Gastrointestinal Tract

REVIEW

COVID-19 vaccine and liver dysfunction

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ABSTRACT

Due to the COVID-19 pandemic's high death rate and rapid spread, an effective vaccination is urgently needed. The detrimental consequences of the COVID-19 vaccination have received a lot of attention in reports on the vaccine's side effects. The liver problem that appears after getting the COVID-19 immunization causes clinical hepatology considerable concern. Hepatitis is one of the clinical issues that the COVID-19 vaccine may cause. Often, the autoimmune pathogenic process is mentioned in relation to the pathophysiology. Although the precise cause of the COVID-19 vaccine-related liver dysfunction is not yet understood, immunopathological mechanisms are likely to be involved.

Key words: COVID-19, vaccine, liver, dysfunction

INTRODUCTION

The rapid spread and high fatality rate of the COVID-19 pandemic make the development of a potent vaccine imperative.[1] According to the literature currently in circulation, both immunizations aid in preventing SARS-CoV-2 infection. Nonetheless, considering the recentness of the vaccination, any potential side effects are more concerning.[2] Pharmacovigilance was unintentionally brought to light when a few innovative vaccinations developed in response to the COVID-19 pandemic received emergency approval and were widely distributed in late 2020.[2] Due to the employment of cutting-edge technologies and the anticipated rapid and extensive deployment of the vaccines, an efficient worldwide post-marketing safety surveillance system was stressed.

A regulatory agency study and in-depth clinical evaluation of the immunizations were conducted. The range of COVID-19 vaccination adverse effects have been discussed in numerous studies. The endocrine problem that emerges after getting the COVID-19 immunization is of great concern to clinical endocrinology. The key worry raised by the study's authors is that after receiving the COVID-19 vaccination, liver dysfunction might develop into a medical issue. Many clinical problems could develop after receiving the COVID-19 vaccination, as was already indicated. Liver problem after COVID-19 vaccination is a topic that should be discussed.

The vaccinations underwent a rigorous clinical analysis and regulatory agency review. The purpose of this manuscript, which is a brief review, is to raise awareness about the risk of auto-immune hepatitis (AIH) among those who have received the COVID-19 vaccine. Second, it's crucial to record vaccine adverse effects, particularly for brand-new vaccines and medications. Next, we must list any adverse effects, but it is crucial that readers understand that these problems are infrequent before reading further. Here are the important words along with a succinct explanation.

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COVID-19 VACCINATION AND HEPATITIS

As was already indicated, it is believed that immunopathological mechanisms play a role in the hepatitis brought on by the COVID-19 immunization. In a recently published article by *et al.*,[3] there are reports on new evidence of autoimmune reactions in response to various COVID-19 vaccines, including in patients with special disease backgrounds like primary sclerosing cholangitis (PSC), liver transplantation, and prior hepatitis C virus (HCV) treatment. Molecular mimicry, adjuvants, epitope dispersion, bystander activation, the X chromosome, and perhaps SARS-CoV-2 hepatotropism all have a role in the partial explanation of these autoimmune reactions.[3] Immunosuppressive corticosteroids, with or without azathioprine, are beneficial in treating such post-COVID-19 vaccination autoimmune hepatitis. To pinpoint the exact process and prove causation, additional proof is required.[3]

COVID-19 vaccine included hepatitis in healthy vaccine recipient

In general, autoimmune hepatitis is a non-communicable, chronic inflammatory autoimmune disease that develops when the body's own immune system attacks normal, healthy liver cells. Although the exact cause of autoimmune hepatitis is frequently unknown, the condition may be influenced by a number of genetic, environmental (including pharmaceutical and natural infection) and immunological factors. Immunization practices may make autoimmune hepatitis worse.[4–6] An individual who was previously healthy may develop autoimmune hepatitis after getting the COVID-19 vaccination. The patient's eyes, urine, and feces may all have a yellowish hue. Laboratory testing usually reveal elevated bilirubin and liver enzyme levels.[4–6]

