

Referral Pattern of ^{99m}Techneium Thyroid Scan Patients with Suspected Subacute Thyroiditis Before and After the Covid-19 Period

Shimul Sarkar, Shamsun Nahar Bailey, Jasmin Ferdous, Mohammad Sajjad-Al-Mishal, Fatima Begum

National Institute of Nuclear Medocine & Allied Sciences (NINMAS)

Correspondence Address : Dr. Shimul Sarkar, Medical Officer, National Institute of Nuclear Medicine & Allied Science (NINMAS), Block-D, BSMMU Campus, Dhaka. Email: shimul.sarkar18@gmail.com

ABSTRACT

Subacute thyroiditis (SAT) is a transient inflammatory condition of the thyroid gland, often triggered by viral infections or drug exposure, predominantly affecting females between the ages of 20 and 40. This study is aimed at observing the association between COVID-19, vaccination, and patients presenting symptoms suggestive of SAT using ^{99m}Tc-Thyroid scans. A total of 1,935 patients with suspected subacute thyroiditis from 2017 to 2022 were retrospectively assessed based on clinical history, blood parameters, high resolution ultrasound (HRUS) of neck, ¹³¹I thyroid uptake, and ^{99m}Tc scans. They were classified into three groups: Group I : pre-COVID-19 (2017–2018), Group II: during COVID-19 (2019–2020), and Group III: post-COVID-19 (2021–2022). The hallmark of diagnosing SAT in a sonographically intact thyroid gland is absence of radiotracer concentration in a ^{99m}Tc thyroid scintigraphy. In Group-I, 6.6% (493 out of 7,359), Group-II, 11.34% (568 out of 5,007), and Group-III, 14.23% (874 out of 6,138), patients were reported as SAT. Male to female ratio was 1:1.6 (Group I), 2:1 (Group II), and 1.2:1 (Group III), respectively. Other parameters, such as thyroid uptake at 24 hours, were less than 4%, serum TSH levels were low, and FT3 and FT4 levels were in the upper limit of the normal range. The number of suggestive SATs was noticed more in the post-COVID period and after vaccination than in the non-COVID period.

Keywords: Subacute thyroiditis, COVID-19, ^{99m}Tc-thyroid Scan

Bangladesh J. Nucl. Med. Vol. 26 No. 2 July 2023

DOI: <https://doi.org/10.3329/bjnm.v26i2.71486>

INTRODUCTION

Subacute thyroiditis (SAT) is a transient inflammatory condition of the thyroid gland. The pathophysiology of SAT is a self-limited inflammatory disorder of the thyroid gland characterized by T-cell-mediated destruction of thyroid follicles and granuloma formation (1). The common symptoms of SAT are discomfort or pain in the neck, sometimes a brief episode of hyperthyroidism followed by euthyroidism, and rarely hypothyroidism. Previous studies

indicate that symptoms of SAT typically manifest days or weeks after infection in post-viral thyroiditis, which seems more fitting for describing post-COVID-19 thyroiditis (2, 3). It is usually linked to an inflammatory response, which is often triggered by viral infections, vaccinations, or drug exposure, predominantly affecting middle-aged females. In the COVID-19 era, SAT seems to be an underestimated consequence of the disease that occurs during SARS-CoV-2 infection (4). This study is aimed at observing the association between COVID-19, vaccination, and patients presenting symptoms suggestive of SAT using ^{99m}Tc-Thyroid scans.

PATIENTS AND METHODS

A total of 18,504 patients were referred to the thyroid division of NIMMAS for thyroid scans between 2017 and 2022. Among those 1,935 patients suspected of SAT, considering clinical history, blood parameters, thyroid ultrasound imaging, ¹³¹I thyroid uptake, and ^{99m}Tc scans indicative of SAT. For radioiodine uptake studies, patients were given an oral dose of 1cc ¹³¹I followed by obtaining the count at 2 hours and 24 hours using thyroid uptake systems. High resolution neck ultrasound (HRUS) appearance of thyroid lobes was poorly defined with regions of decreased echogenicity and vascularity in the affected areas involving single or both lobes with or without normal but slightly enlarged as well as smaller were found too. Isotope scanning with technetium is an accurate, non-invasive diagnostic tool for diagnosing SAT. For thyroid scans, a dose of 2 mCi IV injection of ^{99m}Tc were administered. Imaging was done after 30 minutes using a Nucline TM (Mediso) gamma camera with a pinhole collimator. A prefixed count of 200,000 was acquired both in the anterior and oblique

