1. Study Area

The study area was the General Hospital, Ogbakiri, in Emohua LGA, Rivers State, Nigeria. A small communal settlement of the Ikwere-speaking tribe of Rivers State with vast land covering almost the area, the people are known to be hunters, traders and other business activities done in its peaceful environment.

2.2. Study Design

This hospital-based cross-sectional study involves patients at the General Hospital, Ogbakiri, in Emohua Local Government Area, Rivers State, Nigeria.

2.3. Study Population

The targeted population constituted all patients who were at the hospital to receive medical care. A total of 89 blood samples were collected from patients who were included in the study.

2.4. Inclusion and Exclusion Criteria

The patients included in this study comprised patients who were at the General Hospital, Ogbakiri, in Emohua LGA, Rivers State, Nigeria and in which they gave their consent to participate in the study. Patients who gave no consent were excluded from this study.

2.5. Sample Collection, Transport, Preparation & Storage

From the study population, 89 blood samples were collected from the patients. Four millilitres (4 ml) of blood samples were aseptically collected from each patient into sterile EDTA tubes. The collected blood sample was carefully transported with an ice pack to the Virus & Genomics Research Unit of the Department of Microbiology, University of Port Harcourt. In the laboratory, the blood samples were centrifuged, after which serum samples were collected using a micropipette. After collection, the plasma was stored at -20^{0}C till it was ready for use.

2.6. Serological Analysis

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Plasma samples were analyzed for HCV antibodies using the ELISA kit manufactured by Dia. Pro. Diagnostic Bioprobes, Milano, Italy. The analysis was performed according to the manufacturer's instructions. Results were interpreted according to the manufacturer's guide. The values obtained were used to interpret the results as the ratio of the sample OD450nm and the cut-off value according to the following: S/CO<0.9 as negative, 0.9-1.1 as equivocal and >1.1 as positive.

2.7. Data analysis

Data were analyzed using Microsoft Excel version 16.0 (Microsoft, USA). Statistical significance for all analyses was determined at a 5% significance level.

3. Results And discussion

3.1. Patients Characteristics

In this study, 89 (100%) patients were tested for HCV antibodies; their age range was between 2 years and above. The samples were that of patients in the hospital for a routine check. A total of 89 patients were sampled in this study, with their socio-demographic data stratified in Table 1.

Table 1. Socio-demographic of the studied Febrile Patient's population

Characteristics	**Categories**	**No. Tested**	**Percentage**
Age group (years)	2-20	27	30.3
	21-40	35	39.3
	41 & above	27	30.3
Gender	Females	58	65.1
	Males	31	34.8
Marital status	Married	51	57.3
	Single	38	42.7
Educational	No formal	55	61.7
	Primary	6	6.7
	Secondary	17	19.2
	University	11	12.4
Total		**89**	**100.0**

3.2. Overall Prevalence of HCV Antibody

Of 89 patients who participated in the study, 5(5.6%) tested positive, while 84(94.4) were negative. This result, however, indicates the seroprevalence of HCV Ab, as in Figure 1.

