

times may occur. In some of the cases of TTP, the cause is traced to some points such as autoimmune disorder, certain medications which can trigger the disease, bacterial infections, pregnancy and so on. Some causes are not yet detected and their occurrence remains a topic of research. In rare cases, it can be inherited by offspring from its parent. The inheritance of TTP is also known as Upshaw-Schulman syndrome. In such cases dysfunction in enzyme ADAMTS13 (A Disintegrin and Metalloproteinase with a Thrombo-Spondin type 1 motif, member 13) is found at birth it. Otherwise there is involvement of certain antibodies which inhibits the functioning of enzyme ADAMTS13 [16]. The subtle and non-specific symptoms and associated signs make it more difficult to diagnose it precisely. In some patients the symptoms may range from diarrhea to influenza like symptoms.

Seizures and occasional jaundice are also considered as symptoms or signs of onset of TTP. Purpura is a condition where there are spots of red or purple color which are discolored on the skin and do not change color to white even after applying pressure. These spots are caused by injury in vessels and bleeding underneath skin occurs. This mainly happens due to low platelet count. The spots may vary from few millimeters to one centimeter. Exchange of plasma therapy happened to be a boon for the patients of thrombotic thrombocytopenic purpura as the risk associated with producing fatal clinical outcome has been dropped to 20 percent from whopping 90 percent. Timely intervention can be very effective in managing the patients of TTP [17].

In the post vaccination scenario, some patients have developed the TTP. This can create scare and can hamper the vaccination drive which is the only available and viable option to contain the pandemic. In a study one on five patients which experienced TTP post vaccination, one can find a guiding light to clear the issue properly. Severe venous thromboembolism has been found in these patients after 7 to 10 days post vaccination. Out of this, four patients had severe cerebral venous thrombosis which produces fatal clinical outcome for 3 out of them. The reason of the death of three patients was intracranial hemorrhage. The common string among all the patients was high level of antibodies to PF4 poly anion complexes. There was a sound link between thrombosis and immune system [18].

Issues with vaccines of COVID-19

Vaccination is the only arsenal available with us to contain the viral spread. Therefore it is necessary to carry out the process as soon as possible and in smooth and hassle free way. There is a general tendency of doubting any medications that has arrived for the first time in the market. Vaccines have a long history of taking doubts on them. The trust needs to be built by competent authorities. Events like TTP among the vaccinated population can be detrimental to the vaccination efforts. Other issues are supply and demand mismatch, ambiguity in deciding the time duration between two dosages of vaccine. There is a recent study which

suggested that COVID-19 infected and recovered patients must not be given preference whole vaccinating because the antibodies made by the body in response to this external pathogenic invasion are sufficient for them from protection from reinfection. It can solve the demand supply mismatch and targeted vaccination can be achieved. These people can be vaccinated in later stage of the vaccination drive [19].

CONCLUSION

Mutations or changing genomic sequence are inevitable in case of the viruses. Hence we have to be more watchful about it. Genome sequencing must be done at fixed intervals among samples from different geographical background so that all the mutations are listed and studied. The frequency of the sequencing can be increased. COVID-19 pandemic is still developing and pandemic is still far from over. The instances of Thrombotic Thrombocytopenic Purpura (TTP) are extremely rare and should not be blown out of proportion. Proper study is needed with larger pool and cross country cohort so that concrete evidence can be presented before people. Vaccine hesitancy should not gain ground among normal folks. Comorbid patients can take advices from their physician before getting vaccinated. Although there is no such requirement. The issues related to vaccination should be resolved at the earliest so that no questions remain in the mind of people before vaccinating themselves. Prevention is better than cure has been proved in COVID-19, therefore, till the issues related to vaccine of COVID-19 is not resolved, all the preventive measures must be followed with utmost sincerity.

REFERENCES

1. Coronavirus Resource Center (CRC). COVID-19 map. Johns Hopkins University of medicine, 2021.
2. Bawiskar D, Phansopkar P, Gotmare AV. COVID-19 facets: Pandemics, curse and humanity. IJRPS 2020; 11:385-390.
3. World Health Organization (WHO). WHO Coronavirus (COVID-19) dashboard. 2022.
4. Vetter P, Vu DL, L'Huillier AG, et al. Clinical features of COVID-19. BMJ 2020; 369:m1470.
5. Shah SJ, Barish PN, Prasad PA, et al. Clinical features, diagnostics and outcomes of patients presenting with acute respiratory illness: A retrospective cohort study of patients with and without COVID-19. Clin Med 2020; 27.
6. Zimmermann P, Curtis N. Coronavirus infections in children including COVID-19: An overview of the epidemiology, clinical features, diagnosis, treatment and prevention options in children. Pediatr Infect Dis J 2020; 39:355-368.
7. Wang T, Du Z, Zhu F, et al. Comorbidities and multi organ injuries in the treatment of COVID-19. Lancet 2020; 395:e52.

8. Shaffer L. 15 drugs being tested to treat COVID-19 and how they would work. *Nat Med* 2020.
9. Owa AB, Owa OT. Lopinavir/ritonavir use in COVID-19 infection: Is it completely non-beneficial? *J Microbiol Immunol Infect* 2020; 53:674–675.
10. Venkatasubbaiah M, Dwarakanadha Reddy P, Satyanarayana SV. Literature based review of the drugs used for the treatment of COVID-19. *Curr Med Res Pract* 2020; 10:100–109.
11. Xu P, Zhou Q, Xu J. Mechanism of thrombocytopenia in COVID-19 patients. *Ann Hematol* 2020; 99:1205–1208.
12. World Health Organization (WHO). COVID-19 vaccines. 2021.
13. Merchant HA. COVID vaccines and thrombotic events: EMA issued warning to patients and healthcare professionals. *J Pharm Policy Pract* 2021; 14:32.
14. Kim JH, Marks F, Clemens JD. Looking beyond COVID-19 vaccine phase 3 trials. *Nat Med* 2021; 27:205–211.
15. Torjesen I. COVID-19: Risk of cerebral blood clots from disease is 10 times that from vaccination, study finds. *BMJ* 2021; 373:n1005.
16. Sissa C, Al-Khaffaf A, Frattini F, et al. Relapse of thrombotic thrombocytopenic purpura after COVID-19 vaccine. *Transfus Apher Sci* 2021; 60.
17. Folegatti PM, Ewer KJ, Aley PK, et al. Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: A preliminary report of a phase 1/2, single blind, randomized controlled trial. *Lancet* 2020; 396:467–478.
18. Schultz NH, Sorvoll IH, Michelsen AE, et al. Thrombosis and thrombocytopenia after ChAdOx1 nCoV-19 vaccination. *N Engl J Med* 2021; 384:2124–2130.
19. Jayadevan R, Shenoy R, Ts A. Survey of symptoms following COVID-19 vaccination in India. *Med Rxiv* 2021.