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The Prevalence of Hepatitis C Among Health Care Providers – A Preliminary Study

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A B S T R A C T

Hepatitis C virus (HCV) infection contributes significantly to morbidity and mortality worldwide, is a prominent cause of chronic liver disease, and is the most prevalent reason for adult US residents to get a liver transplant. The aim of the study is to carry out a preliminary study on the prevalence of hepatitis C virus (HCV) among health care providers. A total of 100 blood sample were collected intravenously using sterile disposable needles and syringes into clean dry test tubes, allowed to clot, then centrifuged and the serum separated into dry plain containers. The serum was screened for hepatic C – antibody using the immunodiagnostic HCV spot card. The results revealed that health care providers within the age of 18 – 27 years were reported to have contacted the hepatitis C virus with having HCV of 6, this was followed by those within the age range of 28 – 37. The least value was recorded for health care providers within the age range of 48 – 57 years. The results show that the prevalence of HCV among health care providers within the age range of 18 – 27 and 28 – 37 years revealed a percentage prevalence of 8.33% and 6.67% respectively. According to the study, there is a significantly high prevalence of HCV infection among teenagers and adult health care providers within the age range of 18 - 27 and 28 - 37 years old, respectively.

Introduction

Hepatitis C virus (HCV) infection contributes significantly to morbidity and mortality worldwide, is a prominent cause of chronic liver disease, and is the most prevalent reason for adult US residents to get a liver transplant (Lingala and Ghany, 2015; WHO, 2017). About 7.11 million people worldwide have HCV infection as of 2015, and 1.75 million new cases were reported in that year alone, according to the World Health Organization (WHO, 2017). HCV is the second most common cause of liver cirrhosis, hepatocellular carcinoma, and liver failure-related mortality in children, adolescents, and adults globally. It is frequently linked to persistent infection (Polaris Observatory HCV Collaborators, 2017).

Although sustained virologic response to HCV treatment has increased to up to 97%, many populations still only have limited access to screening and treatment (WHO, 2016). According to a recent comprehensive assessment of the literature, just 16% of people with chronic HCV infection had medication recommended to them, and about 50% were ignorant that they had the disease (Sonderup *et al.,* 2017). To lower morbidity and death in at-risk populations, HCV screening is essential. Though considered to be significant, the prevalence of viral hepatitis C in sub-Saharan Africa is difficult to assess due to the dearth of relevant investigations (Isaac *et al.,* 2019).

Hepatitis C virus (HCV) prevalence in sub-Saharan Africa is estimated to be 2–8%. Nearly one fifth of all cases of HCV in the globe occur there (Kateera *et al.,* 2015). According to estimates, Nigeria has a 2.4–18.4% HBV infection prevalence and a 3.6–5% anti–HCV sero-prevalence (Esan *et al.,* 2014). Nigeria has a pooled prevalence of 13.6 percent of hepatitis B virus infection, according to a thorough review and meta-analysis conducted to find out (Musa *et al.,* 2015). The risk factors linked to the infection's transmission, such as injections, blood products, transfusions, surgical procedures, body tattooing, workplace accidents, sexual behaviour vertical transmission, and a history of not receiving vaccinations, can be used to predict the prevalence of HBV and HCV in a population (Esan *et al.,* 2014).

Health care personnel have a heavy burden from exposure to blood-borne diseases (such the hepatitis B and C viruses). A non-immune host, an infected source, and a damaged skin or mucous membrane are all necessary for hepatitis virus transmission. The primary areas for preventative actions are these three aspects (Danaei *et al.,* 2011). HBV and HCV infections continue to be a serious public health concern for people, especially because of the frequent patient contact that health care workers and their families experience. This is true despite several efforts to avoid transmission. Health care workers who have HBV or HCV run the danger of infecting patients, who then run the risk of infecting their families (Danaei *et al.,* 2011).

A human-infecting RNA virus known as the hepatitis C virus (HCV) is known to cause disease in humans. HCV is most frequently spread parenterally, however it can also spread vertically and sexually (Karoney and Siika, 2013). Sub-Saharan Africa has the greatest frequency of the disease in the world—5.3% an estimated 32 million people are affected. Eastern Mediterranean (4.6%) and Western Pacific (3.9%) are two more WHO regions with significant HCV prevalence rates (Karoney and Siika, 2013).

HCV is still under diagnosed and underreported in Africa despite its high incidence and highly contagious nature (with the exception of Egypt). Most of the information on HCV in Africa that is currently available is dated. Little attention has been paid to HCV in Africa as a result of the dearth of data that is currently available. Therefore, the goal of this study was to evaluate the information that was available on HCV in Delta State, Nigeria, in order to ascertain how common it was there.

