ISSN: 2474-3658

Isaac et al. J Infect Dis Epidemiol 2019, 5:096
DOI: 10.23937/2474-3658/1510096
Volume 5 | Issue 6
Open Access

Journal of
Infectious Diseases and Epidemiology

ORIGINAL ARTICLE

Hepatitis C in Adults and Children: A Cross-Sectional Review from a Tertiary Hospital, Northeast Nigeria during the Period 2008-2015

Isaac Warnow Elon[1,2], Ajani Ayomikun[2], Jalo Iliya[1,2], Alkali Yaya[1,2], Oyeniyi Christianah[1], Okolie Henry[3], Saidu Abubakar[3], Jibrin Bara[3], Aremu John[3], Kudi Ayuba[4], Danlami Halilu[4] and Charanchi Musa[4]*

[1]Department of Paediatrics, College of Medical Sciences, Gombe State University, Nigeria

[2]Department of Paediatrics, Federal Teaching Hospital, Gombe, Nigeria

[3]Department of Internal Medicine, Federal Teaching Hospital, Gombe, Nigeria

[4]Department of Medical Microbiology, Federal Teaching Hospital, Gombe, Nigeria

***Corresponding authors:** *Isaac Warnow Elon, Department of Paediatrics, College of Medical Sciences, Gombe State University, Nigeria, Tel: +23480-2378-5735, Email: dreiwarnow@gsu.edu.ng*

Abstract

Background: HCV is a leading cause of liver cirrhosis, hepatocellular carcinoma and liver failure related deaths among children, adolescents and adults worldwide. Sub-Saharan Africa suffers disproportionately from lack of access to both screening for HCV and treatment services with a resultant high rate of chronic hepatitis C related morbidity and mortality. Nigeria is considered among countries with high Hepatitis C burden and the national prevalence average in 2013 was estimated to be 2.2%. Routine screening for hepatitis C antibody in the country is however sub-optimal. The present study sought to determine the prevalence of hepatitis C antibody in adults and children.

Methods: This was a cross-sectional analysis of adults and children tested for Hepatitis C at the Federal Teaching Hospital, Gombe; northeast Nigeria from January 2008 to December 2015. We consecutively reviewed results of Hepatitis C antibody tests performed using HCV ACON rapid immunoassay. Variables including age; sex, year test was performed and hepatitis C antibody status were analysed.

Results: 6874 individuals tested aged 1-98 years; male: female ratio 1.4:1. HCV antibody was positive in 473 (6.9%). HCV antibody sero-positivity was associated with increasing age and was highest (18.0%) above 65 years. ($p < 0.001$) 282 (59.6%) with HCV antibody also tested for HBsAg. Dual seropositivity with HBsAg and HCV antibody was significantly higher among males ($p < 0.001$).

Conclusion: Hepatitis C prevalence is high and increased with age to peak in the elderly. Dual HBV/HCV infection is highest in males.

Keywords

Hepatitis C, Hepatitis B, Seropositivity, Adults, Children

Abbreviations

HCV: Hepatitis C Virus; HbsAg: Hepatitis B surface Antigen; WHO: World Health Organisation

Introduction

Hepatitis C virus (HCV) infection is a leading cause of chronic liver disease globally [1]. According to the World Health Organisation [2] 71.1 million individuals were infected with HCV by 2015, and 1.75 million new infections occurred that year alone. Commonly associated with persistent infection, HCV is the second leading cause of liver cirrhosis, hepatocellular carcinoma and liver failure related deaths among children, adolescents and adults worldwide [1,3]. Mortality from viral hepatitis is on the rise globally and it is estimated that approximately 48% of the estimated 1.4 million deaths that resulted from viral hepatitis in 2013 were attributable to hepatitis C infection [4]. This trend of increasing hepatitis-related morbidi-

Citation: Isaac WE, Ajani A, Jalo I, Alkali Y, Oyeniyi C, et al. (2019) Hepatitis C in Adults and Children: A Cross-Sectional Review from a Tertiary Hospital, Northeast Nigeria during the Period 2008-2015. J Infect Dis Epidemiol 5:096. doi.org/10.23937/2474-3658/1510096

Accepted: November 02, 2019: **Published:** November 04, 2019

ty and mortality worldwide has informed the World Health Organization (WHO) adoption of a strategy in 2016 to eliminate viral hepatitis by 2030 [5].