Immunoglobulin G levels are typically positive, as are antinuclear antibodies, anti-smooth muscle antibodies, and other markers. Typically, the liver biopsy reveals histopathological anomalies indicative of autoimmune hepatitis.[4–6] The patient was diagnosed with autoimmune hepatitis after extensive clinical and laboratory tests. This symptom might be the abrupt worsening of a latent autoimmune condition that the immunization brought on. It could have been weeks or even months between receiving the vaccination and contracting hepatitis.[4] Yet, there is widespread concern regarding the exact causation of hepatitis. It may or may not be a new episode or a relapse of an unidentified liver disorder.[5–6] Particularly in those who are predisposed, atypical immune responses and bystander activation brought on by molecular mimicry are believed to be potential pathways for autoimmune reactions.[6–7] This is accurate despite the fact that the precise cause of these reactions is unknown. As long as strict immunization against SARS-CoV-2 is underway, clinicians are urged to remain cautious and examine AIH in patients presenting with comparable signs and symptoms.[6–8] It is suggested that the vaccine can impair self-tolerance and trigger autoimmune reactions through cross-reactivity with host cells.[7–9] As a result, medical personnel must use caution during the widespread COVID-19 immunization.[7–8]

COVID-19 vaccine induced hepatitis in vaccine recipient with underlying liver problem

Vaccine recipient with viral hepatitis carrier status: There have been reports of hepatitis episodes in persons who received the COVID-19 vaccine and had underlying chronic viral hepatitis. According to Hasegawa *et al.*,[9] this is the first case report of autoimmune hepatitis with a history of HCV treatment. Although while the COVID-19 vaccination is beneficial, we are all concerned that it might also be dangerous. Changing the semen concentration and total motile count of current study participants might be harmful. As vaccine recipients' pre-vaccination health and immunological status cannot be established, the cause of the patient's hepatitis in this case is still a mystery. Due to conflicting facts, the people may grow discouraged and oppose immunizations.

Nonetheless, the COVID-19 vaccination has been given to a large number of hepatitis B and C carriers in numerous endemic settings, and there is no issue.[10] Nonetheless, a patient comorbidity could be the source of the issue.[11] Although the patient's underlying viral hepatitis was obvious, other comorbidities could still exist. Co-infections, which might occur to vaccine recipients after receiving the vaccine, may be considered a vaccine impact. Dengue fever is one such example. As an illustration, consider the impact of concurrent dengue infection on sperm concentration and count.[12] To reach a conclusion about the vaccine's effects on andrology, there must be sufficient evidence. A group of people with known pre-vaccination immunological and health statuses who were afterwards observed to assess how the vaccine changed liver function status would provide more conclusive evidence on this topic.

Vaccine recipient with underlying PSC: An intriguing research topic in clinical hepatology is the hepatitis triggering in a vaccination recipient with PSC. Duengelhoef *et al.* recently examined the humoral and cellular immune response to the SARS-CoV-2 vaccine in patients with AIH and individuals with cholestatic autoimmune liver disease (PSC) and primary biliary cholangitis (PBC). Duengelhoef *et al.* came to the conclusion that individuals with autoimmune hepatitis had greater rates of SARS-CoV-2 infection and worse B- and T-cell responses to the SARS-CoV-2 vaccine than

PBC and PSC patients, despite the absence of immunosuppression. As a result, in AIH patients, antibody responses to vaccination need to be tracked, and early booster vaccinations should be considered in low responders. Furthermore, the COVID-19 vaccination is safe whether it is given in the standard 2-dose regimen or as an additional booster.[13,14]

Vaccine recipient with post liver transplantation status: The COVID-19 vaccination may result in a severe episode of hepatitis, requiring the patient to undergo liver transplantation.[15] The prevalence of hepatitis among COVID-19 vaccine recipients who have had liver transplants is unknown, though. Hepatitis was not mentioned in a recent study,[16] despite the rate of adverse events being comparable between healthy vaccine recipients and receivers with post-liver transplantation status. Because COVID-19 hepatitis is so uncommon and there are so few data on vaccine recipients who have post-liver transplantation status, more study is needed on this specific subject.