projections. The hallmark of thyroid scan in SAT patients was absence of radiotracer concentration in the thyroid bed. The three phases of thyroiditis showed the following findings- a) Acute phase- no radiotracer concentration (RTC) seen in the thyroid bed; b) Intermediate phase- decreased RTC in the thyroid bed and c) Recovery/euthyroid phase- fairly uniform RTC in the thyroid bed. However, contraindications of thyroid scan in cases of children, pregnant women, lactating mothers, patients on levothyroxine or history of recent imaging with contrast agents were maintained strictly. Patients were categorized into three groups based on time periods: Group-I (2017–2018, pre-COVID-19), Group-II (2019–2020, during COVID-19), and Group-III (2021–2022, post-COVID-19).

RESULTS

The mean age of the study patients was 30.9 ±11.18 years. Preponderance of female patients were more than males, with 1173 (60.62%) females and 762 (30.38%) males respectively. Thyroid uptake was normal at 2 hours (6%) and

less than 4% at 24 hours. Serum TSH level was 0.1, which was lower than the normal range for adults; The mean of FT3 was 8.9 (SD: ±2.68) and FT4 was 24 (SD: ±1.89), which is the upper limit of the normal range.

Table 1: Mean of age and blood parameters of study population

Variables	Mean ± SD
Age (year)	30.9 ±11.18
FT4 (pmol/L)	24 ±1.89
FT3 (pmol/L)	8.9 ±2.68

Among these, 7,359 were scanned in Group-I, and 493 (6.6%) reported SAT. Number of female patients were 302 (61.26%) and males 191 (38.74%) respectively.

The female-to male ratio was 1.6:1 in this group. On the other hand, group II consisted of 5,007 patients and among them, 568 (11.34%) were reported with SAT by thyroid scan. Numbers of female patients were 381 (67.10%) and male 187 (32.90%) with a ratio of 2:1 in this group.