The burden of viral hepatitis C in sub-Saharan Africa though thought to be substantial; is difficult to accurately estimate due to the paucity of studies on the subject. A recent meta-analysis in 2015 [6] however, reported the prevalence of HCV in the region as 2.98%. The health and economic impact of HCV result from both hepatic and extrahepatic manifestations of chronic infection [2,3]. Sub-Saharan Africa also suffers disproportionately from lack of access to both screening for HCV and treatment services with a resultant high rate of chronic hepatitis C related morbidity and mortality [1].

Unsafe health-care procedures and injection drug use were the leading causes of new HCV among adults in 2015, whereas in children infections were largely attributable to horizontal transmission from adults [3]. Nigeria is among countries with a high burden of HCV, with a prevalence estimated to be about 2.2% and rising [7] however, routine treatment of HCV infection is not readily available in the country.

Subjects, Materials & Methods

Study area

Gombe is the capital of Gombe state. It is one of the six states that comprise the North-East Geopolitical zone in Nigeria, and is located between latitudes 90° 30' and 12° 30'N, Longitudes 8° 5' and 11° 45'E. The state has a land mass of 20,265 square kilometers and It shares borders with Borno, Yobe, Adamawa, Taraba and Bauchi states - other states in the North-east sub-region [8] which is one of the geopolitical zones with the highest levels of poverty and adverse health indices [9].

Study setting

This study was conducted in Federal Teaching Hospital Gombe, a 520 bed hospital serving Gombe and neighboring states. The Federal Teaching Hospital, Gombe (FTHG) started providing services in the year 2000. It is a centre for treatment, teaching and research in the State and northeast sub-region of Nigeria and with a large number of patient referrals from the neighboring states, the hospital serves an estimated population of 20 million.

Study design

The study is retrospective cross-sectional.

Study population

All children and adults who presented to accident & emergency out-patient departments, specialist clinics, emergence units and admitted into wards including the intensive care units and tested for Hepatitis C virus antibody from 2008 to 2015 were included.

Laboratory methods

All tests were performed using the Hospital standard for Hepatitis C antibody test. Hepatitis C virus antibody test was performed using ACON rapid immunoassay. ACON HCV antibody test is a rapid one step test for the qualitative detection of HCV antibody in serum or plasma. Rapid one step diagnostic tests such as ACON have been reported to have very high sensitivity and specificity of 0.98 (95% CI 0.98-1.00) and 1.00 (95% CI 1.00-1.00) when compared to enzyme immunoassay [10].

Principle: The ACON HCV antibody One Step Test is a rapid chromatographic immunoassay for the qualitative detection of antibodies to Hepatitis C virus in plasma or serum. Recombinant HCV antigen (containing Core, NS2, NS3, NS4, NS5 segments) and mouse anti-human IgG antibody conjugated to colloidal gold are embedded in the sample pad on the test line and control line regions respectively. During the test, if the specimen is positive, the HCV antibody in whole blood, serum or plasma specimen combines with the colloidal gold conjugated recombinant HCV antigen and generates a complex. As the mixture moves along the test strip chromatographically by capillary action the complex will be captured by the recombinant HCV antigen (containing Core, NS2, NS3, NS4, NS5 segments) immobilized on the membrane to form a purplish red test band in the test region which indicates a positive test result [11].

A negative specimen will not form any test band due to the absence of colloidal gold conjugate/HCV antibody complex. Regardless of if HCV antibodies exist in a specimen, the unbound gold marked protein will bind to the sheep anti-mouse IgG in the control band region and form a purplish red band. The assay is only valid when the control band appears [11].

Data collection

Laboratory records of Hepatitis C antibody results of all children and adults in Federal Teaching Hospital, Gombe between 2008 and 2015 were retrieved. Variables included age; sex, year test was performed and hepatitis C antibody status.

Data analysis

All variables were imputed into Epi info Version 3.2 and analysed.

Ethical clearance

Permission to carry out this study was received from the Research and Ethics committee of the Federal Teaching Hospital Gombe.

Results

Between 2008 and 2015, a total of 560,857 out-patient clinic patients and 60,285 in-patient admissions

Table 1: Age and Sex distribution of individuals screened for Hepatitis C.

