"Coinfection Of Human Immunodeficiency Virus With Hepatitis B and Hepatitis C At Tertiary Care Hospital, Karachi"

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ABSTRACT

Background: Human immunodeficiency virus (HIV) is a major global health problem, with an estimated 39.9 million people living with HIV and around 1.3 million new infections reported worldwide in 2023. Co-infection with Hepatitis B virus (HBV) and with Hepatitis C virus (HCV) is prevalent among individuals living with Human Immunodeficiency Virus (HIV) infection (PLWH) due to shared routes of transmission and is the primary cause of liver-related morbidity and mortality in HIV-positive patients. Therefore, it is essential that all HIV-seropositive patients must be ruled out for Hepatitis B and Hepatitis C infection because when HIV coexists with viral hepatitis, it leads to greater chronicity, accelerated progression, and increased mortality of liver diseases compared to infections with HBV or HCV alone.

Methodology: It was a retrospective descriptive record-based study conducted at tertiary care hospital-Jinnah postgraduate medical center (JPMC), Karachi between January-2024 to January-2026. In this study, all HIV-seropositive patients were included and then coinfection with Hepatitis B and Hepatitis C virus was ruled out among these HIV positive patients in order to calculate the rate of HIV coinfection with viral hepatitis (HBV and HCV). Hospital registration logs, screening registers and electronic data bases were used to extract data and all this data was entered and analyzed into IBM-SPSS version 23.0. Pearson Chi Square test was used to determine the prevalence of all studied infections, and their association was tested with gender and age group. A P-values less than 0.05 was considered statistically significant.

Results: Findings of the present study have shown that there were total of 161 human immunodeficiency virus (HIV) positive cases, the coinfection rate of HIV with Hepatitis B virus was of 6.2% and 26.9% in case of HIV coinfection with Hepatitis C virus. The prevalence

of triple infection (HIV, HBV and HCV) was 3.1%. The coinfection prevalence of HIV/HCV was much higher than HIV/HBV. Among 161 of HIV-positive individuals, 126 were males (77%) while only 37 were females (23%), accordingly males are more likely to be infected with HIV as compared to females.

Conclusion: The current study support the need for making new public health policies and improve preventive strategies to control the concurrent infection of HIV with viral hepatitis. In Pakistan , further studies are need in this area to accurately measure the coinfection rate of HIV with HBV and HCV especially in areas where there are limited resources.

Key Words: Human Immunodeficiency Virus, Hepatis B virus, Hepatis C virus, Prevalence, Coinfection rate

INTRODUCTION

Co-infection with Hepatitis B virus (HBV) and/or Hepatitis C virus (HCV) is prevalent among individuals living with Human Immunodeficiency Virus (HIV) infection (PLWH) due to shared transmission methods, including blood or bodily fluid exchange during intravenous drug use (IVDU), sexual activities, or mother-to-child transfer during childbirth. [1]. The primary causes of liver-related morbidity and mortality in HIV-positive individuals are coinfections with hepatitis B virus (HBV) and hepatitis C virus (HCV). These individuals experience a more rapid natural progression of viral hepatitis and accelerated liver disease advancement, leading to cirrhosis and hepatocellular cancer [2]. Human immunodeficiency virus (HIV) is a type of lentivirus from the Retroviridae family, characterized by a roughly spherical structure approximately 120 nm in diameter, enveloped by an outer lipid membrane [3]. HIV, a member of the Lentivirus genus, has two types: HIV-1 and HIV-2, which share structural similarities but differ in genome organization. Both types target CD4+ immune cells, affecting the immune response and spreading to regional lymph nodes and the bloodstream. HIV-1 is the dominant variant and can progress to acquired immunodeficiency syndrome (AIDS) [4]. The pathogenesis of HIV involves three key stages. Stage 1 is the acute phase, characterized by flu-like symptoms and high contagiousness. Stage 2 is the chronic, asymptomatic phase, where medical therapy is essential to prevent progression to Stage 3. Stage 3, also known as acquired immunodeficiency syndrome (AIDS), signifies advanced infection marked by extreme infectiousness and a significantly high viral load [5].

