JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

THE COVID-19 POST VACCINATION: AUTOIMMUNE EFECTS.

Dhamane Mahesh Vilas and Dhakane Priyanka Ankush

Dr. Vithalrao Vikhe Patil Foundation, college of Pharmacy, Ahemadnagar, Maharashtra, India

Abstract:

The COVID-19 is the infectious disease caused by the virus called as SARS-CoV-2 Virus. The COVID-19 virus infects the many people and it is the most serious disease. The COVID-19 pandemic has a major impact on our living life[1,2]. It has affected the global economy and health. The COVID-19 caused by the corona virus which damages the respiratory system and also affects the immunity. The one of the most effective way to control the spreading of the COVID-19 is the vaccination. When the new drug come into the market the drug passes through the many processes. The time required for the development of new drug to come into the market it take a time of 12 to 15 years, but in COVID-19 pandemic the vaccine are developed in 2-3 months. The most of the vaccine for COVID-19 during pandemic are approved without detail studies on their side effects or long term effect on the various system of the body. The many autoimmune disorder are observed after the COVID-19 vaccination[2,3].

The COVID-19 vaccination is very important for the prevention of the Corona Virus. It is the effective way for the prevention of it but it shows some autoimmune disorders after the vaccination that are summarized in this review for the understanding the hypersensitivity of the immune system.

Key words: autoimmune disorder, COVID-19 Vaccination, thrombocytopenic purpura, Graves' disease, Type 1 diabetes mellitus.

Introduction:

Almost three- four years have passed since the beginning of the novel corona virus disease 2019 pandemic. Studies have revealed that more than one- third of patient with COVID-19 developed a range of symptoms after the acute phase of the infection. The many autoimmune disorder are observed after the COVID-19 vaccination [e.g. immune thrombotic thrombocytopenia, alopecia areata, autoimmune liver disease, Guillain-Barre syndrome, IgA nephropathy][4,5].

Autoimmune phenomena	Vaccine type
Vaccine-induced immune thrombotic thrombocytopenia	Adenovirus vector vaccine and mRNA vaccine
Immune thrombocytopenic purpura	mRNA vaccine
Autoimmune liver diseases	mRNA vaccine and Adenovirus vector vaccine
Guillain–Barré syndrome	mRNA vaccine and Adenovirus vector vaccine
IgA nephropathy	mRNA vaccine
Autoimmune polyarthritis	mRNA vaccine
Rheumatoid arthritis	mRNA vaccine and Adenovirus vector vaccine
Graves' disease	mRNA vaccine
Type 1 diabetes mellitus	mRNA vaccine
Systemic lupus erythematosus	Adenovirus vector vaccine

Table.1: The autoimmune disorder caused by COVID-19 Vaccine.

The many scientist work on COVID-19 vaccine showing 100% effect against the corona virus. There are about 21 vaccines available in market worldwide. The 137 vaccines are in clinical trials and about 194 vaccines are in the pre-clinical development[3,5].

Diseased caused post COVID-19 Vaccination:

1. Vaccine-induced immune thrombotic thrombocytopenia purpura:

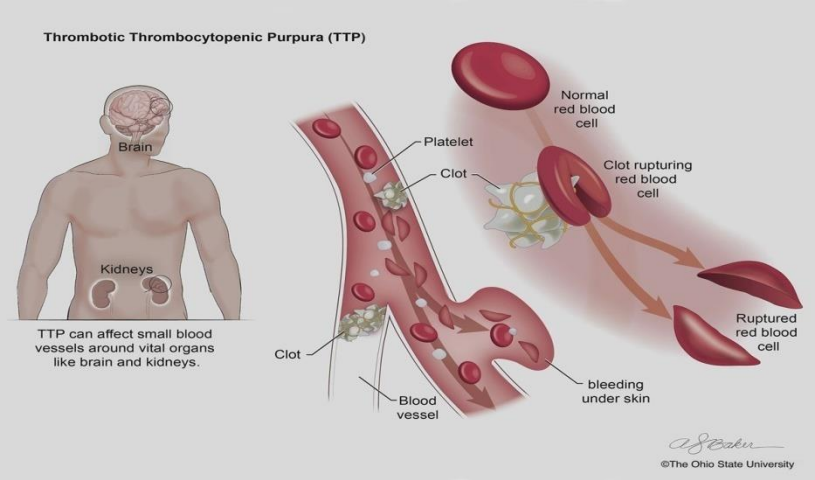

Fig.1: Thrombotic thrombocytopenia purpura.