Age group (years)	Male (%)	Female (%)	Total	P*
0-18	342 (8.8)	310 (10.9)	652 (9.7)	
19-25	350 600 (15.5)	644 (22.6)	1244 (18.5)	
26-45	2026 (52.2)	1426 (50.1)	3452 (51.3)	
46-55	454 (11.7)	249 (8.7)	703 (10.4)	
56-65	279 (7.2)	129 (4.5)	408 (6.1)	
> 65	180 (4.6)	87 (3.2)	267 (4.0)	< 0.001**

*Pearson's Chi square value; **significant P-value.

Table 2: Age distribution and Hepatitis C antibody status.

Age group (years)	Reactive (n = 473) n (%)	Non-reactive (n = 6401) n (%)	Total (n = 6874) n (%)	P*
0-17				
Male	22 (4.7)	320 (5.0)	342 (5.0)	
Female	16 (3.4)	289 (4.5)	305 (4.4)	0.522
18-25				
Male	36 (7.6)	578 (9.0)	614 (8.9)	
Female	25 (5.3)	601 (9.4)	626 (9.1)	0.128
26-45				
Male	113 (23.9)	1962 (30.7)	2075 (30.2)	
Female	70 (14.8)	1203 (18.8)	1275 (18.5)	0.804
46-55				
Male	60 (12.7)	410 (6.4)	458 (6.7)	
Female	19 (4.0)	211 (3.3)	225 (3.3)	0.069
56-65				
Male	32 (6.8)	245 (3.8)	277 (4.0)	
Female	17 (3.6)	110 (1.7)	127 (1.8)	0.600
> 65				
Male	29 (6.1)	147 (2.3)	176 (2.6)	
Female	19 (4.0)	69 (1.1)	88 (1.3)	0.310

*Pearson's Chi square.

were recorded in children and adults.

6874 individuals ranging from 1 to 98 years were tested for hepatitis C Virus antibody. Males were 3982 (57.9%) and females 2835 (41.2%) with a male: Female ratio 1.4:1. Adults aged 26-45 years constituted 3452 (51.3%) of all individuals tested for HCV antibody, followed by 19-25 years 1244 (18.5%). Ages 0-17, 46-55, 56-65 and > 65 years contributed 652 (9.5%), 703 (10.5%), 408 (6.1%) and 267 (4.0%) of individuals tested respectively. Males predominated across all except the 19-25 year age-group (P < 0.001) Table 1.

HCV antibody was positive in 473 (6.9%) children and adults; males were 284 (60.0%) and female 185 (39.1%). 183 (38.7%) of all individuals with HCV antibody were ages 26-45 years; 42 (8.9%) were 0-17; 61 (12.9%) 18-25; 79 (16.7%) 46-55; 49 (10.4%) 56-65 and 48 (10.1%) > 65 years respectively Table 2.

Yearly testing for HCV antibody was 10 (2008), 46 (2009), 1605 (2010), 1375 (2011), 1269 (2012), 1160 (2013), 1799 (2014) and 281 (2015). HCV antibody was positive among 3 (30%) tested in 2008; 1 (2%) 2009; 61 (3.8%) 2010; 111 (8.2%) 2011; 89 (7.0%) 2012; 90 (7.7%) 2013; 103 (5.7%) 2014 and 14 (5.0%) 2015 Figure 1.

HCV antibody prevalence was higher among males 7.1% (284/3982) than females tested 6.5% (185/2385). (p = 0.362) HCV antibody sero-positivity was 6.4% among individuals aged 0-17 years; 4.9% in 18-25 year-olds; 5.3% in 26-45 year-olds; 11.2% in 46-55 year-olds; 12.0% in 56-65 year-olds and 18.0% above 65 years. HCV antibody sero-positivity was associated with increasing age and this finding was statistically significant (p < 0.001) Figure 2.