HIV remains a major global health concern, with an estimated 39.9 million people living with HIV and around 1.3 million new infections reported worldwide in 2023. While progress has been made in developed countries, the epidemic continues to severely impact populations, particularly in developing countries [6]. According to WHO report, it is estimated that there are 350,000 individuals living with HIV in Pakistan, with a significant awareness gap as nearly 80% are unaware of their status. Alarmingly, the impact on children is growing, as new HIV cases among those aged 0-14 years have escalated from 530 in 2010 to 1,800 in 2023. In Pakistan, over 14,000 people are estimated to have died from AIDS in 2024, with more than 1,100 deaths related to AIDS affecting children in 2023 [7]. The yearly death rate for individuals with HBV-related conditions is nearly 900,000. About 71 million individuals worldwide are afflicted with HCV, which is one of the main causes of chronic hepatitis and kills 0.4 million people annually [8]. Vaccines are available for preventing HBV infection, but none exist for HCV so, prevention focuses on harm reduction strategies like safe injection practices and condom use. Antiviral therapies exist for both HCV and HBV, with treatment outcomes varying by individual condition [9].

Overall, hepatitis B and C prevalence with HIV coinfection is 50.3%. Within this population, HIV-HBV (HIV with hepatitis B) accounts for 8.4%, while HIV-HCV (HIV with hepatitis C) accounts for 35.4%. It is essential that all patients infected with HIV are tested for hepatitis B and C, as well as the other way around [10]. Coinfection with HIV significantly alters the characteristics of Hepatitis B Virus (HBV), leading to changes in genome replication status, elevated chronic infection rates, and accelerated liver disease progression. Moreover, in cases of HIV and Hepatitis C Virus (HCV) coinfection, HIV further exacerbates the HCV viral load, contributing to faster liver disease progression [11]. For this reason, when HIV coexists with hepatitis B or C viruses, it leads to greater chronicity, accelerated progression, and increased mortality of liver diseases compared to infections with HBV or HCV alone [12]. With the global adoption of antiretroviral therapy (ART) for HIV, direct-acting antivirals (DAAs) for HCV, and nucleos(t)ide analogues (NAs) for HBV, the rates of viral coinfections have decreased in certain populations. However, unlike HBV, HCV and HIV lack preventive vaccines, leading to a higher burden among individuals involved in unsafe injecting practices [13]. HIV and HBV share similar transmission routes, including vertical, blood, and sexual transmission. Therefore, HBV infection more frequently occurs in individuals with HIV [14]. HIV coinfection worsens the progression of HBV-induced liver disease, increasing the risks of liver-related complications and morbidity compared to mono-infections. Additionally, it is

linked to higher mortality rates than HBV mono-infection, highlighting the necessity for improved HIV treatment approaches [15] The prognosis for patients coinfected with HIV, HBV, and HCV is poor, leading to disease progression and immunocompromise. HIV-infected individuals are particularly at risk for HBV and HCV coinfection, especially at the AIDS stage, making this issue a significant public health concern [16] Study was conducted at Khushal medical center, between February, 2019 and April, 2020. All HIV positive patients were screened for hepatitis B and hepatis C virus. Results showed that 12% of HIV patients had coinfection with viral hepatitis. Male gender was found to be dominant for HIV coinfection with viral hepatitis as compared to females [17]. Vaccines are available for preventing HBV infection, but no vaccine currently exists for HCV. Prevention strategies focus on harm reduction approaches, such as safe injection practices and promoting condom use. Antiviral therapies are available for both HCV and HBV, although treatment outcomes can vary depending on the individual's condition.

Despite all of this, there is limited research work has been done in this area, that have studied the prevalence of HIV coinfection with Hepatitis B and/or Hepatitis C and has explored the ways to overcome the complications, treatment resistance and severity of the disease which commonly occur due to coinfection. This study have added on new information regarding the coinfection rate of HIV with viral hepatitis and their pattern of distribution in the existing literature. This research also highlighted the association between sociodemographic factors and HIV coinfection with viral hepatitis. This study has shaded the light in the area of HIV coinfection with viral hepatitis, particularly on epidemiology to improve our understanding about their distribution and pattern of occurrence in our community. In this study, we have estimated the rate of HIV coinfection with viral hepatitis, that is necessary for modifying the guidelines, practices and SOPs so that early screening and management of viral hepatitis (HCB and HCV) should done in HIV-Seropositive positive patients. In this way, we can improve the prognosis and life expectancy of HIV-infected individuals as it is a lethal disease if not treated promptly. This study was conducted to evaluate the prevalence of Hepatis B, Hepatitis C and Human immune deficiency virus (HIV), as well as to determine the coinfection rate of HIV with viral hepatitis including Hepatitis B (HBV) and Hepatitis C (HCV) virus.