HCV is an enclosed virus with a single positive sense strand RNA genome of approximately 9.6 kb. This genome encodes a polyprotein of 3010 amino acids, which is then broken down by cellular and virally encoded proteases into 4 structural proteins and 6 nonstructural (NS) proteins (Dubuisson, 2007; Posta *et al.,* 2008).

International standardisation of nomenclature has divided HCV into 6 major genotypes (1–6) and more than 70 sub genotypes, with nucleotide differences between them varying between 30 and 15%, respectively. Their distribution and prevalence are correlated with their geographic distribution and mechanism of transmission (Simmonds, 2004; Roman *et al.,* 2008).

According to WHO data, 170 million people worldwide are at risk of acquiring chronic liver disorders due to the presence of HCV in 3% of the population. The estimated prevalence of HCV in economically developed nations is 1% to 2%, compared to 5% to 10% in less developed nations (Madhava *et al.,* 2002). The regions with lower reported incidence included North America, northern and western Europe, and Australia; those with greater reported prevalence were in Africa, the Eastern Mediterranean, South East Asia, and the West Pacific (Lee *et al.,* 2014).

The HCV sero-prevalence studies offer helpful descriptive information to comprehend the global HCV epidemiology. To determine the distributions of HCV, numerous surveys were undertaken. However, most studies primarily enrolled specific demographics, such as blood donors and clinical patients, which are not typical of the population of the locations in which they dwell.

Additionally, because blood donors are often healthy than the general population and clinical patients already had symptoms, the estimated prevalence could be under- or over-estimated.

The community-based studies were scarce and unavailable in the majority of nations. There is a significant geographic variance in the sero-prevalence of HCV, which may be explained by differing risk factor contributions and distributions in various research regions. Anti-HCV sero-prevalence varies dramatically by geography, from 0.5 percent to 24.3 percent (Okayama *et al.,* 2002; Gogos *et al.,* 2003; Pérez *et al.,* 2005; Lee *et al.,* 2014).

HCV is most commonly transmitted by blood or goods derived from blood. It was discovered that an unidentified agent was contaminating the blood supply worldwide and causing post-transfusion non-A, non-B hepatitis. Post-transfusion hepatitis C is now relatively uncommon in developed nations. The prevalence of transfusion-associated hepatitis decreased from 33% to almost zero transmission of HCV between 1970 and 1998, which was attributed to the success of several donor screening interventions (Alter and Houghton, 2000).

Receiving blood products continues to be a major source of HCV infection in developing nations where it has not been practical to test donors for the virus. The majority of these nations are in Asia and Africa, where traditional cultural obstacles, a lack of qualified specialists, a lack of resources for equipment and laboratory reagents, and challenges recruiting voluntary donors all pose threats to the safety of the blood supply. Drug users who share injection equipment are the main source of HCV transmission in affluent nations (Armstrong *et al.,* 2006; Tagny *et al.,* 2008).

Anti-HCV prevalence among intravenous drug users ranged from 31% to 98% (Memon and Memon, 2002). According to reports, injectable drug use causes 60% and 80%, respectively, of HCV infections in the United States and Australia. HCV is primarily spread in developing nations through risky therapeutic injections.

Every year, between 2.3 and 4.7 million HCV infections are thought to be caused through unsafe injections, which are defined as the reuse of syringes or needles from patient to patient without sterilising (Chan and Mangla, 2022).

In the majority of developing nations, HCV transmission via contaminated injection equipment has been identified (Chowdhury *et al.,* 2003; Khan *et al.,* 2008a). The findings showed that the transmission of HCV was caused by contaminated or non-disposable injecting equipment.

The aim of the study is to carry out a preliminary study on the prevalence of hepatitis C virus (HCV) among health care providers. A total of 100 blood sample were collected intravenously using sterile disposable needles and syringes into clean dry test tubes, allowed to clot, then centrifuged and the serum separated into dry plain containers.

Hepatitis C Antibody Detection

The serum were screened for hepatic C – antibody using the immunodiagnostic HCV spot card.

Hepatitis C Screening Using Immunodiagnostic Spot Card

The HCV spot card is a rapid and qualitative test for the detection of antibodies to hepatitis C virus in human serum or plasma principally with fresh samples.

Principles

The test involves capturing of antibodies to HCV by immunodominant proteins of the virus immobilized onto a porous membrane. After washing, the presence of the antibody is revealed by treatment with conjugate which will bind to absorbed HCV antibody, forming a red spot on the membrane.