282 (59.6%) with HCV antibody also tested for HBsAg; 184 (65.7%) and 96 (34.3%) were male and female respectively. 63 (22.3%) individuals were HBsAg positive; 52 (82.5%) and 11 (17.5%) were male and female

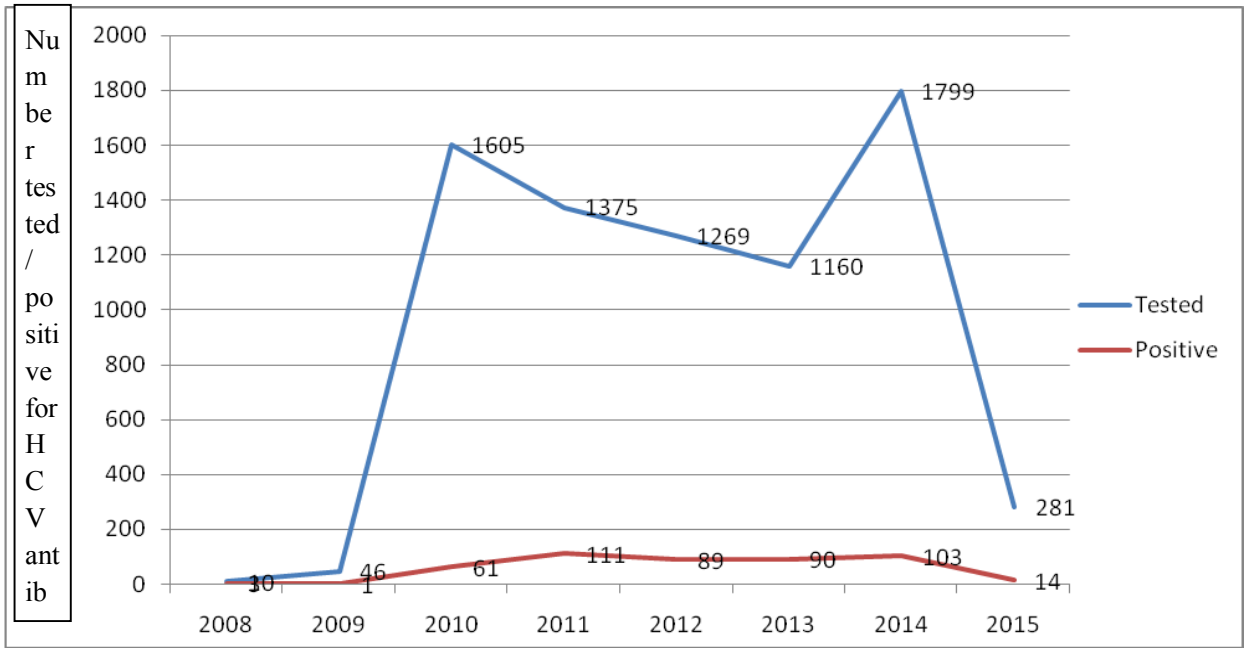

Figure 1: HCV antibody testing and positivity 2008-2015.