MATERIALS AND METHODS

A retrospective descriptive record-based study was conducted at tertiary care hospital-Jinnah postgraduate medical center (JPMC), Karachi. Before starting this study, ethical approval for

this study was obtained from Institutional Review Board (IRB) under the IRB# F.2-81/2026-GENL/83/JPMC. Data were analyzed and extracted from last two-years old screening record of patients came to the tertiary care hospital-Jinnah postgraduate medical center (JPMC), Karachi between January-2024 to January-2026. Non-probability convenience sampling technique was used to recruit participants in the study. Inclusion criteria included all the patients who were screened at tertiary care hospital-Jinnah postgraduate medical center (JPMC), Karachi and had complete record for HIV, Hepatitis B (HCB) and Hepatitis C (HCV) status. All HIV-Seropositive patients were included in this study and then coinfection with hepatitis B and hepatitis C virus was ruled out among these HIV positive patients in order to determine HIV coinfection prevalence with viral hepatitis (HBV and HCV). All patients with incomplete screening records, duplicate patient entities and all those who tested negative for HIV antibody (HIV seronegative) were excluded from this study. Data were obtained from patient registration logs, screening registers and electronic data bases. The following variables were extracted from the record;

- Sociodemographic information (age, gender and residency)
- HIV-screening reports
- Screening result of HBV
- Screening result of HCV

Blood samples of all the participants were analyzed into fourth generation ELIZA (enzyme-linked immunosorbent assay) kit according to the “Clinical Guidelines on HIV Diagnosis” (World Health Organization, 2016) in order to detect HIV antigen/antibody. The HBsAG (Hepatitis-B surface antigen) and anti-HCV antibody test were also performed.

All the extracted data were entered and analyzed into IBM-SPSS version 23.0; Counts with percentages were given on age group and gender, mean with standard deviation was reported for age (years), Median with range was given on HIV test values of patients. Prevalence was reported for all studied infections, and their association was tested with gender and age group using Pearson Chi Square test. P-values less than 0.05 were considered statistically significant. Pie diagrams and bar charts were also reported to give graphical presentations of study outcomes.

Ethical approval for this study was obtained from Institutional Review Board (IRB) of JPMC, Karachi. All the data were kept confidential and participants information were presented anonymously.

RESULTS

Table-1 reports the baseline characteristics of studied cohort, among one hundred and sixty-one patients (77%) were male gender, mean age was 31.6 (SD=±10.3) years, results showed under 1-years (15.5%), from 15 - 30 years (46.6%), from 31 – 40 years (26.1%), from 41 – 50 years (8.1%) and aged more than fifty-years were (3.7%) samples. Median test value of HIV was 344.4 with range from 2.20 – 8032 showed skewed distribution of samples.

Table-2 reports the prevalence of all studied infections, among 161 samples all were found positive for HIV, (6.2%) were found reactive HBSAG and (26.9%) were found reactive HCV infection. Only cases of HIV were (70.2%), with two infections (26.7%) samples and (3.1%) samples were found with triple infection (HIV, HBSAG and HCV).

Table-3 reports the association of gender with HIV, HBSAG , HCV and triple infections, among male samples (7.3%) were found reactive for HBSAG, (28.5%) were found reactive for HCV, (67.7%)were found positive for only HIV, (29%) were found positive for any two infections and (3.2%) were found positive for triple infection, whereas among females (2.7%) were found reactive for HBSAG, (21.6%) were found reactive for HCV, (78.4%)were found positive for only HIV, (18.9%) were found positive for any two infections and (2.7%) were found positive for triple infection. Pearson Chi Square showed the distribution of infections with gender was equally likely distributed and association was statistically insignificant ($p>0.05$).

Table 4 reports the association of infections with age group, results showed under 1-years age none was HBSAG reactive, HCV reactive were (20%), and none was found with triple infection, In age group 15 – 30 years old (4%) were reactive HBSAGA, (18.9%) were reactive HCV and (2.7%) were found positive for triple infection, in age group 31 – 40 years old (9.5%) were found reactive HBSAG, (38.1%) were found reactive HCV and (2.4%) were found positive for triple infection, in age group 41 – 50 years old (23.1%) were found reactive HBAG, (46.2%) were found reactive HCV and (15.4%) were found positive for triple infection whereas in age group more than 50-years old (33.3%) were found reactive HCV . The association of HBSAG, and triple infection with age group was found statistically significant ($p<0.05$).