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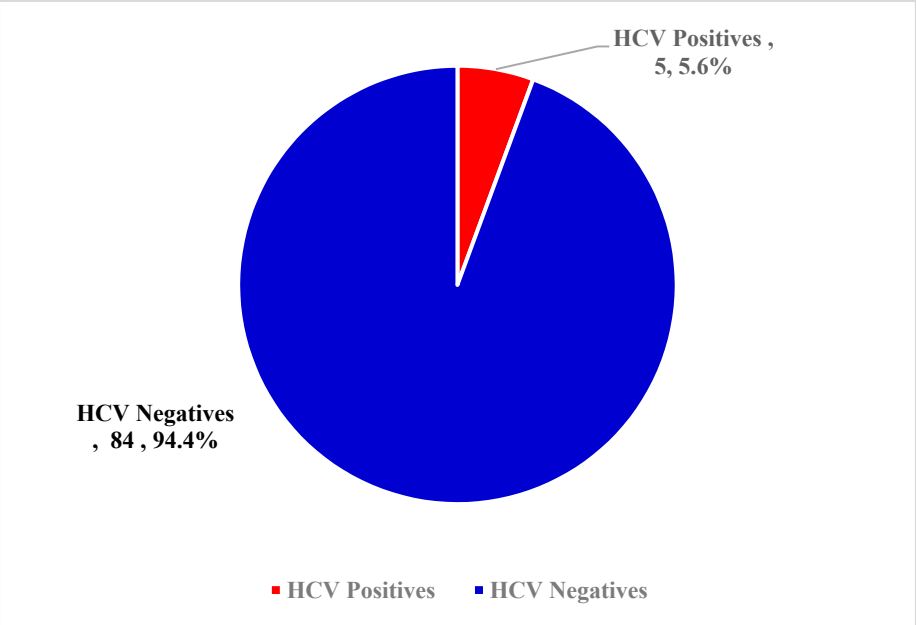

Figure 1. Overall Prevalence of Hepatitis C Virus

3.3. Prevalence of HCV with Age

This study indicates that the prevalence of HCV is higher within the age range of ≥41(11.1%) than in other age groups, 21-40 (5.7%) and 2-20 years (0.0%). Nevertheless, there was no significant relationship between age (p = 0.21) and HCV antibody, as shown in Figure 2.

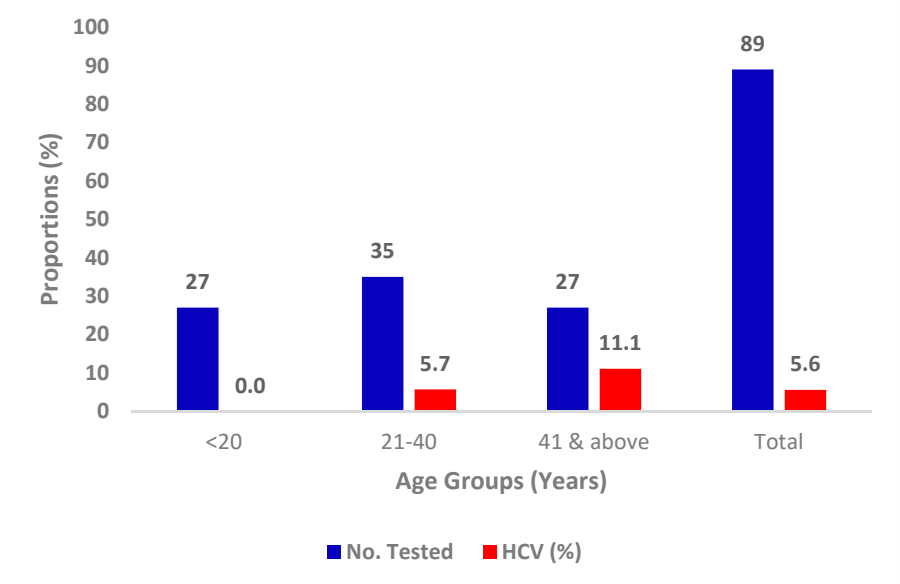

Figure 2. Prevalence of Hepatitis C Virus with age.

3.4. Prevalence of HCV with Sex

Figure 3 shows the prevalence of HCV Ab with sex. A higher prevalence occurred in females (6.9%) than in males (3.2%). There was no relationship between sex (p = 0.47) and the prevalence of HCV Ab.