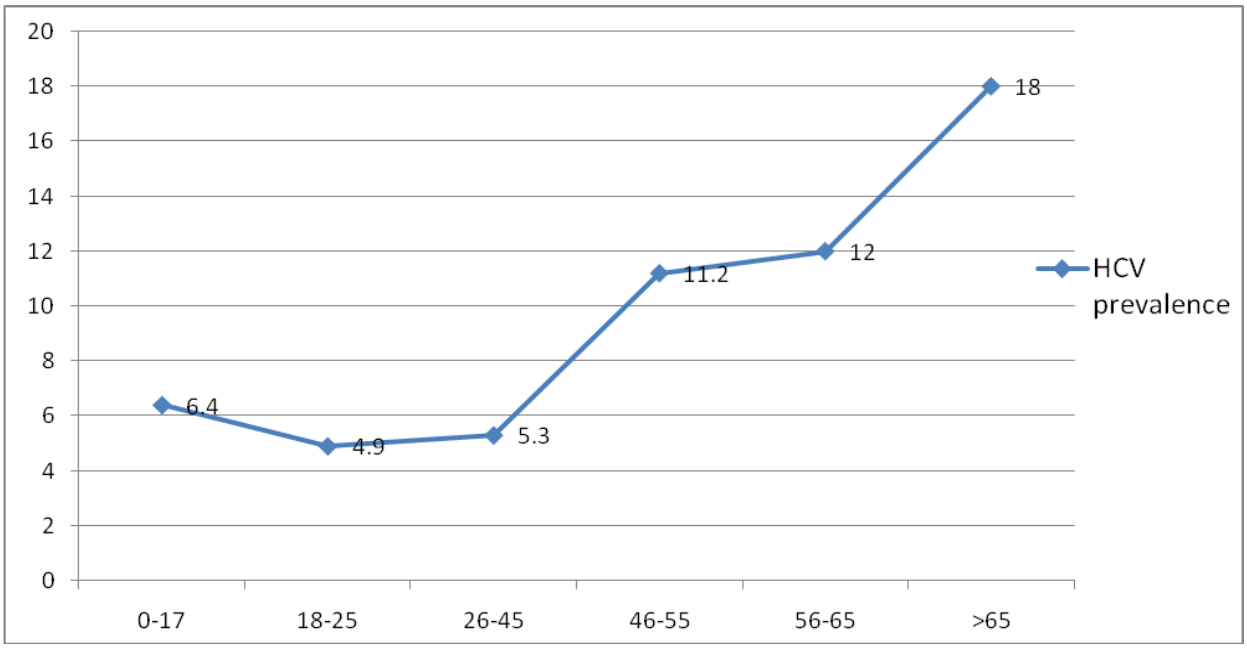

Figure 2: HCV prevalence by Age-group.

Table 3: HbsAg status of subjects with HCV antibody seropositivity.

HBsAg	Male (n = 186)	Female (n = 96)	Total (n = 282)	P*
	n (%)	n (%)	n (%)	
Positive	52 (28.0)	11 (11.5)	63 (100)	
Negative	134 (72.0)	85 (88.5)	219 (100)	< 0.001**

*Pearson's Chi square; **significant P-value.

respectively. Dual sero-positivity with HBsAg and HCV antibody was significantly higher among males (p = 0.001) Table 3.

Discussion

This study represents one of the largest series on Hepatitis C from sub-Saharan Africa and also spans a period of 8 years. The prevalence of hepatitis C virus infection of 6.4% obtained in this report is comparable to the 6.2% from a study [12] carried out much earlier among patients attending Aminu Kano Teaching Hospital, Kano (North-West Nigeria). We report a higher hep-

atitis C prevalence than the 2013 National (2.2%) and Gombe state prevalence (3.7%) [7]. The relatively high prevalence from our report and that that from the researchers in Kano is not surprising considering that both are hospital based studies and were retrospective. Data obtained in healthcare settings has been associated with a higher prevalence attributable to symptomatic individuals who are likely to contribute to a large extent to subjects tested compared to community based studies which mostly comprise apparently well individuals. Our relatively high prevalence also contrasts to the low prevalence ranging between 0-1 percent reported by studies involving healthy subjects [13,14].

A higher prevalence of HCV antibody was demonstrated in children aged 0-17 years compared to adults aged 18-25 and 26-45 years of age respectively. These findings may be explained by mother-to-child transmission of HCV with later clearance of the infection. Although vertical transmission of HCV is reported to range from 6-15%, the clinical course of perinatally acquired HCV infection is yet to be fully understood [15].

We report a prevalence of HCV antibody increasing with age from late adolescence to peak among subjects greater than 65 years. This finding is not unexpected considering that hepatitis C is associated with persistent infection with development of chronic liver disease and shows concordance with reports by Azeez-Akande, et al. [14] and Karoney, et al. [16] of higher HCV antibody seroprevalence in the elderly. In contrast to these findings, Ya'aba, et al. [17] found the highest prevalence of hepatitis C among adults aged 26-45 years in 4 health facilities in Abuja, Nigeria. In yet another study, Nwokedi and his colleagues [12] reported highest HCV antibody seroprevalence among individuals aged 31-40; followed by the 41-50 age group and found a subsequent steady decline in prevalence with increasing age. The differences between these reports [12,17] and ours may be explained by the onset of hepatitis C related mortality among their populations with resultant lower number of surviving individuals still living with chronic liver disease with increasing age.

We report male sex as being associated with a slightly higher HCV burden than females. This finding has also been reported by other researchers; [13,14,16] and may be attributable to increased involvement of males in high risk sexual behaviour [18] and intravenous drug use [19]. Furthermore, male sex has been associated with decreased likelihood of clearing the virus following acute HCV infection [20] and higher rates of liver disease progression compared to their female counterparts (especially those who are of reproductive age) [21].