Table 1: Baseline Characteristics of Patients (N=161)

Characteristics		***N***	***%***
Gender	***Male***	***124***	***77.0***
	Female	***37***	***23.0***
Age (years)	***Mean ±SD***	***31.6***	***±10.3***
Age Groups	***< 1 year***	***25***	***15.5***
	15 - 30 years	***75***	***46.6***
	31 - 40 years	***42***	***26.1***
	41 - 50 years	***13***	***8.1***
	>50 years	***6***	***3.7***
HIV test value	***Median (Range)***	***344.4***	***2.20 – 8032***

Chart 1:

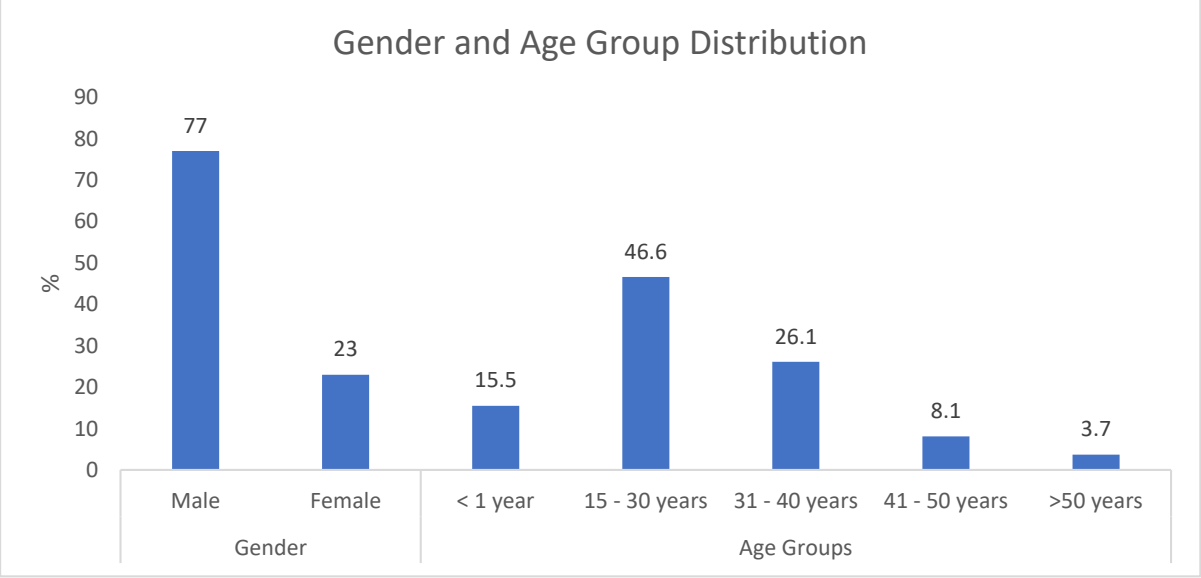


Table 2: Prevalence of Infections

Characteristics		***N***	***%***
HIV	Positive	161	100
	Negative	0	0
HBSAG	Reactive	10	6.2
	Non-Reactive	151	93.8
HCV	Reactive	43	26.9

	Non-Reactive	117	73.1
Triple Infection	Only HIV	113	70.2
	Any Two	43	26.7
	All Three	5	3.1

Chart 2:

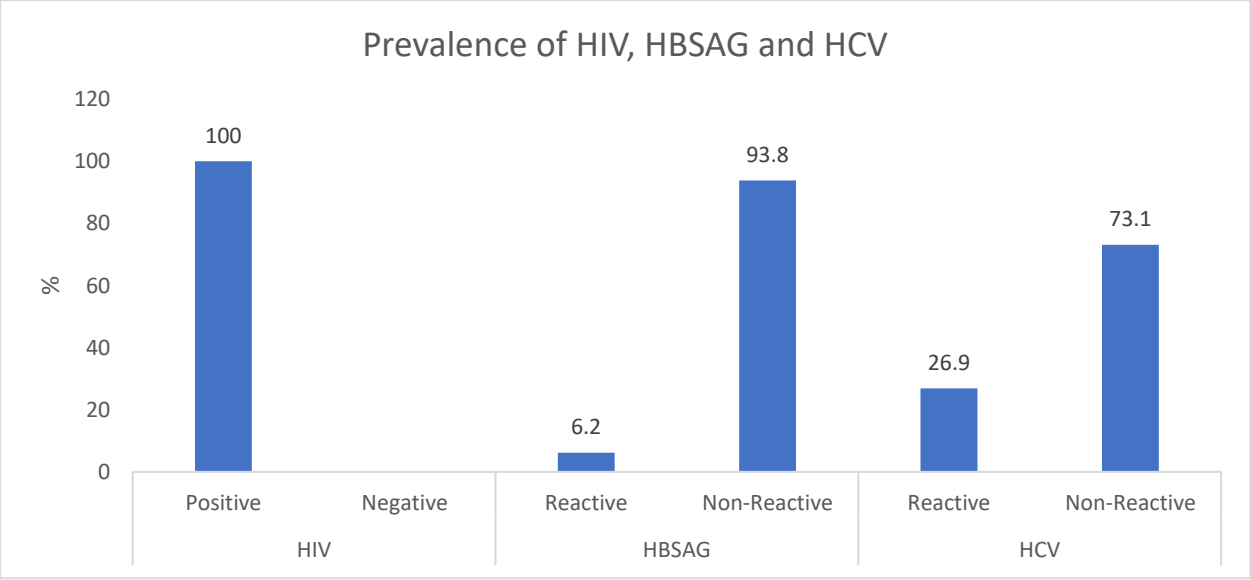


Chart 3:

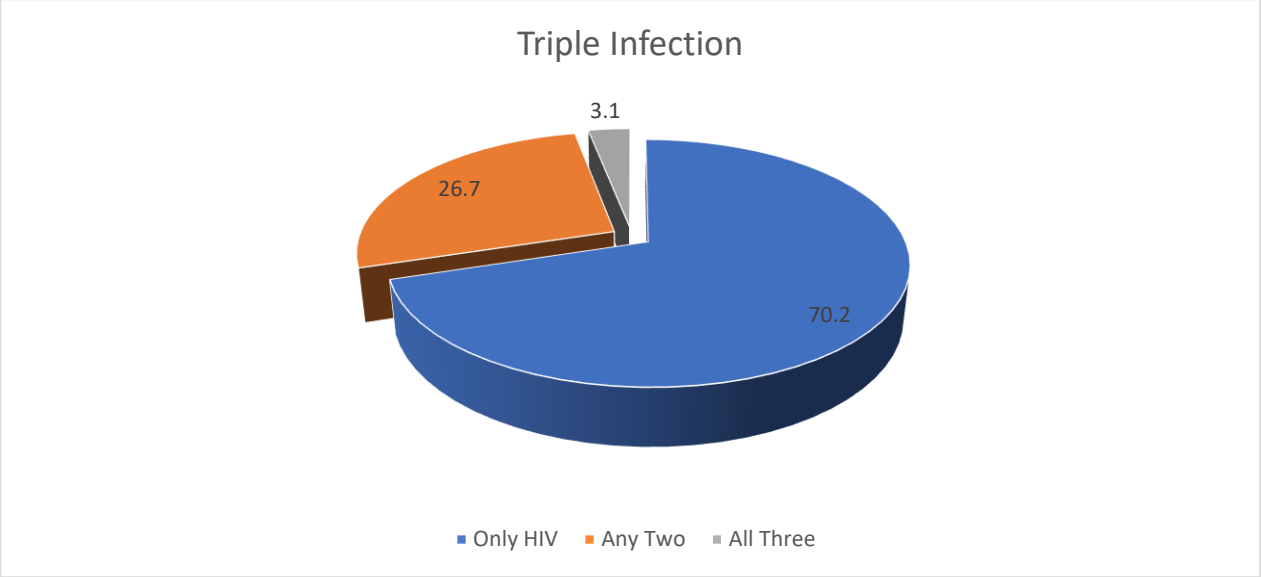


Table 3: Association of Infections with Gender

Infection		***GENDER***				***p-value***
		Male		***Female***		
		N	***%***	***N***	***%***	
HIV	Positive	124	100	37	100	N. A
	Negative	0	0	0	0	
HBSAG	Reactive	9	7.3	1	2.7	0.31
	Non-Reactive	115	92.7	36	97.3	
HCV	Reactive	35	28.5	8	21.6	0.41
	Non-Reactive	88	71.5	29	78.4	
Tripple Infection	Only HIV	84	67.7	29	78.4	0.45
	Any Two	36	29.0	7	18.9	
	All three	4	3.2	1	2.7	
*p<0.05 was considered statistically significant						