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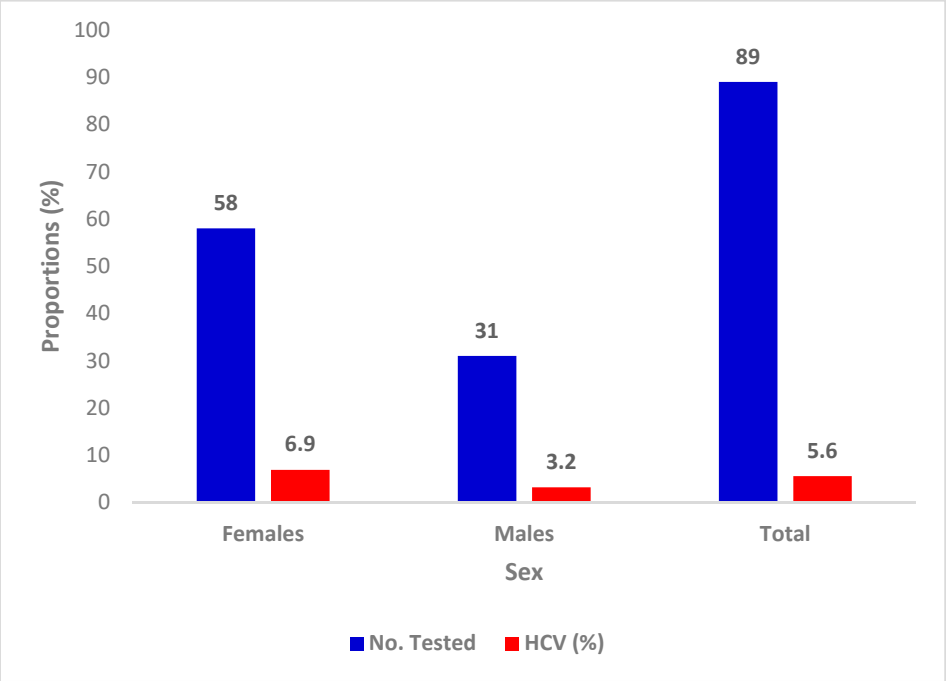

Figure 3. Prevalence of Hepatitis C Virus with sex

3.5. Prevalence of HCV with Marital Status

From the result obtained, the percentage of positive individuals concerning their marital status shows 7.9% for married and 3.9% for singles (Figure 4). However, there was no relationship between marital status (p = 0.42) and the prevalence of HCV.

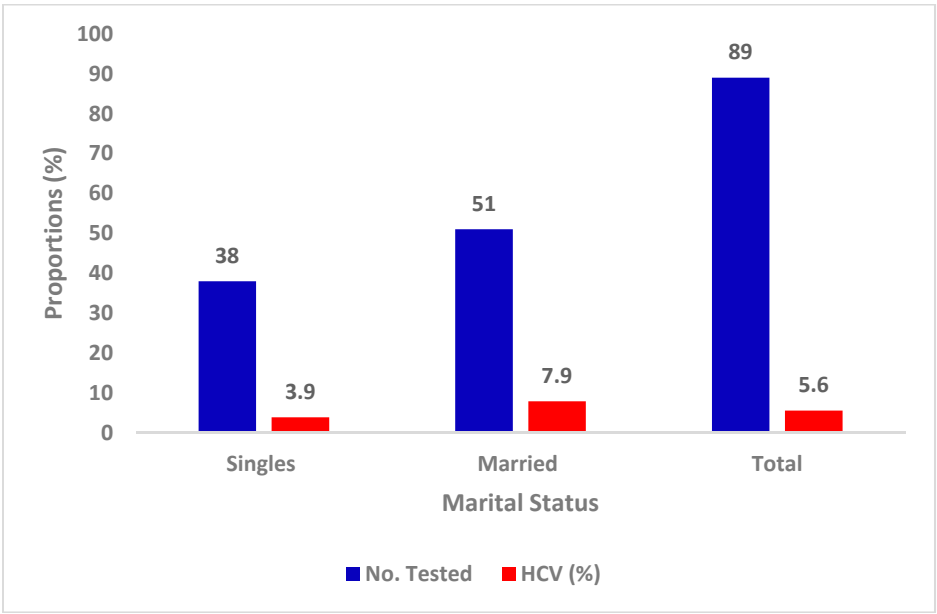

Figure 4. Prevalence of Hepatitis C Virus with Marital Status

3.6. Prevalence of HCV with Educational Status

The study indicates a higher prevalence of HCV among primary school education (33.3%) than secondary education (11.8%) and those without formal education (1.8%).

