Research article

Differential Viral Load of HBV and HCV in Co-infected Patients: A Potential Battle between the Viruses

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Abstract

Viral hepatitis is one of the major health problems, in which Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) have the highest affinity to cause chronic liver disease. 5% of the people are infected from HBV and 1% are infected from HCV worldwide. In Pakistan 7.4% of the population is suffering with HBV and HCV (An Overview of Hepatitis B and C in Pakistan). Co-infection is more frequent than single infection particularly in areas where these two viruses are endemic. This study was conducted to observe and compare the viral loads of HBV and HCV in co-infected and mono infected patients in Karachi, Pakistan. A total 419 serum samples were collected from suspected patients with HBV and HCV infection. 276 were males and 143 were females, with the age ranging from 10 to 40 years. HBV DNA and HCV RNA were extracted. HCV viral load was detected in 86 patients (20%), whereas HBV/HCV Co-infected patients were detected in 89 (21%) patients. In co-infected patients, an HCV viral load of <1000 was found in 37 (41%) patients while the viral load >1000 was 52 (58%) patients. The HBV viral load of <1000 was found in 32 (35.95%) patients and >1000 was in 57 (64.04%). 87 (20.76%) of the patients tested negative for both HBV and HCV. The HBV viral load was higher than HCV viral load in co-infected patients, indicating that there may be a competition between the two viruses in which HCV is suppressed by HBV.

Keyword: HBV/HCV; Viral load; Pakistan

Introduction

Globally HBV and HCV are important human pathogens that can cause chronic liver disease resulting in cirrhosis and even hepatocellular carcinoma. It is estimated that nearly 350 million people around the world are infected with the Hepatitis B virus (HVB) and 170 million people are infected with hepatitis C virus (HCV)[1]. The viruses are classified as hepatotropic viruses because they replicate primarily in the liver. Both viruses belong to different families and therefore have different life cycles. HBV belongs to a Hepadnaviridae family and HCV belongs to a Flaviviridae family[2]. Co-infection of these two viruses is prevalent in areas where these viruses are endemic.

In non-endemic areas, co-infection of HBV/HCV is found in the high risk population which includes

injection drug users, immunocompromised patients, organ transplantation recipients, and persons having multiple sex partners3. Some cross-sectional studies have shown that in comparison with mono-infection of HBV and HCV the co-infection has a higher prevalence of liver cirrhosis4-6. Clinical observation on disease outcome and procession among patients with both HBV and HCV are uncertain and inconsistent. Reports declare reciprocated replicative abstinence of these two viruses and viral disturbance7,8. There is a lack of an appropriate model system, thus molecular and virological aspects of the co-infection of HBV and HCV are not well established2. Co-infection of HBV/HCV can occur because they share same route of transmission and patients are at high risk of progression to hepatocellular carcinoma (HCC)9-11.

Numerous studies have revealed the possible interaction of HBV and HCV and their associated effects on immune response. These studies also discovered that in co-infection both viruses are capable of inducing suppression over the other depending on the condition of co-infection11-13. In co- infected patients, the suppression of either one of the viruses depends on which virus was introduced first.

HBV superinfection is less common than HCV superinfection comparatively. Some reports have declared the clearance of HCV infection after the superinfection of HBV, whereas in Asian countries, HCV superinfection is common where HBV is prevalent13,14.

Materials and Methods:

A total of 419 samples were collected, out of which 276 were male (65.8%) and 143 were female (34.1%) within the age group of 10 to 40 years. Patients known to have chronic liver disease due to any reason other than HBV and HCV were excluded. Patients with dual infection of HBV/HIV, HBV/HDV, HCV/HIV or with triple infection were also excluded.

HBV DNA was extracted from 500 µl of serum by using the Abbott m2000sp, an automated sample preparation system designed for the purification of nucleic acids from the samples. HBV DNA was quantified with Abbott HBV Quantification kit by using Abbott rt2000 amplification and detection system. The target region of this kit is the conserve region of HBV surface antigen and the lower detection limit of kit is 10 IU/ml. HCV RNA was also extracted from 500 µl of serum by using the Abbott m2000sp. HCV RNA was quantified with Abbott HCV Quantification kit by using Abbott mrt2000 amplification and detection system. The target region of this kit is the conserve region of HCV (5 prime UTR) and the lower detection limit of kit is 12 IU/ml.

Results

A total of 419 samples were extracted and amplified to obtain HBV and HCV viral loads. Out which 332 were positive and 87 were negative for HBV and HCV (Figure 1). Gender distribution showed that 276 (66%) were male and 143 (34%) were female (Figure 2). This showed a higher prevalence of HBV and HCV in males as compared to females. HBV was detected in 157 patients and HCV was detected in 86 patients with co-infection of HBV/HCV detected in 89 patients. (Figure 3). Out of 89 co-infected samples, the HBV viral load <1000 was observe in 32 (36%) samples, whereas, HBV viral load > 1000 is observe in 57 (64%) samples. On the other hand, HCV viral load < 1000 was observe in 37 (42%) samples and HCV viral load >1000 is observe in 52 (58%) samples.

