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Research Article

Lipid Profile Assay in HIV/HBV/HDV Triple Infection of Patients attending Antiretroviral Clinic in Port Harcourt, Nigeria

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ABSTRACT

Viral hepatic diseases which may change the plasma lipid distribution, has been associated with most prevalent and fatal non-communicable diseases (NCDs). This study was designed to determine the effect of triple infection of human immunodeficiency virus (HIV) positive individuals with Hepatitis B virus (HBV) and Hepatitis D virus (HDV) on lipid profile and the likely consequence. Five milliliters (5ml) of blood sample was obtained through vein puncture from nine-three (93) HIV positive (male and female adults) out-patients attending antiretroviral clinic and transferred into EDTA bottles. Samples were centrifuged at 3000 rpm, plasma separated into another tube, labeled appropriately and refrigerated at -20^{0}C. Presence of HBV was determined using SWE-Care HBsAg rapid kit strip (China) while presence of HDV was determined using a DIA.Pro HDAb (Italy) ELISA kit. Total cholesterol, (TC) triglyceride (Trig), high density lipid (HDL) and low density lipid (LDL) levels were determined using standard methods. Of the 93 HIV positive blood samples obtained, 7 of them were co-infected with HIV/HBV (7.5%) and of the 7 who were co-infected, 6 of them were also infected with HDV. That is, 85% of co-infected patients had triple infection (HIV/HBV/HDV). Results of lipid profile of TC, Trig, HDL, and LDL mean level in the patients infected with HIV/HBsAg/HDV were 4.22 ± 0.40mmol/L, 1.40 ± 0.18mmol/L, 1.55 ± 0.20mmol/L, and 3.29 ± 0.37mmol/L respectively. Only the mean value of LDL (3.29 ± 0.37) was above and significantly higher than its normal standard range with the p value < 0.005. The result of high levels of the LDL marker shows that, the subjects of this study with the triple infection may be predisposed to cardiovascular disease.

Keywords: HIV co-infection, Hepatic virus, liver damage, total cholesterol, low density lipid.

Introduction

The term viral hepatitis refers to a pathologic condition wherein an infection due to hepatitis viruses causes inflammation of the liver (Satsangi and Chawla, 2016), of which hepatitis D virus happens to be one of the hepatitis viruses responsible for liver inflammation (Stockdale *et al.*, 2017).). The hepatitis D virus, can be detected in blood and body fluids (semen, saliva, nasopharyngeal fluids) and it can be transmitted either sexually or by exposure to infected blood or fluids (WHO, 2020) and due to its necessary association with HBV, HDV can only be transmitted in the presence of co-infection with HBV especially in the presence of hepatitis B surface antigen (HBsAg) (Niro *et al.*, 2021). This indicates that people who are immune to HBV (anti-HBsAg positive) are not susceptible to HDV infection (Cerva *et al.*, 2022).

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Viral hepatitis is a major risk factor for liver fibrosis, cirrhosis, and hepatocellular carcinoma (HCC), which is the second leading and fastest rising cause of cancer death worldwide (Villanueva, 2019). Clinically, HDV/HBV co-infection varies from fulminant acute hepatitis as reported in Africa (Sagnelli *et al.*, 2021), to asymptomatic carriers or severe chronic liver disease, progressing rapidly to cirrhosis (Miao *et al.*, 2020). The HBV replication is usually low or absent in chronic delta hepatitis. Nevertheless, some cases with both HBV and HDV replication exist, especially in HIV-co-infected patients, and seem to have a more severe prognosis (Loureiro *et al*., 2021)

Due to shared routes of transmission, co-infection of HIV with hepatitis viruses is common worldwide and it is estimated that 5–20% of the approximately 37 million people living with HIV are co-infected with HBV with a higher risk of impaired immunological recovery and hepatotoxicity during antiretroviral treatment (ART) and a faster rate of progression to cirrhosis and hepatocellular carcinoma (Lunel *et al*., 2018).