Those with university education had zero prevalence (0.0%), as shown in (Figure 5). There was a significant relationship between educational status (p = 0.007) and the prevalence of HCV.

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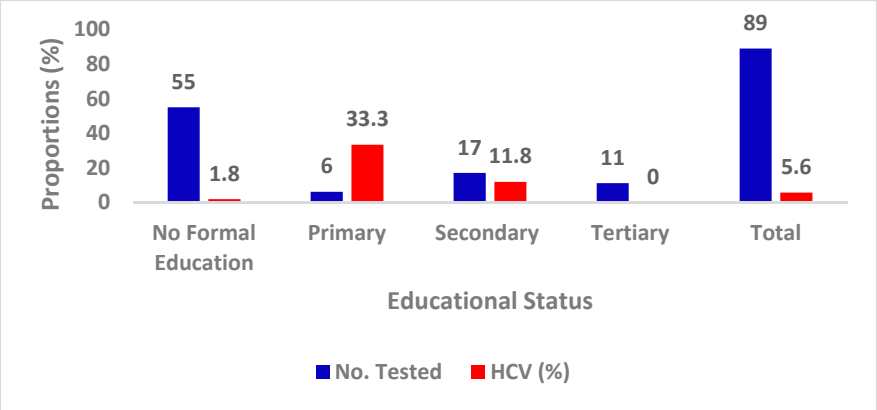

Figure 5. Prevalence of Hepatitis C Virus with Educational Status.

4. Discussion

The prevalence rate of 5.6% obtained from this study is comparable to the prevalence rate of 5.20% that was reported in Ghana (Acquaye & Tettey-Donkor, 2000). It is also comparable to the 5.70% reported in Jos, Nigeria (Inyama et al., 2005), the 5.0% reported in Port Harcourt, Nigeria (Abeni et al., 2020) and the 6.1% and 6.0% reported by Dammulak et al. (2013) in Jos and Buseri et al. (2009) in Osogbo, respectively.

The 5.6% revealed in this study is also more significant than the results of other earlier investigations conducted in Nigeria and elsewhere outside Nigeria. It exceeds the global prevalence of 3.0% (WHO, 1999), the 2.3% and 3.86% found in Abuja (Tremeau-Bravard et al., 2012; Anyanwu et al., 2020), the 3.3% in Lagos State (Akinbami et al., 2010), the 4.50% in Benin (Nwannadi et al., 2012), and the 1.6% in North-Western Nigeria (Hamza et al., 2013). The 2.9% previously reported in Rivers State (Koate et al., 2005), the 3.0%, 3.4%, and 4.1% reported by Ejele et al. (2006) in the Niger Delta region, Kano State (Bala et al., 2012), and Benin City, Edo State are all greater than the 4.1% described in this paper (Nwannadi et al., 2014) and the 4.8% obtained by Halim and Ajayi (2000). When compared to other African nations, it was also greater than the 3.2% and 4.4% results found in Kenya and Ghana by Kamande et al. (2016) and Walana et al. (2014), respectively; the 4.7% in Southern Taiwan (Tsai et al., 2015); and the 1.6% in Senegal, West Africa (Diop-Ndiaye et al., 2008).

This value is in contrast to studies by Okonko et al. (2014), Cookey et al. (2021), Opaleye et al. (2016), who reported a 0.0% prevalence rate of HCV antibodies in southwestern Nigeria, and Alli et al. (2010), who similarly reported a 0.0% HCV seroprevalence rate in Ibadan, Oyo State, Nigeria. There have also been reports of other exceedingly low incidence rates in Nigeria. 1.0% was recorded by Aaron et al. in Port Harcourt, Nigeria, in 2021. Ikeako et al. (2014) observed 0.16% prevalence in the south-east of Nigeria, 0.5% in Anyigba, 0.7% in the south-east (Diwe et al., 2013), 0.8% in Abuja (Agboghoroma & Ukaire, 2020), and 0.8% and 0.9% reported by Oluremi et al. (2021) and Onyekwere and Hameed (2015), respectively.