Thrombotic thrombocytopenia is a rare disorder, in which causes blood clots (thrombi) to form in blood vessels throughout body. The block causes serious problems when it causes the block in the vessels and restrict the blood flow. Due to the blockage or clots from the complication including neurological problem[6,7].

Blood clots normally from to stop blood loss of the sites of blood vessel injury, but in thrombotic thrombocytopenia the blood clots form without injury[8].

Types:

- **Acquired (non inherited)**
- **Familial (inherited)**

The non-inheritable type typically seems in late childhood or adulthood. Affected people could have one episode of signs and symptoms, or, additional normally, they'll expertise multiple recurrences over time. The familial type of this disorder is far rarer and usually seems in infancy or babyhood, though it will seem later in life. In individuals with the familial type, signs and symptoms typically recur on a daily basis and will come throughout times of stress, like throughout ill health or physiological state[7,8].

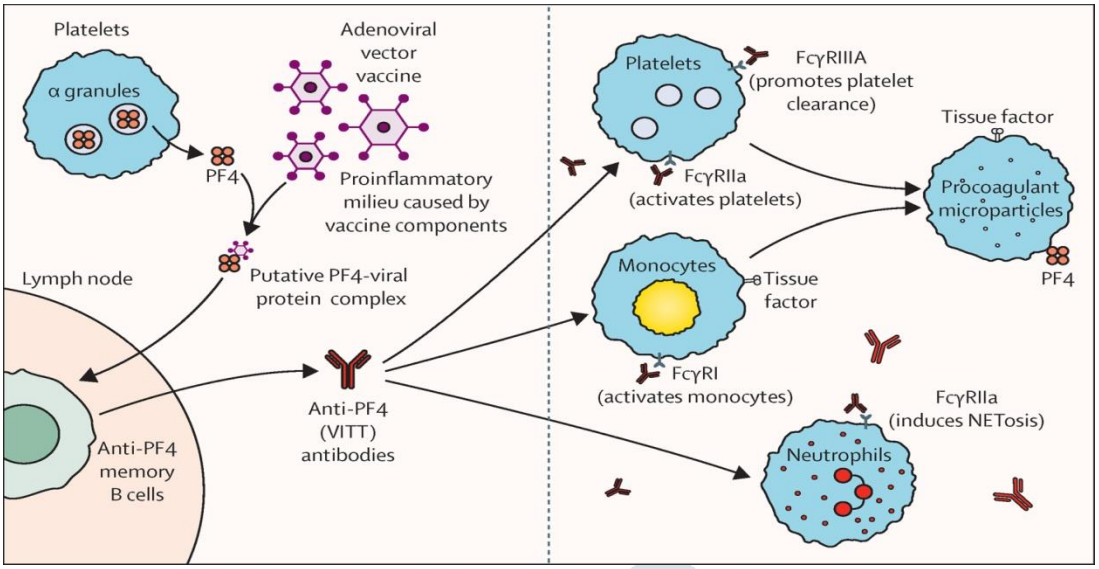

Fig.2: Immune Thrombotic Thrombocytopenia purpura.

In the February of 2021 the immune thrombotic thrombocytopenia or prothrobotic syndrome was observed in small number of indivi9duals how take the vaccine i.e. ChAdoX1 CoV-19 vaccine. The adenoviral vector-based vaccine also shows this disorder after the vaccination. The exact incident of the Vaccine Induced Thrombotic Thrombocytopenia is unknown because it is very rare. There are about hundred patient will be found VITT in many million individuals. The VITT is caused by antibodies that recognize platelet factor. Due to the activated platelet the coagulation of the blood cause and it causes the clots in blood[6,7].

