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Assessing the Influence of COVID-19 on Antinuclear Antibodies

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ABSTRACT

An increasing amount of data suggests that the coronavirus disease 2019 (COVID-19) may cause immune system dysregulation and the emergence of autoimmune disorders. Coronavirus disease 2019 (COVID-19) has several autoimmune characteristics that may have an impact on immunity, autoimmune pathology, and the course of the illness. To determine the prevalence, temporal trajectory, and the relationship between systemic autoantibodies and immunity, co morbidities, and COVID-19 severity, we longitudinally tested participants in this research for these antibodies. We looked through the data of 79, 232 patients at Neuberg Supratech Reference Laboratories between May 2018 and May 2023. This study shows a yearly increase in the absolute number of low positive ANA (ANA ++ intensity) and high positive ANA (ANA +++ with ++++ intensity). Year over year, the number of positive patients and analytical numbers for ANA testing increased after 2020. Similar patterns and frequencies of ANA were seen in patients during acute COVID-19 and recovery when compared to healthy controls.

Keywords: - COVID-19, Antinuclear antibodies, Immunity.

Introduction

When immunologic tolerance to auto-reactive immune cells is compromised, the immune system targets self-molecules, leading to autoimmune disease. Many autoimmune illnesses have been linked to genetic, viral, and/or environmental risk factors. The body's immune-mediated attack against its organs, tissues, and cells can affect any part of the body, their clinical symptoms are exceedingly variable. While most of these diseases are uncommon on their own, they are among the most common in industrialized cultures. They pose growing dangers to global public health since their incidence is increasing in both developing and industrialized countries. The illness often requires a great deal of care because it can lead to organ function loss and decreased productivity. Because most autoimmune diseases are chronic and there is no known cure, patients may endure lifelong disability from their illnesses (1).

It is well-recognized that viral infections are among the most frequent external stimuli that might initiate autoimmunity. Autoantibodies often target nuclear antigens, and anti-nuclear antibodies (ANA) are present in many viral infections. (2). Herpes viruses, parvovirus B19, hepatitis C virus, hepatitis B virus, Chikungunya virus, and other viruses are examples of viruses that can cause autoimmune illness. (4).

Historically, T-cell activation and cross-reactive T-cell recognition—also referred to as molecular mimicry—have been the main ways that infection might trigger a T-cell-mediated autoimmune response. It is yet unclear what processes underlie the link between viruses and autoimmune. (4) So further studies are required to examine the relationship between autoantibodies and illness prognosis, even though multiple studies in the literature show autoantibodies are frequently observed in COVID-19 patients. Due to the fact that ANA is also positive in different clinical diseases and the healthy population (with a weak titer and prevalence ranging from 8% to 15%), positive results must be explicated with clinical data (3).

COVID-19, the acute coronavirus illness, is a serious clinical range, with the bulk of patients having a minor ailment and 1-2% of people having a deadly illness. Many characteristics of acute Clinical signs and symptoms of COVID-19 include tiredness, myalgia, hyperinflammation, thrombosis, and skin rashes, which are typical of autoimmune and systemic inflammatory illnesses. In addition, COVID-19 may initiate autoimmune disease, as documented for the anti-phospholipid syndrome, vasculitis, and Guillain-Barré syndrome, especially in youngsters, multisystem inflammatory syndrome. On the other hand, the Pathophysiology of severe COVID-19 has been linked to autoimmune events. Around 10% of COVID-19 cases with severe illness had pre-existing autoantibodies that target the type I interferon pathway. Various autoantibodies have been described in association with COVID-19, including antinuclear antibodies (ANA). (5)Furthermore, following COVID-19 infections, several novel autoimmune and auto-inflammatory diseases have been documented, including idiopathic inflammatory myositis and systemic lupus erythematosus. (6)

This issue of the Korean Journal of Internal Medicine highlights a study by Park et al. (7) that highlights the connection between autoimmunity and COVID-19 infection.

Another important question in the study of autoantibodies in COVID-19 patients is the serial change in autoantibodies over time, the effect of autoantibody positivity on the use of Immunomodulatory drugs, and the association between autoantibody positivity and the development of autoimmune disease. (8)

The age and gender-specific prevalence of ANAs in populations before and after the COVID-19 Pandemic was detected in this investigation.

Every nation has its unique socioeconomic structure, dietary preferences, way of life, genetic and medical histories, and environmental influences. The focus of this study is the ANA profile scenario in the Indian state of Gujarat, with particular attention to social obligations, age, and sex. This research will aid in the comprehension of risk variables in various age groups of both men and women.

Materials and Methods

This study is clinically attractive, as it had a relatively large sample size, the study population comprised 79, 232 subjects from which 51,655 (65.20 %) were female and 27,577 (34.80%) male. This study was conducted from 2018 - May 2023 at Neuberg Supratech Reference Laboratories. The majority of the patients were in the year 2022.

The demographic details including BMI, smoking, Drinking, Family history, and disease status were not involved. The study population was divided based on gender and test parameters available in this study.