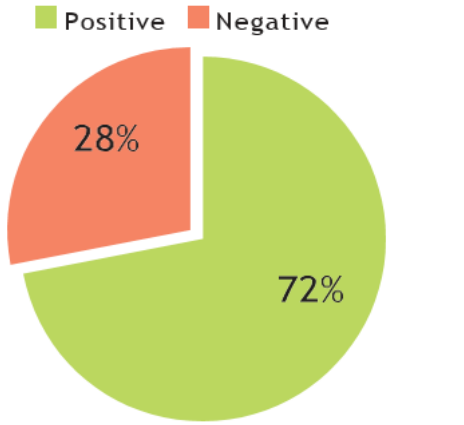

Figure 1: Total no of positive and negative patients

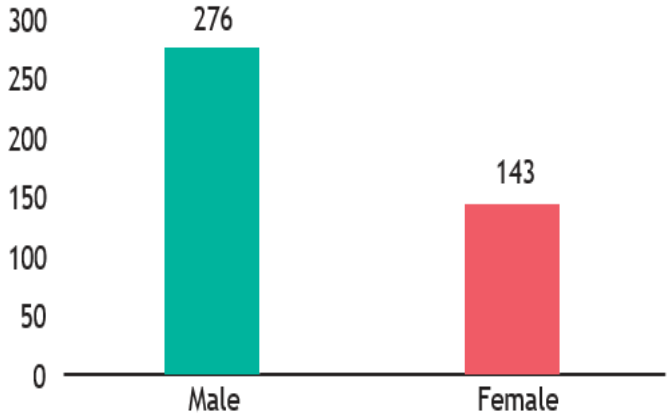

Figure 2: HBV and HCV viral loads in 419 samples

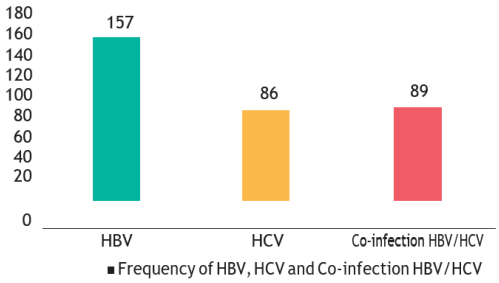

Figure 3: Frequency of HBV, HCV and Co-infection HBV/HCV

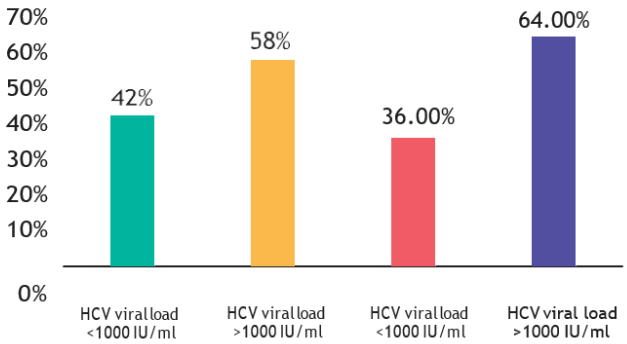

Figure 4: HBV and HCV viral load in co-infected patients

Discussion

A medical condition like co-infection of HBV/HCV is of great concern due to its treatment response, unpredictable clinical appearance and development of liver cirrhosis or carcinoma. HBV and HCV have common risk factors for infection, so the co-infection of these viruses is not uncommon[15-17]. To the best of our knowledge the data regarding the prevalence of HBV/HCV co-infection is still limited[3]. And there is not ample information regarding the treatment of these co- infected patients. The recent guidelines cannot approve any specific treatment for co-infected patients[16]. Pakistan is included in developing countries with limited economic and health care resources, low literacy rate and limited awareness about diseases. HBV and HCV share the same route of transmission, so there is a high risk of developing co-infection of HBV/HCV. The combined action of both HBV and HCV increases the chances of cancer due to combined oncogenic effects of both viruses. In this study, we observed the age of infected individuals ranging from 10 to 40 years. Males were more infected than females which may be due to exposure of high risk activities.

Out of 419 patients 157 (37.4%) were HBV positive patients and 86 (20%) were HCV positive. There was a higher chance of HBV infection as opposed to HCV. 89 (21%) of the patients were con-infected with both viruses, which established that there was a higher increase in co-infection. Combination therapy of peg-interferon and ribavirin is recommended as a standard treatment for mono infection of HCV17. Unfortunately, because of little data available on the co-infection, there is no established treatment for HBV/HCV co-infected patients3. A study reported that in HBV with chronic hepatocellular carcinoma both peg-interferon and conventional interferon-based regimens were not effective18. Recently in Taiwan a randomized prospective trial showed that for both HCV mono-infection and HBV/HCV co-infection the combination therapy of peg interferon and ribavirin is equally effective[19]. We observed high viral load of HBV DNA as compared to HCV RNA in co-infected patients, which is, may be due to possible competition of both viruses and in result possible suppression of HCV by HBV. There is also a possibility of inactive carriers. In HBV and HCV co-infected patients the treatment ability of the combination therapy of ribavirin and peg-interferon alpha was relatively similar to HCV mono- infection patients, though there are less studies to support this data. The recurrence of HBV replication is very susceptible after the viral suppression of HCV and the treatment of chronic hepatocellular carcinoma.

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