This study demonstrates that a high proportion of individuals with HCV antibody also tested positive for hepatitis B surface antigen. Coinfection with HBV/HCV has been reported [22-24] and may be explained by the shared mode of transmission of both infections. There have been conflicting reports concerning the impact of dual infection with hepatitis B and C on liver disease progression and risk of developing hepatocellular carcinoma compared to mono infection [22-26]. Increased morbidity in HCV/HBV co-infection observed by some researchers [25,26] has been attributed to viral interaction, individual immunological responses and challenges resulting from the treatment of hepatitis C such as reactivation of hepatitis B infection [27,28].

Routine surveillance for hepatitis C is needed in Nigeria. Also, all individuals who test positive for HCV should be offered routine testing for hepatitis B and HIV infection. Children borne to hepatitis C positive women and those who have chronically elevated transaminases should be routinely screened for hepatitis C [29]. More robust collaborative efforts are also needed towards estimating the HCV prevalence using HCV RNA detection (which is the gold standard) rather than hepatitis C antibody which may overestimate the burden and also in order to ascertain the serotypes involved because of the implications for treatment and prognostication [30]. Overall, the prevalence of hepatitis C in Nigeria varies depending on the sub-population under review.

In interpreting our findings, we are limited by our use of a single positive rapid test to determine hepatitis C infection and also by our inability to ascertain ongoing hepatitis C viraemia using further tests. The WHO recommends a rapid HCV antibody test for screening followed by a quantitative or qualitative RNA nucleic acid test (NAT) as the preferred testing strategy to diagnose viraemic infection [29]. Detection of core HCV antigen may be considered as an alternative to nucleic acid tests. Our report of HCV antibody seropositivity therefore, does not necessarily imply HCV infection, because a percentage of individuals have HCV antibody even after having been cured. Because routine treatment for HCV is not readily available in the country at present, the use of the HCV antibody seropositivity may however suffice to give an estimate of the disease burden. Due to the retrospective nature of this study, we are also unable to further define characteristics of our study population by identified risk factors for hepatitis C such as HIV status, presence of high risk such as men who have sex with men, intravenous drug use, previous blood transfusions, healthcare procedures or local practices such as scarification or body piercing.

Author Contributions

Isaac Warnow Elon: Conceived of the study and study design, developed the first manuscript draft, and critically reviewed all drafts of the manuscript.

Ajani Ayomikun: Oversaw the study design, conducted quantitative data analysis, developed the first

manuscript draft, and critically reviewed all drafts of the manuscript.

Jalo Iliya, Alkali Yaya: Oversaw the study design and critically reviewed and commented on the final manuscript.

Oyeniyi Christianah: Conducted quantitative analysis and commented on all drafts of the manuscript.

Okolie Henry, Saidu Abubakar, Jibrin Bara, Aremu John, Kudi Ayuba, Danlami Halilu, and Charanchi Musa: Critically reviewed and commented on the final manuscript.