Symptoms:

- Personality change
- Headaches
- Confusion
- Slurred speech
- Fever
- Abnormal kidney function
- Abdominal pain
- Heart problems
- Purplish spots on skin
- Hemolysis
- Jaundies

Treatment:

- Therapeutic plasma exchange (plasmapheresis)
- The drug used for to treat Thrombotic thrombocytopenic purpura (TTP) are as follows: Glucocorticoids, Vincristine, Rituximab and Cyclosporine A
- Removal of spleen (spleen makes antibody that block ADAMTS13 enzyme

2. Autoimmune liver Diseases:

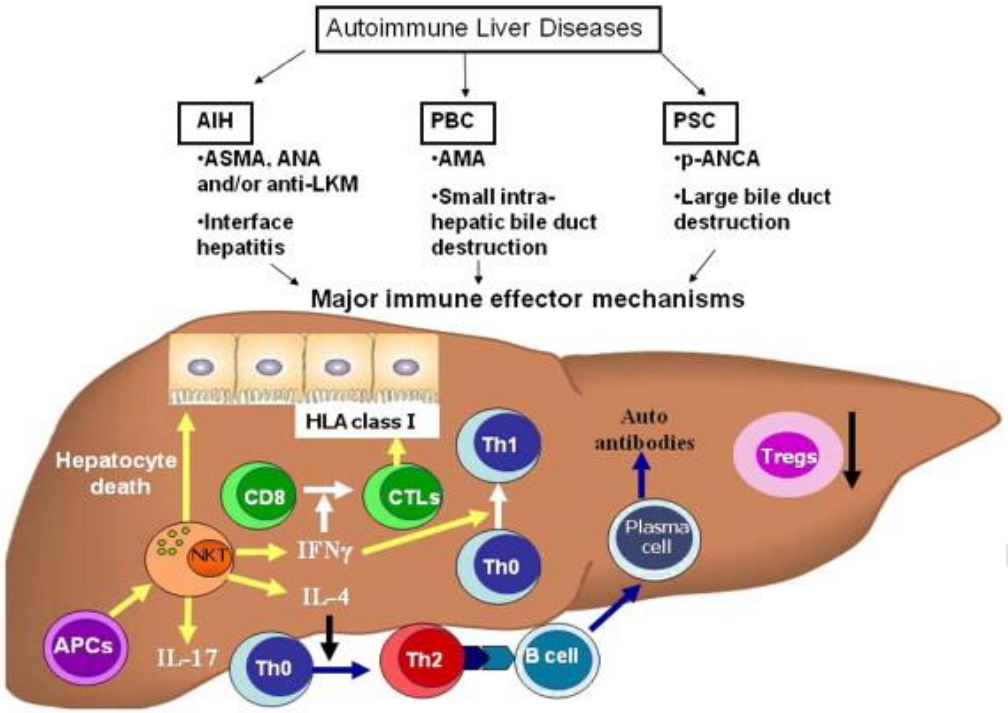

Fig.3: Autoimmune Liver Diseases.

The autoimmune liver disease is also called as the autoimmune hepatitis, in this the inflammation of liver is occurs. When the body's immune system turns against liver cells. The exact cause of it is unclear. The untreated autoimmune hepatitis damages the liver and also causes the liver failure[9].

The autoimmune system is attack on the own liver cell and lead to the chronic inflammation and serious damage to liver cells[9,10].

Types:

- **Type-1 autoimmune hepatitis.**
- **Type-2 autoimmune hepatitis.**

Symptoms:

- Fatigue
- Abdominal discomfort
- Jaundice
- An enlarge liver
- Abnormal blood vessels on the skin
- Skin rashes
- Joint pains
- Loss of menstrual periods.

Treatment:

- **Liver Transplantation:**
  When the autoimmune hepatitis does not respond on the drug treatment the liver transplantation is done.
- **By using the drugs that suppress the immune system:**
  Glucocarticoid (steroid medication) like Prednisone
  Budesonide.

