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Journal of Antivirals & Antiretrovirals

Commentary

Hepatitis B Infection Growth and Regulation

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ABOUT THE STUDY

The conventional war on Hepatitis B Virus (HBV) in hemodialysis has been largely successful, thanks to widespread vaccination policies and infection control procedures such as mandatory HBV screening and surveillance, as well as contact isolation of HBV-positive patients. Since 1995, these efforts have resulted in a 95% decrease in HBV infections and a stable seroprevalence of 1% in dialysis facilities. The case series of HBV mutant infections reported in this issue of Kidney Medicine, on the other hand, serves as a sobering reminder that the war against HBV is still ongoing. Guerrilla-like tactics used by rare but emerging mutant virus strains could pose new risks in hemodialysis facilities. This report describes four HBV infections that were linked to an undetectable hepatitis B surface antigen (HBsAg) test result. As a result of the delay in identifying HBV mutant infections and the failure to institute HBV isolation procedures to protect patients and dialysis staff, patient safety was jeopardized. The lack of a consistent clinical picture to assist dialysis facilities in suspecting the presence of a mutant HBV infection was a major source of concern.

HBV infection remains a global health issue, particularly outside the United States, and is linked to significant morbidity and mortality from cirrhosis and hepatocellular carcinoma. The problem of chronic HBV infections in patients from endemic regions is becoming more problematic as hemodialysis becomes more globalised. In the immunocompromised end-stage kidney disease population, a poor response to HBV vaccination has raised concerns about the ongoing risk of dialysis-related transmission. The appearance of strains containing variants in the preS1, preS2, and S regions of the HBsAg gene has increased concern about the threat of HBV mutant infections. These mutations create conformational changes in surface antigen structure or reduce expression of HBV surface proteins that lead to undetectable HBsAg by enzyme-linked immunosorbent assay.The presence of these mutant strains has been linked to occult HBV infection in dialysis facilities, and they present with highly variable clinical manifestations, making detection difficult without quantitative Polymerase Chain Reaction (PCR). Although low-level occult HBV viremia or mutant HBV exposure does not always result in clinically significant hepatic disease in chronic kidney failure, it remains a serious safety concern, especially given the risk of HBV reactivation after kidney transplantation.

In terms of numbers, the ratio of HBV mutant to wild-type strains is most likely extremely low. The magnitude of the threat of mutant HBV relative to the entire dialysis population is small across the vast expanse of dialysis facilities in the United States.

However, the silent nosocomial spread of occult HBV poses a public health quandary. Decision-makers will struggle to come up with a resource-efficient way to combat the unlikely but potentially disastrous consequences of a mutant HBV outbreak. Combating a guerilla-like foe that can appear anywhere, at any time, and without warning highlights the guerilla-like characteristics of mutant HBV strains. Though a rare threat, mutant HBV infections have the potential to cause far more disruption, confusion, and chaos than their rarity suggests. This situation is strikingly similar to the quandary confronting military commanders attempting to deploy forces against an adversary who prefers to strike where defenses are weakest and attacks are least expected.

Vigilance against occult HBV mutant infections appears warranted, but using HBV DNA PCR for screening and detection indiscriminately would be costly and inefficient. Multiple layers of defence against HBV should be included in a systems-level infection prevention strategy. Conventional HBsAg screening will detect some HBV mutants, because a small number of dialysis organisations provide the majority of outpatient hemodialysis in the United States, there is an opportunity to standardise testing practises to ensure that the more sensitive assays are used.

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Received: 20-Sep-2022, Manuscript No. JAA-22-19522; **Editor assigned:** 22-Sep-2022, PreQC No. JAA-22-19522 (PQ); **Reviewed:** 05-Oct-2022, QC No. JAA-22-19522; **Revised:** 11-Oct-2022, Manuscript No. JAA-22-19522 (R); **Published:** 17-Oct-2022, DOI: 10.35248/1948-5964.22.14.245

Citation: Jilkar L (2022) Hepatitis B Infection Growth and Regulation, J Antivir Antiretrovir. 14:245.