Co-infections of HIV-positive individuals with Hepatitis B and D virus (HBV and HDV) are common and can be associated with rapid liver damage (Lunel-Fabiani *et al*., 2013). HIV-infected individuals present multiple risk factors for liver damage and chronic elevation of transaminases, especially when co-infected with hepatitis B, C and D viruses leading to nonalcoholic fatty liver disease (Cai *et al.*, 2019).

The more severe prognosis of HDV infection is found among people co- infected with the human immunodeficiency virus (HIV) (Sultanik and Pol, 2016). The HBV replication is usually low or absent in chronic delta hepatitis. Nevertheless, some cases with both HBV and HDV replication exist, especially in HIV-co-infected patients, and seem to have a more severe prognosis (Loureiro *et al*., 2021).

According to Arain *et al.* (2017), chronic pro-inflammatory cytokine surge has been associated with viral hepatic diseases which may change the plasma lipid distribution and has been associated with most prevalent and fatal non-communicable diseases (NCDs) such as cardiovascular disease (CVD), cancer, chronic respiratory disease, diabetes and others (Habte *et al*., 2021).

Currently, there is no information on the effect of the triple infection of HIV/HBV/HDV on the lipid profile of the infected individuals in Port Harcourt, Rivers State. Hence, the need for this study is to determine the effect of the triple infection on the lipid profile and the likely consequence.

Materials and Methods

Study Area

The blood samples for the study were collected from out-patients attending the antiretroviral clinic of the Rivers State University Teaching Hospital (RSUTH), in Port Harcourt, Rivers State, Nigeria during the months of October and November 2022.

Ethical Approval

The ethical approval on the strength of which the study was carried out was obtained from the Rivers state University teaching hospital ethical health committee with record number: RSUTH/REC/2022220

Sample Collection

A total of ninety-three (93) blood samples were collected through vein puncture from HIV positive out-patients (male and female adults) attending the Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Rivers State and transferred into EDTA bottles (to prevent coagulation). The samples were centrifuged at 3000 rpm and the plasma was separated into another tube and labeled appropriately. These blood samples were preserved by refrigerating at -20^{0}C.

Serological Detection

Five milliliter (5ml) of blood samples were obtained from persons living with HIV, attending the antiretroviral clinic through the vein puncture into an EDTA bottle, spun at 3000rpm for 10 minutes and the plasma separated into another bottle and labeled appropriately. The samples were stored at -20ºC until the analyses were carried out. The samples were tested with SWE-Care HBsAg rapid kit strip (China) for the presence of the hepatitis B virus and a DIA.Pro HDAb (Italy) ELISA kit for the detection of the presence of the HDV and the assay was performed in line with the manufacturer's instruction.

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Lipid Profile

The Total cholesterol was determined using the enzymatic and Point method as described by Corso *et al*. (2016). While the triglyceride, was determined after the enzymatic hydrolysis with lipases as described by Kraume (2021). The high density lipid was determined using the precipitant method as described by Mulinge *et al*. (2017) and the Low Density Lipid was detected using the Freidewald equation method as explained by Emunyu *et al*. (2021).

Statistical Analysis

Software minitab version 21.3 was used to analyze the data and the paired T test was used to determine the significant difference.

Result

A total of ninety-three (93) HIV-positive blood samples were analyzed during this study. Of the total of ninety-three (93) of HIV-positive blood samples, seven (7) of them were co-infected with HIV/HBV (7.5%). Of the 7 who were co-infected, six (6) of them were also infected with HDV. That is, six (6) of the co infected patients had triple infection (HIV/HBV/HDV) implying that 85% of the co-infected patients had triple infection. The results of the Mean values of the lipid profile for HIV/HBV/HDV infected patients are as shown in Table 1. The lipid profile test (TC, Trig, HDL and LDL) mean level in the patients infected with HIV/HBsAg/HDV were 4.22 ± 0.40mmol/L, 1.40 ± 0.18mmol/L, 1.55 ± 0.20mmol/L, and 3.29 ± 0.37mmol/L respectively as shown in Table 1.