3. Type 1 diabetes mellitus:

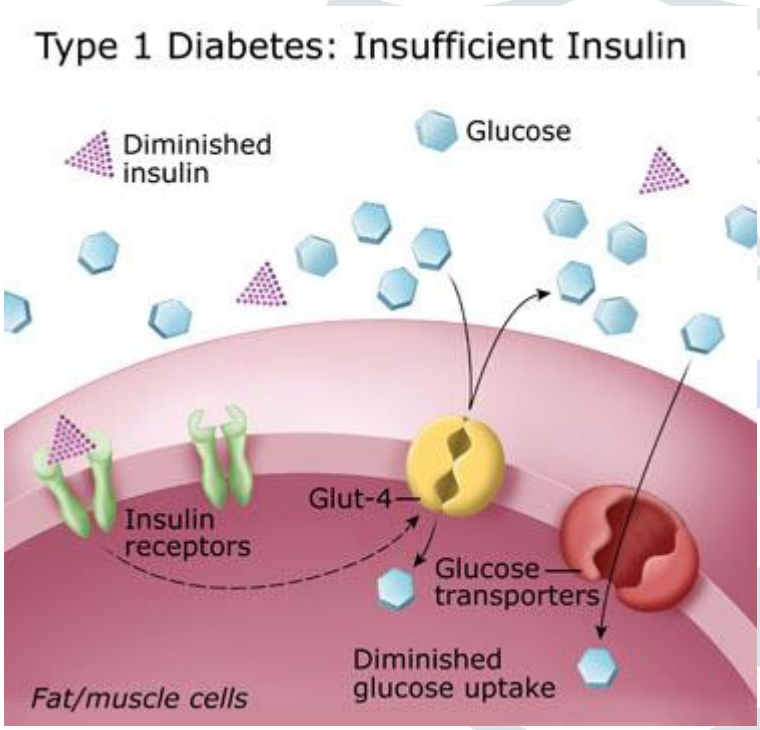

Fig.4: Type 1 Diabetes.

The Beta cells present in the pancreas is destroyed due to which the Type-1 diabetes is an autoimmune disease is caused, the own cell of the body attacks on Beta cell of the pancreas which affects the secretion of the insulin. The Type-1 Diabetes (T 1D) is associated with the other diseases i.e. organ –specific autoimmune diseases, including autoimmune thyroid disease (AITD), pernicious anemia and idiopathic Addison's disease[11,12].

It is generally known that the T1D is a T-cell mediated autoimmune disease and it circulates to various islet cell antigens are causes the destruction of pancreatic beta cells. The Type-1 Diabetes is also called as juvenile diabetes. The insulin dependent diabetes is another term used for describes the Type-1 Diabetes[12,13].

Types:

- **Fulminont form of T1D**
- **Acute-onset form of T1D**
- **Slow-onset form of T1D**

Symptoms:

- Above average thirst
- Tiredness during the day
- Needing topee regularly
- Unexplained weight loss
- Genital itchiness
- Glucosourea

Treatment:

- Take insulin by injection
- By wearing insulin pump
- Exercising
- Healthy diet
- Artificial pancreas
- Encapsulated islet cells
- Diabetes vaccine
- Retinopathy

4. Alopecia areata:

Fig. 5: Alopecia Areata.

The alopecia areata is the autoimmune disorder which is T lymphocyte-mediated. In this disorder the hypersensitive immune system attack on the own body cell i.e. hair follicle. In alopecia areata the circular patch form due to inflammatory response targeting the hair follicle, which is coin size[14,15].

The alopecia is of two types one in which the all the hair on the scalp is lost [alopecia totalis] and second is the all body hair is lost [alopecia universalis]. The hair loss is permanent and temporary. This is commonly shown in the male. There are about 7 million people in the UK are facing to this autoimmune disorder. There is some factor which cause the alopecia areata, the deficiency of the vitamin D also causes the hair loss. The vitamin D is essential for stimulating new and old follicle[16,17].