References

1. World Health Organisation (2019) Hepatitis C.
2. World Health Organisation (2017) Global hepatitis report, 2017.
3. Polaris Observatory HCV Collaborators (2017) Global prevalence and genotype distribution of hepatitis C virus infection in 2015: A modelling study. Lancet Gastroenterol Hepatol 2: 161-176.
4. GBD 2013 Mortality and Causes of Death Collaborators (2015) Global, regional and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: A systematic analysis for the global burden of disease study 2013. Lancet 385: 117-171.
5. World Health Organisation (2016) Global health sector strategy on viral hepatitis, 2016-2021: Towards' ending viral hepatitis.
6. Sonderup MW, Afihene M, Ally R, Apica A, Awuku Y, et al. (2017) Hepatitis C in sub-Saharan Africa: The current status and recommendations for achieving elimination by 2030. Lancet Gastoenterol Hepatol 2: 910-919.
7. Federal Ministry of Health (2013) Prevalence survey of hepatitis B and C in general population.
8. National Bureau of Statistics, United Nations Children's Fund (2017) Multiple indicator cluster survey 2016-17: Survey findings report. Nigeria.
9. Gombe state, Nigeria. General information.
10. World Health Organisation (2015) Annex 5.4. PICO 2 - How to test (HCV). Diagnostic accuracy of tests to detect hepatitis C antibody: A meta-analysis and review of the literature.
11. World Health Organization (2019) Rapid anti-HCV test.
12. Nwokedi EE, Ilyasu Z, Emokpae AI, Dutse AI, Taura AA (2006) Hepatitis C Virus infection among Teaching Hospital Patients in Kano, Nigeria: A Retrospective study. Ann Afr Med 5: 185-187.
13. Jemilohun AC, Oyelade BO, Oiwoh SO (2014) Prevalence of hepatitis C virus antibody among undergraduates in Ogbomoso, Southwestern Nigeria. Afr J Infect Dis 8: 40-43.
14. Azeez-akande O, Sarki A, Wokedi EE, Olabode A, Alabi P (2010) Sero-prevalence and risk factors of hepatitis C virus in patients and blood donors in Kano, Nigeria. Afr J Cln Exper Microbiol 11: 170-173.
15. Padua LT, Jhaveri R (2016) Hepatitis C mother-to-child transmission. Neo Reviews 17: e521-e531.
16. Karoney MJ, Siika AM (2013) Hepatitis C virus (HCV) infection in Africa: A review. Pan Afr Med J 14: 44.
17. Ya'aba Y, Isu NR, Onoja AJ, Ibrahim K, Mohammed SB, et al. (2015) Prevalence of Hepatitis C Virus (HCV) in Healthy Adults and Human Immunodeficiency Virus (HIV) infected persons in Abuja, Nigeria. JOPAT 1: 11-23.
18. Romero-Estudillo E, González-Jiménez E, Mesa-Franco MC, García-García I (2014) Gender-based differences in the high-risk sexual behaviours of young people aged 15-29 in Melilla (Spain): A cross-sectional study. BMC Public Health 14: 745.
19. Center for Behavioral Health Statistics and Quality (2017) Results from the 2016 national survey on drug use and health: Detailed tables. Substance Abuse and Mental Health Services Administration, Rockville, Maryland.
20. Grebely J, Page K, Sacks-Davis R, van der Loeff MS, Rice TM, et al. (2014) The effects of female sex, viral genotype, and IL28B genotype on spontaneous clearance of acute hepatitis C virus infection. Hepatology 59: 109-120.
21. Baden R, Rockstroh JK, Buti M (2014) Natural history and management of hepatitis C: Does sex play a role? J Infect Dis 209: S81-S85.
22. Mekky MA, Nasr AM, Saleh MA, Wasif NK, Khalaf M, et al. (2013) Virologic and histologic characterisation of dual hepatitis B and C co-infection in Egyptian patients. Arab J Gastroenterol 14: 143-147.
23. Gaeta GB, Stornaiuolo G, Precone DF, Lobello S, Chiaramonte M, et al. (2003) Epidemiological and clinical burden of chronic hepatitis B virus/hepatitis C virus infection. A multicenter Italian study. J Hepatol 39: 1036-1041.
24. Grewal US, Walia G, Bakshi R, Chopra S (2018) Hepatitis B and C viruses, their coinfection and correlations in chronic liver disease patients: A tertiary care hospital study. Int J Appl Basic Med Res 8: 204-209.
25. Pol S, Haour G, Fontaine H, Dorival C, Petrov-Sanchez V, et al. (2017) The negative impact of HBV/HCV coinfection on cirrhosis and its consequences. Aliment Pharmacol Ther 46: 1054-1060.
26. Yan L, Rao H, Ma Y, Bai L, Chen E, et al. (2016) Hepatitis B virus infection in Chinese patients with hepatitis C virus infection: Prevalence, clinical characteristics, viral interactions and host genotypes: A nationwide cross-sectional study. BMJ Open 6: e012016.
27. Papadopoulos N, Papavdi M, Pavlidou A, Konstantinou D, Kranidioti H, et al. (2018) Hepatitis B and C coinfection in a real-life setting: Viral interactions and treatment issues. Ann Gastroenterol 31: 365-370.
28. Chen G, Wang C, Chen J, Ji D, Wang Y, et al. (2017) Hepatitis B reactivation in hepatitis B and C co-infected patients treated with antiviral agents: A systematic review and meta-analysis. Hepatology 66: 13-26.
29. World Health Organisation (2016) Guidelines on hepatitis B and C testing. Policy brief World Health Organization.
30. Sonderup MW, Afihene M, Ally R, Apica B, Awuku Y, et al. (2017) Hepatitis C in sub-Saharan Africa: The current status and recommendations for achieving elimination by 2030. Hepatology 66: 13-26.