Chart 4:

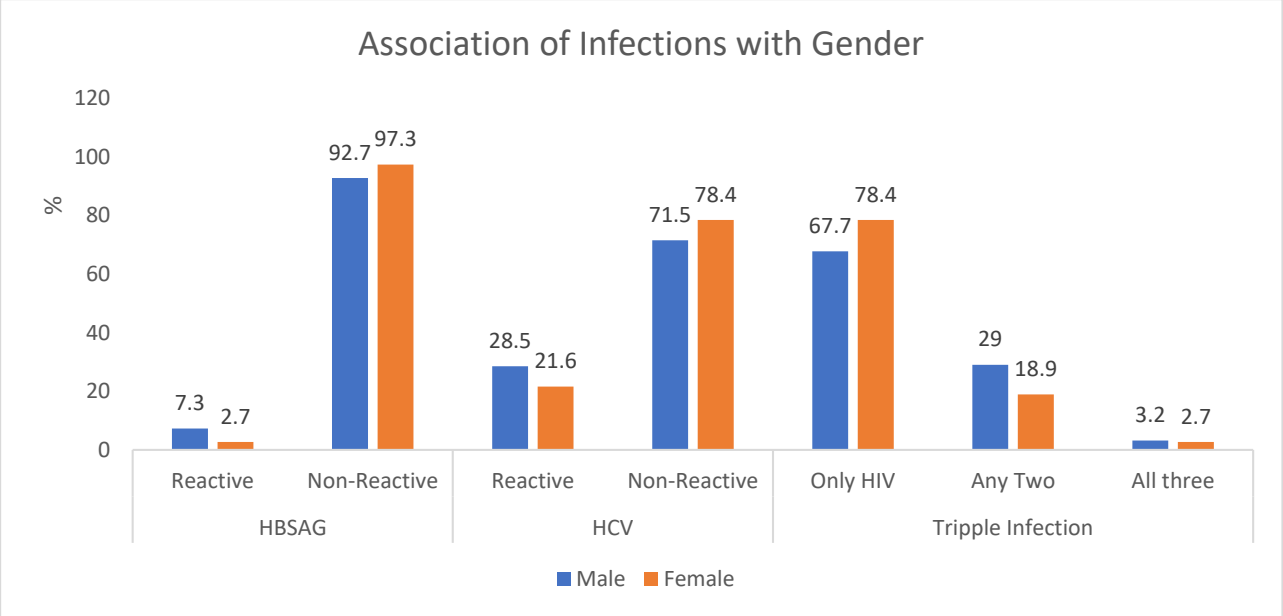
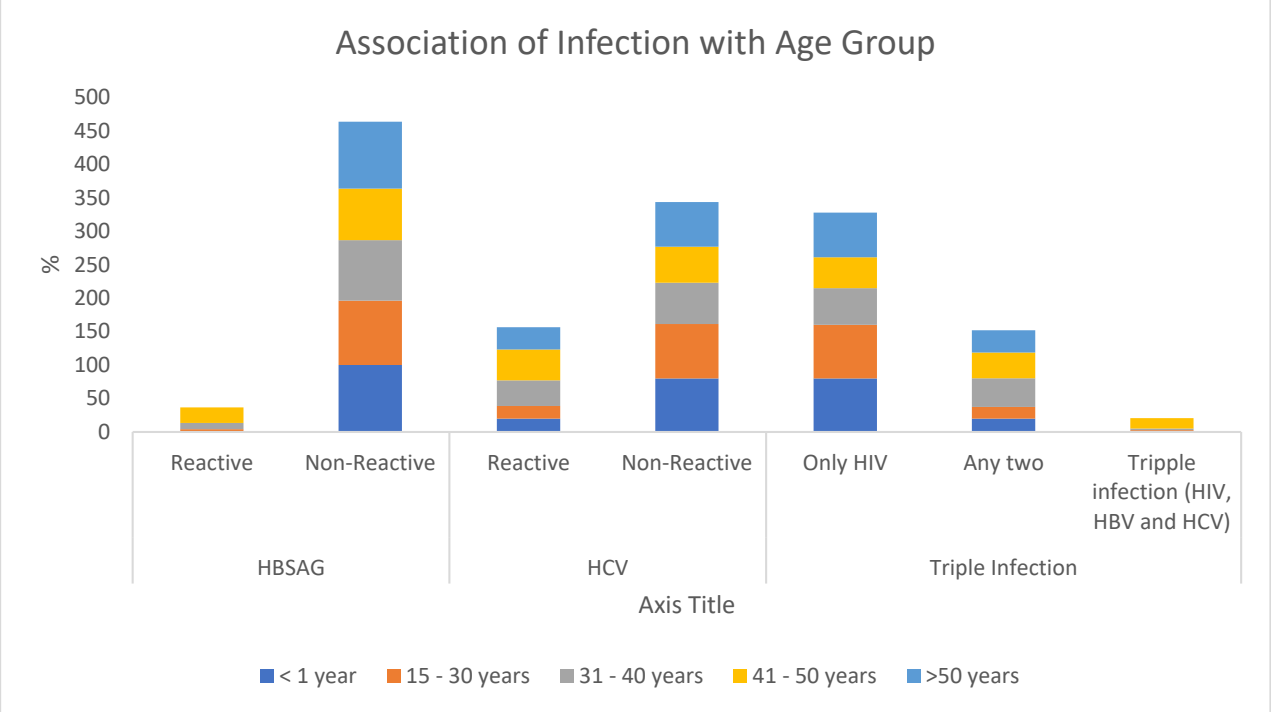