Table 1: Mean values of the lipid profile for HIV/HBV/HDV infected patients

Marker	Mean (mmol/L) HIV/HBV/HDV	Standard Value (mmol/L)	P-value
Total Cholesterol	4.22 ± 0.40	6.0	0.0005
Triglyceride	1.40 ± 0.18	1.8	0.0040
High Density Lipid	1.55 ± 0.20	1.6	0.0337
Low Density Lipid	3.29 ± 0.37	0.4	0.0002

Discussion

This present study has revealed that, Co-infection of HIV and HBV and triple infection of HIV, HBV and HDV occurred in out-patients attending the HIV antiretroviral clinic of the Rivers State University Teaching Hospital (RSUTH), in Port Harcourt, Rivers State. Of the total of nine-three (93) HIV positive blood samples obtained, 7 of them were co-infected with HIV/HBV (7.5%). Of the 7 who were co-infected, 6 of them were also infected with HDV. That is 85% of co-infected patients had triple infection (HIV/HBV/HDV). Niro *et al.* (2021) had reported that due to its necessary association with HBV, HDV can only be transmitted in the presence of co-infection with HBV especially in the presence of hepatitis B surface antigen (HBsAg). Some cases with both HBV and HDV replication exist, especially in HIV-co-infected patients, and seem to have a more severe prognosis (Loureiro *et al.*, 2021). Co-infections of HIV-positive individuals with Hepatitis B and D virus (HBV and HDV) are common and can be associated with rapid liver damage (Lunel-Fabiani *et al*., 2013).

From this study, the mean values of the Total Cholesterol, Triglyceride and High Density Lipid were 4.22 ± 0.40, 1.40 ± 0.18, and 1.55 ± 0.20 respectively as shown in Table 1 were all within the normal standard range, while the mean value of Low Density Lipid was 3.29 ± 0.37 which was significantly higher than the normal standard range with the p value < 0.005. According to Arain *et al.* (2018), chronic pro-inflammatory cytokine surge has been associated with

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viral hepatic diseases which may change the plasma lipid distribution and most pro-inflammatory cytokines generally increase lipogenesis, very low density lipoprotein (VLDL) production, and a consequent increase in circulating LDL levels in serum (Quaye *et al.*, 2019).

Dyslipidemia, as described by Pappan and Rehman (2021) is the lipid imbalance such as cholesterol, low density lipoprotein cholesterol, triglycerides and high density lipoprotein and has been associated with most prevalent and fatal non-communicable diseases (NCDs) such as cardiovascular disease (CVD), cancer, chronic respiratory disease and diabetes and others(Habte *et al*., 2021). Lipid abnormality, has been reported in about 50–80% of hypertensives (Ayoade *et al*., 2020). From the work done by Berman and Blankstein (2019), it was discovered that there was a significant association between LDL and cardiovascular disease risk and considered to be a major risk factor in the incidence of revascularizations, ischaemic strokes, atherothrombotic process and cardiovascular death. From the study carried out by Balling *et al*. (2023), high LDL was linked to artheroscleriosis. In a study carried out by Ridker (2014) in which proprotein convertase subtilisin/kexin 9 (PCSK9) inhibitors were used to increase the expression of the LDL-C receptor on hepatocytes as well as of the LDL-C by the liver, it was discovered that there was a significant reduction in the risk of CVD in patients with high-risk of atherosclerotic cardiovascular disease. According to Proctor *et al*. (2004), the components of the circulating lipid profile, but particularly modified LDL-C, may be deposited within the tunica intima of the artery wall, and have been implicated to be involved in the subsequent atherogenic process.

Conclusion

The results from this study showed that people infected with the triple infection of HIV/HBV.HDV had a high level of LDL. The implication of this result suggest that the infected people with the triple infection, may be predisposed to cardiovascular disease and should therefore be subjected to monitoring for cardiac related issues so as to place them on early medication.

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