Hepatitis B and Hepatitis C viruses, revisited.

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SUMMARY

Dental health care personnel are at increased risk of acquiring blood-borne infections including hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). Infection is acquired through innoculation of infected blood by needle stick injuries, by penetrations of sharp dental instruments and by contact of mucous membrane with the infected fluid. HBV infection is a vaccine-preventable disease. There is currently no vaccine available to prevent HCV infection.

INTRODUCTION

Blood borne infections by hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) are major concerns in everyday dental practice. A study conducted between 1990 and 2013 found viral hepatitis to be the seventh leading cause of death worldwide.[1] Infection by HBV and HCV accounted for 96% of hepatitis-related mortality, with deaths mainly due to liver cirrhosis and hepatocellular carcinoma (HCC). HBV and HCV are hepatotropic viruses acquired through exposure to blood and body fluids. Infection in clinical settings is suffered whilst recapping needles, during use of dental sharp instruments i.e. scalers and rotary instruments, and contact with body fluids such as may occur with eye splashes and saliva aerosols. Other modes of transmission are through contaminated needles in users of intravenous drugs, through contaminated transfused blood and blood products, and sexual contact. In endemic areas, vertical transmission from mother to child is still the major route of infection.

PATHOGENESIS OF HBV AND HCV INFECTION

Following inoculation, a variety of clinical syndromes may develop. These include asymptomatic acute infection, acute hepatitis, fulminating hepatitis, chronic hepatitis and chronic carrier state. Chronic hepatitis may progress to hepatocellular carcinoma. Disease progression of HBV infection is monitored by serum markers for HBsAg, HBeAg and HBV DNA.[2] Whilst the presence of HBsAg signifies HBV infection, the presence of HBeAg and HBV-DNA indicate active viral replication. Infection with HCV accounts for more cases of chronic liver disease than HBV and rarely results in fulminating hepatitis.[3] Disease activity is monitored by HCV-RNA in blood and elevated aminotransferase serum levels.

ACRONYMS

ALT : alanine aminotransferase

APRI : platelet ratio index

AST : aspartate aminotransferase

CDC : Centres of Disease Prevention and Control

DAA : direct acting antiviral agents

EPI-SA : South African Expanded Programme of Immunisation

HBsAg : hepatitis B surface antigen

HBV : hepatitis B virus

HCC : hepatocellular carcinoma

HCV : hepatitis C virus

HDV : hepatitis D virus

HIV : human immunodeficiency virus

IVD : in vitro diagnostic test

NAT : nucleic acid test

PegINF : pegylated interferon

RDT : rapid diagnostic test

TTIs : transfusion-transmissible infections

WHO : World Health Organization

PREVENTION OF TRANSMISSION AND TREATMENT

Both HBV and HCV are resistant viruses which can survive in dried blood for at least a week[4] and up to six weeks[5] respectively. Whilst the risk of HBV is higher than that of HIV and HCV, a study found dental staff and student participants were more fearful of contracting HIV and HCV.[6] This is mainly due to the availability of the HBV vaccine whilst there is no preventative vaccine for HCV and HIV infections. Prevention and eradication of infection by HBV, HCV and HIV in the clinical setting is through stringent infection control measures and the use of personal protective equipment. Despite progress made in developing protocols and technologies to improve infection control practices, there are still cases recorded of blood-borne pathogens transmission in dental practices.[7] Risk for HBV occupational exposure

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from a needle stick injury or cut exposure in susceptible (not vaccinated) individuals ranges from 6%-30% depending on the HBeAg status of the source individual whilst that for HCV is approximately 1.8%.[8] This is compared with less than 1% after exposure to HIV-infected blood. [8, 9]

The study by Cleveland et al.,[7] which reviewed the literature between 2003 and 2015, revealed three published reports of HBV and HCV transmission in dental health care settings. These reports highlight the importance of infection control in disease prevention. The Centres of Disease Prevention and Control (CDC) have set guidelines for the stringent infection control measures which should be implemented in dental practice to prevent disease infection.[10] These include a designated Infection Control Co-ordinator who will monitor activity, the use of separate water systems for each dental unit which can be monitored regularly for water quality, routinely documenting percutaneous injuries and the use of safer medical devices.

HBV vaccine is part of the South African Expanded Programme of Immunisation (EPI-SA) programme; administered to babies in three doses at six, 10 and 14 weeks.[11] The vaccine is also available to all health care personnel who are in contact with patients (dentists, medical doctors, dental nurses, cleaners, porters, etc.) at three intervals as follows: first dosage soon after employment, second dose a month later and a third dose six months after the first dose. Staff employed in private practice may purchase the vaccine at leading pharmacies. Following vaccination, continuous monitoring of anti-HB antibody titres is mandatory to evaluate immunity. Vaccination for HBV also confers immunity to hepatitis D virus (HDV), whose infectivity occurs only when encapsulated by hepatitis B surface antigen (HBsAg).

For all other non-vaccinated individuals who contract HBV infection, the World Health Organization (WHO) guidelines [12] recommended Tenofovir (after exclusion of HIV-coinfection) or Entecavir (children 2-11 years) antiviral therapy in patients who are not presenting with elevated alanine aminotransferase (ALTs) liver enzymes and HBV DNA of >20 000 IU/ml. Individuals who are infected with HBV reactive for HBsAg should be monitored every six months for HCC development, every 12 months for treatment response and disease progression, and every 12 months for treatment-associated toxicity.

There is currently no vaccine available for the prevention of HCV infection. Previously, the pegylated interferon (PegINF) based treatments were mainstay therapy, with associated severe side effects which at times were fatal. Currently, interferon-free direct acting antiviral agents (DAAs) show promising results with shorter treatment duration associated with few side effects and an overall high viral efficacy.[13] Due to the increased risk of HBV reactivation during treatment, individuals have to be tested for HBV infection prior to initiating DAA therapy for HCV.[12]

HBV AND HCV SCREENING

All blood donated in South Africa is screened against transfusion-transmissible infections (TTIs including hepatitis B and C. A WHO African regional survey has shown that in South Africa, 3% of donated blood was discarded due to, amongst others, infections of HBV (0.069% of discarded blood) and of HCV (0.0144%).[14] The WHO has recommended guidelines for chronic HBV and HCV testing in order to implement prevention and treatment.[12] These guidelines recommended the use of a standardized quality -assured serological in vitro diagnostic test (IVD) or a rapid diagnostic test (RDT) to detect HBsAg and HCV antibody. In an individual infected with HBV, a positive HBsAg is compatible with HBV infection but is not definitive for cirrhosis.[15] A second laboratory test, a quantitative HBV DNA nucleic acid test (NAT), should be used to assess for treatment in a HBsAg- positive individual with elevated alanine aminotransferase levels (ALTs) and clinical disease (decompensated cirrhosis). Recommendation for serological HCV infection includes testing of anti-HCV antibody with a laboratory-based immunoassays, confirmation of viremia using a qualitative or quantitative HCV NAT test to detect HCV RNA or core antigen and treatment assessment using clinical criteria and aspartate aminotransferase (AST) to platelet ratio index (APRI) of >2.[16]

CONCLUSION

Occupational exposure to blood borne pathogens particularly HBV, HCV and HIV remains a major concern in dental practice. Not only do dental health care personnel have to be concerned about acquiring the infections from patients through occupational exposure but inadequate infection control practices will allow infections to be transmitted from patient to patient or personnel to patient. Efforts are in place to reduce viral transmission and new infections. With stringent blood screening, vaccination programmes and proper infection control measures, Hepatitis B and C viral hepatitis may soon be problems of the past.

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