Table 4: Association of Infections with Age Group

Infections		***Age Group***										***p-value***
		< 1 year		***15 - 30 years***		***31 - 40 years***		***41 - 50 years***		***>50 years***		
		n	***%***	***n***	***%***	***N***	***%***	***n***	***%***	***N***	***%***	
HIV	Positive	25	100.0	75	100.0	42	100.0	13	100.0	6	100.0	N. A
	Negative	0	0	0	0	0	0	0	0	0	0	
HBSAG	Reactive	0	0.0	3	4.0	4	9.5	3	23.1	0	0.0	0.04*
	Non-Reactive	25	100.0	72	96.0	38	90.5	10	76.9	6	100.0	
HCV	Reactive	5	20	14	18.9	16	38.1	6	46.2	2	33.3	0.082
	Non-Reactive	20	80	60	81.1	26	61.9	7	53.8	4	66.7	
Triple Infection	Only HIV	20	80.0	60	80.0	23	54.8	6	46.2	4	66.7	0.015*
	Any two	5	20.0	13	17.3	18	42.9	5	38.5	2	33.3	
	Tripple infection (HIV, HBV and HCV)	0	0.0	2	2.7	1	2.4	2	15.4	0	0.0	
*p<0.05 was considered statistically significant												

Chart 5:



DISCUSSION

The current study aimed to find out the ratio of Hepatitis B and Hepatis C positive cases among HIV-infected individuals using retrospective record-based study at tertiary care hospital, Karachi. The total number of HIV positive cases were 161, coinfection rate of HBV with HIV came to be 6.2% and it was of 26.9% in case of HCV with HIV. It was observed that the prevalence of triple infection (HIV, HBV and HCV) was 3.1%. Males were found to be more prone to concurrent infection of HIV with Viral Hepatitis than females.

Findings of the present study are consistent with previous study conducted by Seyoum et al in 2022 using historical data extracted from medical records at three different hospitals in Addis Ababa. Accordingly, coinfection of HIV-HBV was 5.96% and HIV-HCV was 1.72% respectively [19]. Similar findings were reported in another study done at Zhongnan Hospital of Wuhan University of China. in which 6623 HIV-positive patients were included in the study and then were categorized into three different groups according to the routes of transmission namely blood borne transmission, sexual transmission and mother to child transmission. The coinfection of HBV with HIV was 27.33%, found a significant link between HBV and HIV while the coinfection of HCV with HIV was 23.60% with highest prevalence was found to be associated with blood borne transmissions [20]. These results are consistent with another