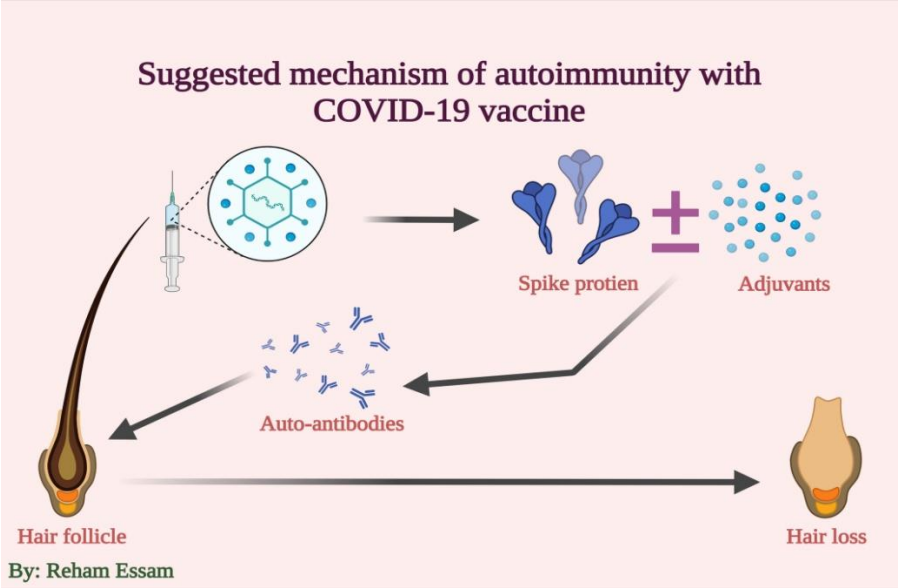

Fig.6: Mechanism of autoimmunity with COVID-19 vaccine.

- **The patient take an corona vaccine [Healthy person]**
- **It form a antibody against corona virus and shows adaptive immune response**
- **It causes the hyper-inflammatory condition**
- **which stimulate the immune system**
- **The hypersensitive immune system attacks on the body cell.**
- **The immune system attacks on hair follicle and the coin like patch are observed.**

Fig.7: The flow chart of the action of the covid 19 vaccine on the immune system showing the autoimmune response.

Types:

- **Alopecia universalis**
- **Alopecia totalis**

Symptoms:

- Hair loss: the hair is falls in patches on the scalp.
- Extensive hair loss
- Nail changes
- Family history
- Early age of onset

Treatment:

- The scientist which study the autoimmune side effect of covid vaccine the suggest the Tofacitinib citrate [5-10 mg twice a day]. The Tofacitinib citrate is the immunosuppressant which suppresses the immune system.
- The other hand the other drug which is used for the treatment of the alopecia areata is the corticosteroid and the anti-inflammatory drug.
- The homeopathic drug like Tuja occidentalis. The Monoxidil is also recommended by the doctor to cure the alopecia areata which the antihypertensive and vasodilator.
- Betamethasone is the corticosteroid which inhibit the production of the prostaglandins and reduce inflammation, which is used to treat alopecia and it stop to new patch formation.
- The folic acid also helps to regrow the hair and hair nourishment.
- Benzyl nicotinate with salicylic acid reduce the inflammation and help to regrow the hair.