Vaccine recipient with liver cirrhosis: Information on the safety and immunogenicity of the COVID-19 vaccine in patients with compensated (C-cirrhosis) and decompensated (D-cirrhosis) cirrhosis is lacking. In cirrhotic patients, inactivated COVID-19 immunizations are safe and have acceptable immunogenicity, according to a recent study. Child-Pugh score levels of B and C are linked to hyporesponsiveness to COVID-19 vaccination.[17]

COVID-19 VACCINATION AND LIVER FAILURE

As was mentioned earlier, liver damage has been linked to SARS-CoV-2 immunization. When someone has severe hepatitis or immune-mediated symptoms, corticosteroid medication may be helpful. The outcome was typically positive, but in severe cases, vaccine-associated liver injury can result in fulminant liver failure.[17] After receiving the first dose, Efe *et al.*[18] advised switching to a different manufacturer for the second dose. However, it should be note that the liver failure after receiving COVID-19 vaccine is extremely rare. A diminished immune response to vaccination is caused by chronic hepatic dysregulation and the underlying cirrhosis-associated immune dysfunction, which may impair vaccination efficacy rates and the duration of protection.[19] Current recommendations consider timely immunization and frequent booster shots administration to be required in this situation.[19] The majority of vaccine-related side effects are minor in character and comparable to those that have been recorded in the general population, while the incidence of liver injury after immunization is quite uncommon.[19] At least, it should note that there is still no conclusive evidence that the liver failure is resulted from vaccine. A recent study on the liver transplant cases, who have relatively poor liver function, there is no graft rejection or liver failure development after vaccination.[20]

COVID-19 VACCINE AND HYPERBILIRUBINEMIA/JAUNDICE

It is clear that people who have COVID-19 infection run the risk of liver damage. Nevertheless, despite the development of antivirals and the availability of many vaccinations, abnormal liver function test results and jaundice are still found in COVID-19 individuals.[21] Regarding COVID-19 vaccination, jaundice is an interesting clinical problem in a vaccine recipient. There are several possible etiologies of post-vaccination jaundice and it might or might not be associated with COVID-19 vaccine.[22] If there is a link between jaundice and vaccination, the underlying pathophysiology could be related to either the liver or a non-liver pathomechanism. A good example is the hemolysis caused by the COVID-19 vaccination, which can lead to jaundice.[23] A hypothesized underlying pathogenic process for liver-related post-vaccination jaundice is an autoimmune mechanism leading to hepatitis.[8,24] According to the study by Roy *et al.*, jaundice is the most common clinical presentation in a vaccine recipient who has vaccine induced autoimmune hepatitis.[25]

CONCLUSION

Hepatitis brought on by the COVID-19 vaccination is a significant issue in the current period of widespread COVID-19 immunization. Hepatitis is one of the clinical issues that the COVID-19 vaccination may cause. Typically, the autoimmune pathogenic process is considered in relation to the pathophysiology. Immunopathological mechanisms are probably at work in the hepatitis that has been related to the COVID-19 vaccine, despite the fact that its precise origin is still unknown. Further research is required to determine whether getting the SARS-CoV-2 vaccine increases the risk of developing autoimmune disorders. There is evidence of liver damage from the SARS-CoV-2 vaccination. Corticosteroids may be beneficial for people with severe immune-mediated symptoms or hepatitis. Even if a link between the two cannot be established, people with known autoimmune liver problems should exercise caution when receiving vaccinations.

DECLARATIONS

Author contributions

Wiwanitkit V wrote the article, revised the article and approved final submission; Yasri S wrote the article,

revised the article and approved final submission; Joob B wrote the article, revised the article and approved final submission.

Conflicts of interest

No conflict of interest is reported.

Data sharing statement

No additional data is available.

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