This number is less than the 22.5% found in a recent study conducted in Port Harcourt, Nigeria (Okonko et al., 2022), the 15.0% found in Ughelli, Delta State, Nigeria (Ogbodo et al., 2015), and the 8.0% and 12.30% found in Port-Harcourt and Benin, respectively (Nwannadi et al., 2012). The figures reported by Ayolabi et al. (2006) in Lagos, Ebie and Pela (2006) in Enugu, Nigeria, and Strickland (2002) in Kaduna, Nigeria, respectively, were 8.4%, 14.9%, and 11.9% lower. Also, it is lower than the 14.7% obtained in other parts of South Western Nigeria (Balogun et al., 2012), the 23.5% reported in Abeokuta, Ogun State, Nigeria (Ogwu-Richard et al., 2015), the 7.0% reported in Benin City (Ojide et al., 2015), and the 10.0% in Kenya, East Africa (Muriuki et al., 2013), the 13.4% in South Africa (Parboosing et al., 2008) and the 18.1% in another Eastern Africa state, Tanzania (Nagu et al., 2008).

Past research has found variable prevalence rates of HCV in various population segments in Nigeria and certain African and Middle Eastern nations (Jeremiah et al., 2008). Low HCV prevalence rates were noted in various studies conducted in Kano, Nigeria (0.40%), Namibia (0.90%), Sudan (1.90%), Senegal (0.80%), and Ghana (0.90%), which are comparable to the prevalence of 0.40%

observed in the study by Jeremiah et al. (2008). (Jeremiah et al., 2008; Imoru et al., 2003). Natalie et al. (2011) in Burkina Faso and Frank et al. (2013) in Egypt reported prevalence rates of 8.6% and 20.0%, respectively. The discrepancy in prevalence can be caused by variations in the social behaviours of the study participants and the populations of the separate studies (Ayele et al., 2002).

Age-specific prevalence was found to be higher in those above the age of 41 (11.1%) than in those between the ages of 21 and 40 (5.7%) and 20 years (0.0%), but there was no correlation between age and HCV antibodies ($p > 0.05$). Comparing this to the findings of our previous study in Port Harcourt, Nigeria (Okonko et al., 2022) shows that the prevalence was greater in the age group of 31 to 40 years. That contradicts the findings of Jeremiah et al. (2008), who found that anti-HCV prevalence was highest in age groups between 21 and 30. According to Tessema et al. (2010), in a study that included patients aged 41 to 50, the condition was more prevalent; this conclusion is consistent with ours. These most recent findings were consistent with our earlier research in Ibadan, Nigeria (Okonko et al., 2012), which found a higher frequency in people over 40. This observation, however, differs from studies we conducted in Port Harcourt (Abeni et al., 2020) and Ugheli, Delta State, Nigeria (Ogbodo et al., 2015), which found greater prevalences in the age group >26 years.

As individuals get older, their seroprevalence of HCV rises, and it is significantly greater in the age group over 41. This observation matches Klevens et al. (2009)'s findings, which agree with the findings of this study. The outcome is also consistent with other data points from throughout the globe, demonstrating that ageing increases a person's risk of contracting HCV (Nagu et al., 2008; Spradling et al., 2010; Ogbodo et al., 2015). The increased seropositivity shown in the elderly age group may be due to social behaviours that are different, parenteral exposures, a loss in physical mobility, and a lower incidence of medical examinations when compared to younger people, which increases the likelihood of infection transmission (Lee et al., 2011).