survey-based study carried out in China on newly diagnosed HIV-patients, 11,024 of total. The concurrent infection rate of HBV with HIV was 8.% and HCV with HIV was 2.4 %. This significant connection was due to same routes of transmission [21]. A prospective observational study was done at Khushal Medical Centre and Hayatabad Medical Complex in Peshawar, Pakistan. In this study, hepatitis B surface antigen for HBV and anti-hepatitis C antibody for HCV was performed in all patients with confirmed diagnosis of HIV. In agreement with our study, 78 out of 650 of HIV positive patients were coinfected with viral hepatitis that is 12%. There was 80% of coinfection rate of HIV/HBV and 29.23% of HIV/HCV. Such a high proportion of HBV/HIV confection as compared to HCV/HIV, was significantly correlated with sexual route of transmission. Male gender was more affected by HIV coinfected with viral hepatitis (HBV and HCV) [22].

In contrast to our findings, Qureshi et al. (2024) conducted a large-scale survey-based study in the province of Sindh, Pakistan included both rural and urban population. All non-residents were excluded from the study. In the survey, 6672 patients were screened for HIV, HBV and HCV. The prevalence of HIV reported to be very low that is around 0.02%, so only 2 participants were found reactive to all three different HIV tests and these are Alere kit, unigold SD and bioline HIV diagnostic kit [23]. Another survey-based study carried out at Rwanda in 2024, recruited all male individuals across the world having sex with men. Coinfection of HIV/HBV came to be only about 0.5% and HIV/HCV was 0.1%. Moreover, there were not any reported cases of triple infection according to this study that oppose the finding of our study [24]. In contrast to our findings, Li et al. (2024) reported in the study that prevalence of Hepatitis B virus in newly diagnosed HIV patients (9.0%) was higher as compared to coinfection rate of Hepatitis C virus with HIV(2.4%) in China. As our findings have showed the higher coinfection rate of HIV/HCV than HIV/HBV [25].

The concurrent infection prevalence of HIV with viral hepatitis can be attributed to similar transmission pathways shared by HIV, HBV and HCV since all three are blood borne viruses. This coinfection can cause poor prognosis in HIV-infected individuals thereby can raise motility rate more specifically in triple positive patients. For this reason, antiviral therapy has become a challenge to treat HIV along with viral hepatitis coinfection. In future, it must be added the screening of HBV and HCV as a part of management plan for HIV patients so that it can be timely treated to get over associated complications.

These findings also highlight the importance of Hepatis B vaccine as this is the first step to suppress the spread of Hepatis B virus in our community. Hospital administration committee must improve the policies and make preventive strategies for HIV, HBV and HCV infection, incorporating safe handling of hospital waste, hygiene of hands before and after patients care, use of proper PPE, sterilization/disinfection of equipment, vaccination and training of all employes before their induction. This emphasize the need for making awareness programs to create safety protocols and proactive approaches for HIV, HBV, HCV and other blood borne viruses at different schools, colleges and universities especially in rural areas.

One of the major strengths of this study was its coast effectiveness as secondary data from hospital records were used to make interferences about prevalence trends of HIV coinfection with HBV and HCV alongside the triple positive infection rate. The other most important advantage of the present study was that it was smoothly conducted within a short time period. This study was limited by having some missing information regarding exposure and risk factors since this was a secondary-data based study. There was no patient follow up so casual interferences cannot be made.

CONCLUSION

The present study have described the pattern of occurrence of HIV (human immune deficiency virus) coinfection with Hepatitis B and Hepatis C virus. Overall, there were 161 of total HIV positive cases reported, there were 6.2% of HIV-positive patients found reactive for HBsAg and 26.9% were reactive for anti-HCV. As a result, coinfection prevalence of HIV/HCV was much higher than HIV/HBV. The rate of triple infection was observed to be 3.1%. Among 161 of HIV-positive individuals, 126 were males (77%) while only 37 were females (23%), accordingly males are more likely to be infected with HIV as compared to females. The current study support the need for making new public health policies and improve preventive strategies to control the concurrent infection prevalence of HIV with viral hepatitis. In Pakistan , further studies are need in this area to accurately measure the coinfection rate of HIV with HBV and HCV especially in areas where there are limited resources. As this was a retrospective record-based study, cross-sectional study needs to conduct for achieving more reliable results. It is highly recommended to perform Hepatitis-B surface antigen and Hepatitis-C antibody test in HIV patients at least annually and must attain Hepatitis B vaccine as early as possible to reduce coinfection rate and improve the prognosis.

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