ISSN: 2835-0448

International Journal of Dental Science and Dentistry Research (IJDSDR)

IJDSDR : Dental Publication

Available Online at: www.ijdsdr.com

Volume – 2, Issue – 3, May – June - 2023, Page No. : 15 – 17

A Clinical study to Detection of Hepatitis C Virus RNA chain inanimate surfaces in dental professional life

[1]D.S. Guadagnino, Institute of Infectious Diseases, Dental Science School, Naples.

Correspondence Author: D.S. Guadagnino, Institute of Infectious Diseases, Dental Science School, Naples.

How to Cite This Article: D.S. Guadagnino, "A Clinical study to Detection of Hepatitis C Virus RNA chain inanimate surfaces in dental professional life", IJDSDR – May – June - 2023, Vol. – 2, Issue – 3, P. No. 09 – 14.

Type of Publication: Case Study

Conflicts of Interest: Nil

Introduction

Hepatitis C virus (HCV), is a small RNA virus from Hepacivirus genus in Flaviviridae family. It encodes RNA-dependent RNA polymerase, which enables mutation after infection and almost always succeeds in evading host immune response. Although, acute Hepatitis C is asymptomatic, only 15%-40% of acutely infected persons clear infection while remaining end up with persistent infection and hepatic inflammation (i.e., chronic hepatitis C [CHC]). Complications include hepatocellular carcinoma, and hepatic decompensations/decompensated cirrhosis.

Decompensated cirrhosis is acute deterioration in liver function in a patient with cirrhosis and is characterized by jaundice, ascites, hepatic encephalopathy, hepatorenal syndrome, or variceal bleeding. Mortality for CHC patients with hepatic decompensation is 15%-20% in first year itself. Hepatitis C virus was first discovered by molecular cloning. HCV genome is a single-stranded RNA genome 10 kb long and 55-65 nm in size. Different HCV isolates from across world show considerable variability in nucleotide sequence throughout their genome. Based on these genomic differences, HCV has been classified into multiple strains. This genetic heterogeneity of HCV is cause for differences in disease outcome and response to treatment seen in HCV-infected persons. Hepatitis C virus genotypes: Six major genotypes (Gts) and several subtypes of HCV have an uneven global distribution pattern.

WHO estimated that in 2020, approximately 290,000 people died from hepatitis C, mostly from cirrhosis and hepatocellular carcinoma (primary liver cancer). Hepatitis C virus is a blood borne virus. It is most commonly transmitted through:

Reuse or inadequate sterilization of medical equipment, especially syringes and needles in healthcare settings, transfusion of unscreened blood and blood products, and injecting drug use through sharing of injection equipment.

HCV can be passed from an infected mother to her baby via sexual practices that lead to exposure to blood (for example, in people with multiple sexual partners and among men who have sex with men); but, these modes of transmission seem to be less common.

Hepatitis C is not spread through breast milk, food, water, or casual contact such as hugging, kissing, and sharing food or drinks with an infected person.[4]

Earlier studies have shown that Hepatitis C survives outside of human body for 5 days, however, current evidence shows that it survives for 7 weeks outside human environment even on dried inanimate surfaces at room temperature. This increases risk of transmission from fomite surfaces. There are various fomites in a dental set-up to consider, for example, electrical switches, cabinet handles, x-ray viewers, etc. which could harbour virus and act as potential sources of infection. Since most hepatitis C infections do not show up as obvious symptoms early on, a potentially infected patient can leave behind viruses in droplets contained in aerosol. Droplet particles are classified based on size: coarse (2.5–10 microns) fine (less than 2.5 microns) and ultrafine (less than 0.1 microns). Nose filters air particles above 10 microns. Droplets that are on heavier side can only travel up to six feet after which they drop down and settle on nearest surfaces.

They stated that these particles behave in a ballistic manner, meaning that they are ejected forcibly from operating site and their arc and trajectory are similar to a bullet until they hit a surface or drop down to floor. These particles are too large to remain in suspension mid-air and remain so only briefly.[6] Particles that splatter and land on surfaces are prone to further evaporation. Now it does help that universal precaution is to consider certain body fluids and blood of every patient to be potentially infectious for human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other blood borne pathogens. And yet, there is aerosol and all surfaces it comes in contact with and fact that certain viruses like Hepatitis C can survive for weeks if these surfaces are unintentionally left without being disinfected. There are many alternatives to sterilize dental set-up than traditional formaldehyde fumigation, like UV radiation for instance, which are known to sterilize or neutralize aerosol. After UV irradiation, the DNA sequence of microorganisms can form pyrimidine dimers, which can interfere with DNA duplication, as well as lead to destruction of nucleic acids, and make viruses non-infectious. There are plenty of conscientious ways to reduce bacterial or viral burden in a dental office, however, there seems to be a lax attitude regarding cross-contamination and other issues in Indian dental practices.[11] harsh truth is HCV transmission risk during dental care is probably associated with sterilization and infection control gaps.[12] Considering how some procedures can transmit particulate aerosol for up to six feet and, without air current, this particulate remain suspended from 35 minutes to several hours.[13] If this suspended particulate is beyond ten microns, gravity causes these particles to settle on surrounding surfaces, such as patient and immediate clinical area, for up to two meters**.** Even with impeccably maintained settings could some fomites be overlooked. This is question we set out to explore in this study, where frequently used surfaces are cleaned and disinfected regularly while certain other infrequently touched surfaces are probably not as habitually disinfected, could these surfaces around dental chair harbour viral RNA, so we hypothesized that Viral RNA could be found in dental setup also & this hypothesis was tested by analysing swab samples for viral RNA

collected from a few inanimate surfaces in vicinity of a dental chair.

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