Females (6.9%) had a higher prevalence than males (3.2%). No association between sex and the prevalence of HCV Ab was found ($p > 0.05$). This finding is consistent with research from Jemilohun et al. (2014) and our recent study in Port Harcourt, Nigeria, which found a somewhat greater frequency among females than males. Our findings concur with those of a prior investigation conducted in the Nigerian regions of Ilorin, Kwara State, and the Niger Delta, all showing a greater prevalence of HCV among the female participants (Udeze et al., 2011; Ogbodo et al., 2015). This observation is also consistent with earlier research in Nigeria (Lesi et al., 2007; Balogun et al., 2012). This finding may be explained by the fact that absent additional means of HCV transmission, females are more likely to become infected through unprotected sex than males are (Tohme, 2010; Ogbodo et al., 2015).

The greater frequency was observed among males in Jos, Plateau State, Nigeria (Egah et al., 2004), in Osogbo, Osun State, Nigeria (Buseri et al., 2009), Ibadan, Oyo State, Nigeria (Udeze et al., 2009; Okonko et al., 2012), and Port Harcourt, Rivers State, Nigeria (Udeze et al., 2009; Okonk (Abeni et al., 2020). Due to the generally low disease frequency in the research population, and the difference is not statistically significant, it is challenging to identify a specific cause for the somewhat higher female preponderance. Other research from other parts of Nigeria has verified this demographic tendency (Kassim et al., 2012; Okocha et al., 2015; Okoroiwu et al., 2018; Abeni et al., 2020).

According to our study, unmarried people (7.9%) had a greater prevalence of HCV than married people (3.9%). The prevalence of HCV Ab and marital status were not related ($p > 0.05$). This outcome supports our earlier investigation in Port Harcourt, Nigeria (Okonko et al., 2022). When compared to the study of Ejele et al. (2006), where they discovered a higher incidence among single respondents (4.1%) than married ones (2.2%), this observation was marginally higher. Compared to Obienu et al. (2011), this study indicated a substantially lower prevalence in connection to marital status; the prevalence of the viral infection in married people was 27.2%, and it was 21.3% in singles. Our results were in line with those of Abeni et al. (2020), who found that unmarried participants had a considerably greater prevalence (6.0%) than married participants (3.0%). This finding is consistent with a 2013 study by Afolabi et al. in Ibadan, which likewise found a greater prevalence of HCV in the unmarried population. The fact that there was a significant frequency in the general population despite the absence of any apparent risk factors may not be unrelated. Another factor might be that

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single people are more likely to engage in illegal activities, which increases their chance of getting HCV and other diseases (Abeni et al., 2020). As the unmarried participants could not have been more sexually active than the married participants, sexual transmission as a risk factor was not raised in this area. Furthermore, repeated or extensive direct percutaneous exposure to blood is the most effective way for the virus to spread.

The prevalence of HCV Ab was significantly correlated with education ($p < 0.05$). According to the study, elementary school students (33.3%) have a higher prevalence of HCV than students in secondary education (11.8%) or those with no formal education (1.8%). The incidence among university students was zero (0.0%). This observation runs counter to a recent study by Okonko et al. (2022) that found a higher frequency among patients with tertiary education and a study by Onyekwere et al. (2016) that found a higher prevalence among people with no formal education. The numbers here also differ from what they found in their survey, where the prevalence of those without formal education was 4.0%, and those with elementary education was 1.8%. Those with secondary education were 0%.

5. Conclusion

The study shows a low prevalence of HCV (5.6%) among febrile patients presenting at a General Hospital in Emohua LGA, Rivers State, Nigeria. In general, the study found low prevalence in the socio-demographic data collected; therefore, this could be due to some variables, including a lack of awareness and low or absent medical checkups. A larger-scale study that includes rural residents and urban distribution is required to assess the disease burden.

Compliance with ethical standards

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Disclosure of conflict of interest: The authors have declared that no competing interests exist.

Statement of ethical approval: All authors declare that all experiments have been examined and approved by the University of Port Harcourt Research Ethics committee. Therefore, the study is performed following the ethical standards laid down in the 1964 Declaration of Helsinki.

Statement of informed consent: "All authors declare that informed consent was obtained from all individual participants included in the study."

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