5. Graves' disease:

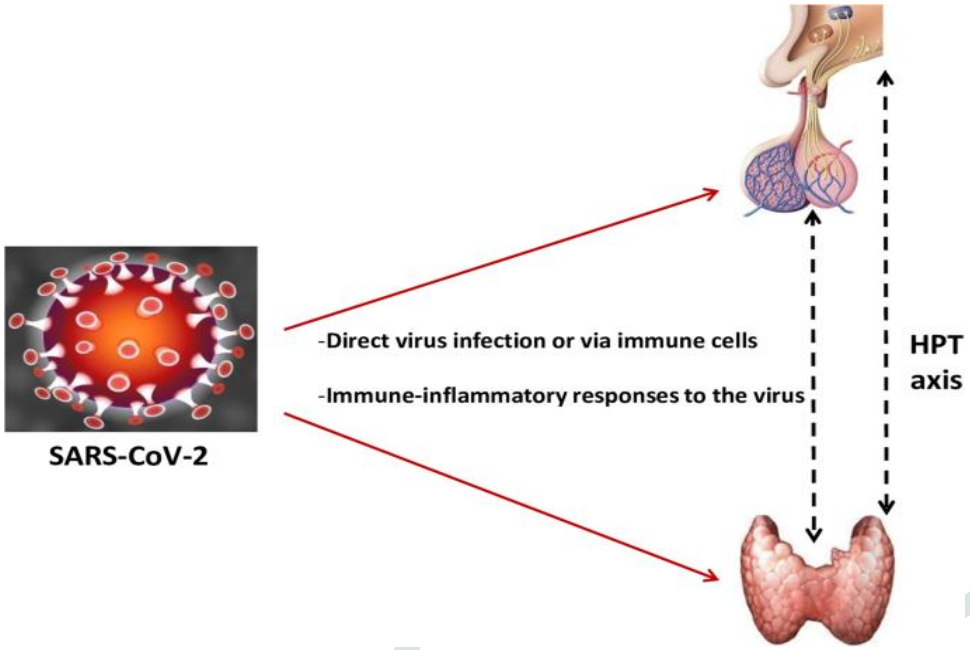

Fig. 8: Effect of COVID-19 Vaccine on the Thyroid Gland.

There is limited data is found for autoimmune diseases after corona-virus disease 2019 (COVID-19) Vaccination. The Graves' disease is an immune system disorder in which the overproduction of thyroid hormones (Hyperthyroidism). It affects many body systems and its signs and symptoms of Graves' disease can be wide ranging. It is commonly showed in people younger than age 40[23,24,25].

Types:

- Basedow disease
- Exophthalmic goiter
- Graves' hyperthyroidism
- Parry disease
- Toxic diffuse goiter.

Symptoms:

- Anxiety and irritability
- Heat sensitivity and a rise in perspiration or heat, moist skin
- Weight loss, despite traditional consumption habits
- Enlargement of the ductless gland (goiter)
- modification in emission cycles
- male erecticle dysfunction or reduced sexual desire
- Frequent intestine movements
- Bulging eyes (Graves' ophthalmopathy)
- Fatigue

- Thick, red skin sometimes on the shins or tiptop of the feet (Graves'dermopathy)
- fast or irregular heartbeat (palpitations)
- Sleep disturbance

Treatment:

- Beta-blockers: Propranolol and Metoprolol.
- Anti-thyroid medication: Methimazole and Propylthiouracil.
- Radioiodine therapy
- Surgery

Acknowledgements

I would like to thanks my professor who made this work possible and the guidance of her in all the stage of my project. I would thanks to my friends who help me in my project and I also thanks to the my family member to support me.

Thanks to all the best wishers and my friends to make this work possible.

Reference:

1. Haynes BF, Corey L, Fernandes P, Gilbert PB, Hotez PJ, Rao S, Santos MR, Schuitemaker H, Watson M, Arvin A. Prospects for a safe COVID-19 vaccine. Science translational medicine. 2020 Nov 4;12(568):eabe0948.

2. Andreadakis Z, Kumar A, Román RG, Tollefsen S, Saville M, Mayhew S. The COVID-19 vaccine development landscape. Nat Rev Drug Discov. 2020;19(5):305-6.

3. Strazzulla LC, Wang EHC, Avila L, et al. Alopecia areata: disease characteristics, clinical evaluation, and new perspectives on pathogenesis. J Am Acad Dermatol 2018;78:1-12.

4. Sgubbi P, Savoia F, Calderoni O, Longo R, Stinchi C, Tabanelli M. Alopecia areata in a patient with SARS-Cov-2 infection. Dermatol Ther 2020;33:e14295.

5. Capalbo A, Giordano D, Gagliostro N, et al. Alopecia areata in a COVID-19 patient: a case report. Dermatol Ther 2021;34:e14685

6. Cines DB, Bussel JB. SARS-CoV-2 vaccine–induced immune thrombotic thrombocytopenia. New England Journal of Medicine. 2021 Jun 10;384(23):2254-6.