Result

TABLE NO:-1 FEMALE ANA INTENSITY DATA FROM 1ST JAN 2018 – 31ST MAY 2023

Sr. No	YEAR	TOTAL PATIENTS	TOTAL POSITIVE	intensity +	intensity ++	intensity +++ with ++++
1	2018	8512	2638	659 (24.98%)	902 (34.19%)	1077 (40.83%)
2	2019	8657	3166	868 (27.42%)	1089 (34.40%)	1209 (38.19%)
3	2020	5860	1617	444 (27.46%)	492 (30.43%)	681 (42.11%)
4	2021	10,155	2770	818 (29.53%)	878 (31.70%)	1074 (38.77%)
5	2022	12,586	3179	615 (19.34%)	1237 (38.91%)	1327
6	1ST JAN -31ST MAY 2023	5885	1829	374 (20.45%)	775 (42.37%)	680 (37.18%)
TOTAL		51,655	15,199	3778	6173	6048

TABLE NO:-2 MALE ANA INTENSITY DATA 2018 TO 1ST JAN – 31ST MAY 2023

Sr. No	YEAR	TOTAL PATIENTS	TOTAL POSITIVE	intensity +	intensity ++	intensity +++ with ++++
1	2018	4903	1001	401 (40.06%)	384 (38.36%)	216 (21.58%)
2	2019	5106	1059	448 (42.30%)	409 (38.62%)	202 (19.07%)
3	2020	3170	471	182 (38.64%)	151 (32.06%)	138 (29.30%)

4	2021	5341	821	312 (38.00%)	323 (39.34%)	186 (22.65%)
5	2022	6264	771	236 (30.61%)	311 (40.34%)	224 (29.05%)
6	1ST JAN - 31ST MAY 2023	2793	568	173 (30.46%)	276 (48.59%)	119 (20.95%)
TOTAL		27,577	4691	1752	1854	1085

TABLE NO:-3 ANA INTENSITY DATA 2018 TO 1ST JAN – 31ST MAY 2023

Sr. No	YEAR	TOTAL PATIENTS	TOTAL POSITIVE	intensity +	intensity ++	intensity +++ with ++++
1	2018	13,415	3639	1060 (29.13%)	1286 (35.34%)	1293 (35.53%)
2	2019	13,763	4225	1316 (31.15%)	1498 (35.45%)	1411 (33.40%)
3	2020	9030	2088	626 (29.98%)	643 (30.80%)	819 (39.22%)
4	2021	15,496	3591	1130 (31.47%)	1201 (33.44%)	1260 (35.09%)
5	2022	18,850	3950	851 (21.54%)	1548 (39.19%)	1551 (39.26%)
6	1ST JAN -31ST MAY 2023	8678	2397	547 (22.82%)	1051 (43.85%)	799 (33.33%)
TOTAL		79,232	19,890	5530	7227	7133

- A noticeable increase in the absolute number and percentage of positivity of ANA is shown in the trend.
- The information was examined annually from January 2018 to May 2023.
- The information provided is based on the data from a Neuberg Supratech Reference Laboratory and is not a comprehensive representation of the whole population.
- A total of 79,232 patients were examined using the IFA method for ANA requests. (According to Table No:- 3)
- 51,655 of the 79,232 patients tested for ANA were female, and 27,577 were male.
- This study shows a yearly increase in the absolute number of low positive ANA (ANA ++ intensity) and high positive ANA (ANA +++ with ++++ intensity).
- A pandemic condition caused a decrease in the absolute number of both high & low positive ANA in 2020 from 2019 due to fewer people going for ANA testing while the country was in pandemic conditions.
- Year over year, the number of positive patients and analytical numbers for ANA testing increased after 2020.
- There was no significant difference in the absolute number of low and high positive ANA from 2018 to 2019, however, after 2020, an annual difference was noted.

- It may have happened as a result of the patients' ANA intensity changing from low-positive to high-positive. It may occur due to the post-COVID-19 effect on patients.
- There was no significant difference seen in this study between male and female low and high positive ANA intensity. (According to Table No:- 1 & 2)

Discussion

Information on individuals with a medium to severe clinical profile strongly implies that an individual's autoimmune response and their response to SARS-CoV-2 may be correlated. This may be the cause of the great variation in clinical symptoms associated with the same infection. Even though the study is single–centered and considerations are preliminary, we have undoubtedly begun to shed light on the connection between COVID-19 illness and autoimmune antibodies. It will be important to do more research utilizing other independent data sets to see whether the autoimmune response varies according to the illness stages in COVID-19 patients, hence validating the clinical laboratory link. To determine if the immunological alterations we saw in our population were temporary or if they may last longer and result in chronic autoimmune illness, it will also be essential to do follow-up at various periods. Additionally, monitoring will enable the assessment of any side effects from the administered treatment.

Numerous investigations on the autoantibody response in COVID-19 patients are yet insufficiently advanced. We assessed the COVID-19-associated autoantibody frequency using ANA. Most ANAs were highly positive at a titer of 3+ & 4+. Both low and high positive titers were recorded, despite efforts to connect ANA titers with clinical severity in chosen patients (9). The determination of the clinical response and the durability of autoantibody production are yet unknown in long-term follow-up.

Conclusion

Autoimmunity is mostly triggered by viral infections. Autoimmunity caused by viruses is a multidirectional process. According to available research, viruses may cause autoimmunity. Additional research is required to determine the impact of autoantibody-positive on the use of immunomodulatory medications, the prognosis of COVID-19 patients, and the correlation between autoantibody positivity and the onset of autoimmune illness. On the other hand, there is mounting evidence that viruses have a protective function against autoimmunity. Specifically, viral infections trigger regulatory immune responses, which in turn prevent the onset of autoimmune reactions. Different host, viral, and environmental elements work together to produce this dual effect of viral infections on autoimmunity. Therefore, more epidemiological and molecular research is required to learn more about the interactions.

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