An additional control spot was been applied onto the membrane to check for the reactivity of the reagents on the kit. In practice therefore, the test has been designed so that one red appears (control spot), if the sample is non-reactive, and two red spots appears if the sample contain HCV antibodies.

Kit contents

- Plastic card plat forms
- Buffer solution in dropper bottle (blue caps) contains sodium azide as a preservative
- Wash solution in dropper bottle (red cap) contains sodium azide as a preservative.

- Protein A-Gold conjugate in dropper bottle (white cap) contains sodium azide as preservative.

Procedure

Label one device for each test sample when adding the sample and solution to the device; be sure to allow them to soak through the membrane before proceeding to the next step. Solution or sample should be added to the inner circle of the device.

Dispense two drops of buffer solution into the device.

Dispense two drops of protein A gold conjugate into the device

Dispense three drops of wash solution in the device.
- Read result with 10 minutes for easiest interpretation

Results and Discussion

Distribution of HCV among Health Care Providers

The results shows the number of health care providers with HCV. It was revealed that health care providers within the age of 18 – 27 years were reported to have contacted the hepatitis C virus with having HCV of 6, this was followed by those within the age range of 28 – 37. The least value was recorded for health care providers within the age range of 48 – 57 years (Table 3.1).

Influence of Age on HCV Antibodies

The result of the influence of age on HCV antibodies is presented in Tale 3.2 below. The results shows that the prevalence of HCV among health care providers within the age range of 18 – 27 and 28 – 37 years revealed a percentage prevalence of 8.33% and 6.67% respectively.

The prevalence of hepatitis C virus infection found in this study was 15%, which is higher than that found in studies by Nwokedi *et al.,* (2006), who found a 6.2% prevalence of the virus among teaching hospital patients at Aminu Kano Teaching Hospital in Kano, and the Federal Ministry of Health (2013), who found a 3.7% prevalence nationwide.

Given that the study was hospital-based and retrospective, the somewhat high incidence found in this study is not unexpected. In contrast to community-based studies, where the majority of participants are people who appear to be in good health, data obtained in healthcare settings has been linked to a higher prevalence attributable to symptomatic individuals who are likely to contribute significantly to the subjects tested. Teenagers between the ages of 18 and 27 and adults between the ages of 28 and 37 both showed increased HCV prevalence rates. These results could be attributed to early mother-to-child transmission of HCV and subsequent infection clearance. The clinical outcome of perinatally acquired HCV infection is still not fully understood, despite reports that vertical transmission of HCV can occur in a 6–15 percent range (Padua and Jhaveri, 2016).

Table.1 Show the Distribution of HCV among Health Care Providers

Age range (years)	No. of sample	Hep –C
18 – 27	72	**6**
28 – 37	15	**1**
38 – 47	10	**-**
48 -57	**3**	**-**

Table.2 Shows the Influence of Age on HCV Antibodies

Age range (years)	18 – 27	28 -37	38 -47	48 -57	Total
No. of sample	72	15	10	3	**100**
No. of positive	6	1	-	-	**7**
% positive	**8.33**	**6.67**	**-**	**-**	**7**

From late youth to a peak among patients older than 57 years, the study reported a decreasing prevalence of HCV antibodies with age. This result is surprising given that hepatitis C is linked to chronic liver disease development and persistent infection, and it is consistent with the findings of Ya'aba *et al.,* (2015) who discovered the highest prevalence of hepatitis C among adults aged 26 to 45 in 4 healthcare facilities in Abuja, Nigeria. Azeez-Akande *et al.,* (2010) and Karoney and Siika (2013) observed increased HCV antibody sero-prevalence among the elderly, in contradiction to these findings.

According to the study, there is a significant proportion of HCV infection among teenagers and adult health care providers within the age range of 18 - 27 and 28 - 37 years old, respectively. Although it is known that healthcare professionals successfully treat HCV infections more frequently than people who do not work in healthcare. But in Nigeria, regular hepatitis C surveillance is required. Additionally, everyone who tests positive for HCV should receive routine testing for HIV and hepatitis B. The results of this study suggest that affected HCWs should be screened nationally and treated.

Author Contributions

Amaihunwa Kingsley Chukwuka: Investigation, formal analysis, writing—original draft. Onyinbe Ijeoma Eyemisa: Validation, methodology, writing—reviewing. Apah Gabriel Chukwuka:—Formal analysis, writing—review and editing. Enwa Felix Oghenemaro: Investigation, writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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