7. Warkentin TE, Cuker A. COVID-19: Vaccine-induced immune thrombotic thrombocytopenia (VITT). Update May. 2021 Nov 17;7.

8. https://medlineplus.gov/genetics/condition/thrombotic-thrombocytopenic-purpura

9.Krawitt EL. Autoimmune hepatitis. New England Journal of Medicine. 2006 Jan 5;354(1):54-66

10. Mieli-Vergani G, Vergani D, Czaja AJ, Manns MP, Krawitt EL, Vierling JM, Lohse AW, Montano-Loza AJ. Autoimmune hepatitis. Nature Reviews Disease Primers. 2018 Apr 12;4(1):1-21.

11. Li A, Riddell MC, Potashner D, Brown RE, Aronson R. Time lag and accuracy of continuous glucose monitoring during high intensity interval training in adults with type 1 diabetes. Diabetes technology & therapeutics. 2019 May 1;21(5):286-94.

12. Lee JM, Carlson E, Albanese-O'Neill A, Demeterco-Berggren C, Corathers SD, Vendrame F, Weinstock RS, Prahalad P, Alonso GT, Kamboj M, DeSalvo DJ. Adoption of telemedicine for type 1 diabetes care during the COVID-19 pandemic. Diabetes technology & therapeutics. 2021 Sep 1;23(9):642-51.

13. Kawasaki E. Type 1 diabetes and autoimmunity. Clinical pediatric endocrinology. 2014;23(4):99-105.

14. Strazzulla LC, Wang EHC, Avila L, et al. Alopecia areata: disease characteristics, clinical evaluation, and new perspectives on pathogenesis. J Am Acad Dermatol 2018;78:1-12.

15. Moreno-Arrones OM, Lobato-Berezo A, Gomez-Zubiaur A, et al. SARS-CoV-2-induced telogen effluvium: a multicentric study. J Eur Acad Dermatol Venereol 2021;35:e181-3.

16. Capalbo A, Giordano D, Gagliostro N, et al. Alopecia areata in a COVID-19 patient: a case report. Dermatol Ther 2021;34:e14685

17. Galeotti C, Bayry J. Autoimmune and inflammatory diseases following COVID-19. Nature Reviews Rheumatology. 2020 Aug;16(8):413-4.

18.Yazdanpanah N, Rezaei N. Autoimmune complications of COVID-19. Journal of medical virology. 2022 Jan;94(1):54-62. Liu Y, Sawalha AH, Lu Q. COVID-19 and autoimmune diseases. Current opinion in rheumatology. 2021 Mar;33(2):155.

19.Allahyari F, Hosseinzadeh R, Nejad JH, Heiat M, Ranjbar R. A case report of simultaneous autoimmune and COVID-19 encephalitis. Journal of NeuroVirology. 2021 Jun;27(3):504-6.

20.Pratt CH, King LE, Messenger AG, Christiano AM, Sundberg JP. Alopecia areata. Nature reviews Disease primers. 2017 Mar 16;3(1):1-7.

21.Gilhar A, Etzioni A, Paus R. Alopecia areata. New England Journal of Medicine. 2012 Apr 19;366(16):1515-25.

22.Chu CH, Cheng YP, Chan JY. Alopecia areata after vaccination: recurrence with rechallenge. Pediatric Dermatology. 2016 May;33(3):e218-9.

23. Singh G, Howland T. Graves' Disease Following COVID-19 Vaccination. Cureus. 2022 Apr 23;14(4).

24. Lui DT, Lee KK, Lee CH, Lee AC, Hung IF, Tan KC. Development of Graves' disease after SARS-CoV-2 mRNA vaccination: a case report and literature review. Frontiers in public health. 2021;9.

25. Weetman AP. Graves' disease. New England Journal of Medicine. 2000 Oct 26;343(17):1236-48.

26. Burch HB, Cooper DS. Management of Graves disease: a review. Jama. 2015 Dec 15;314(23):2544-54.