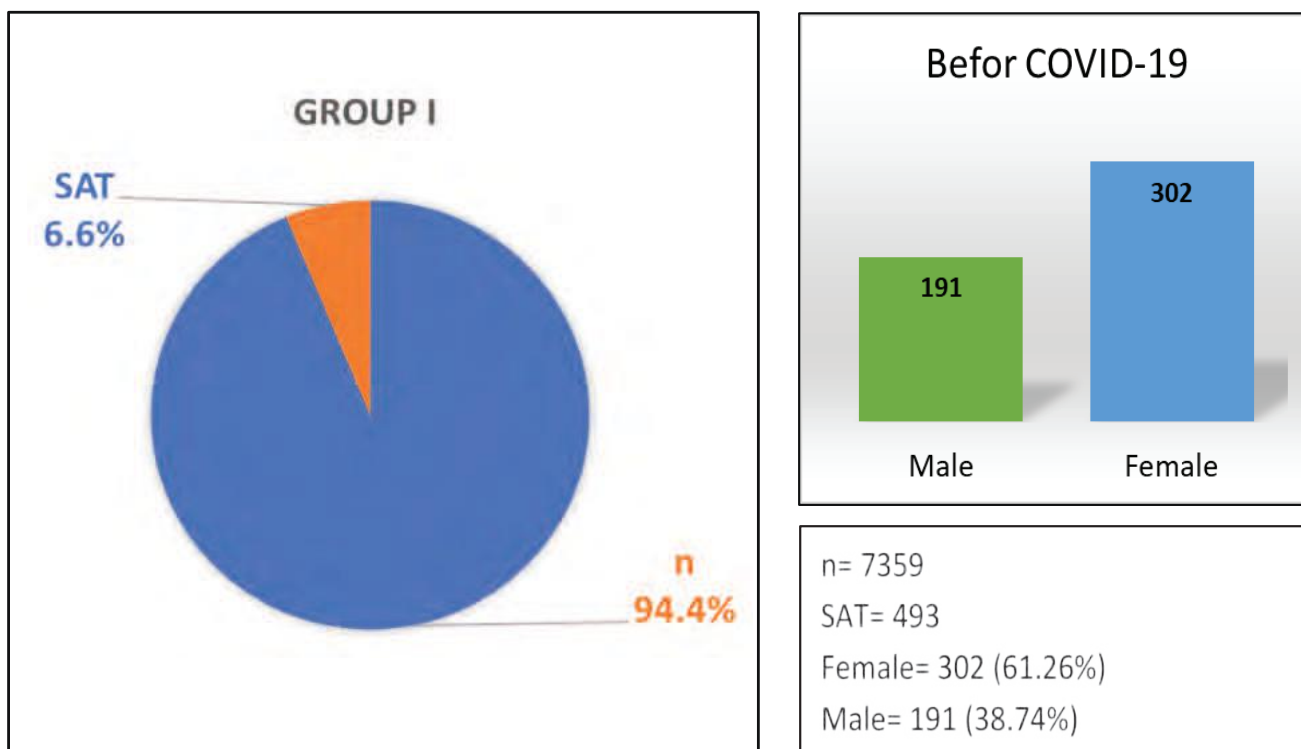


Figure 1: Percentage of subacute thyroiditis patients before COVID-19 period

The female-to male ratio was 1.6:1 in this group. On the other hand, group II consisted of 5,007 patients and among them, 568 (11.34%) were reported with SAT by thyroid

scan. Numbers of female patients were 381 (67.10%) and male 187 (32.90%) with a ratio of 2:1 in this group.

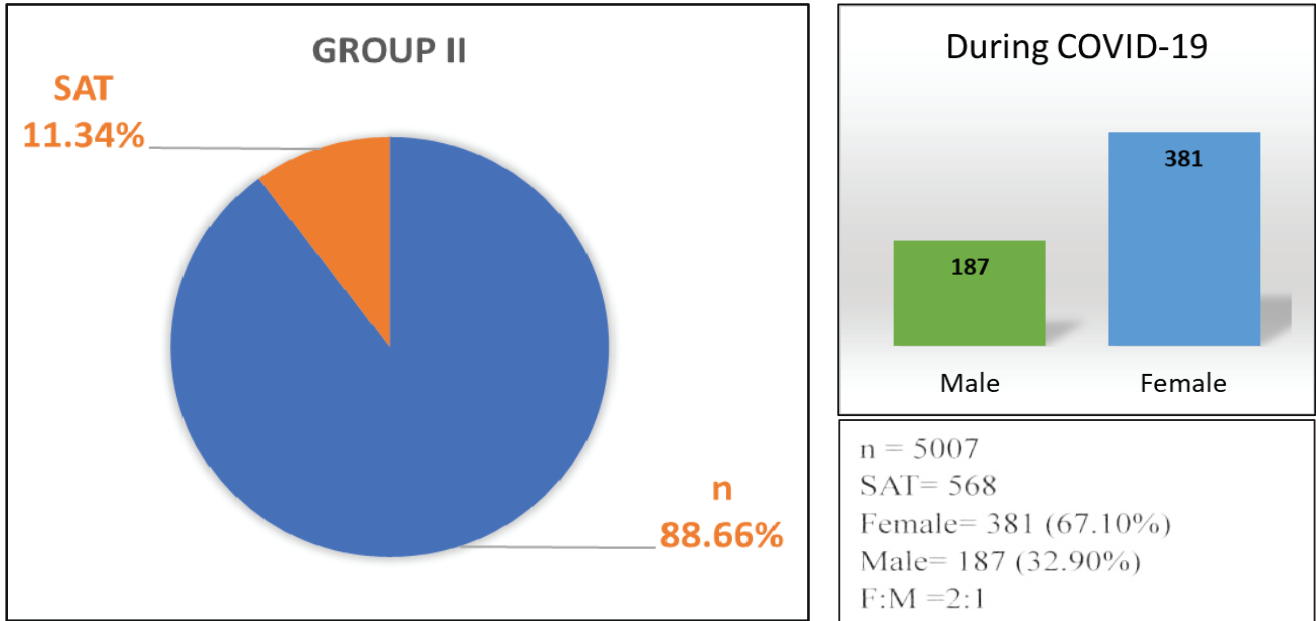


Figure 2: Percentage of subacute thyroiditis patients during COVID-19 period

A total of 6138 patients were studied with thyroid scan in group III. SAT was reported in 874 (14.23%) and among them 490 (56.07%) were female. While males accounted for 384 (43.93%) with a female-to-male ratio of 1.2:1.

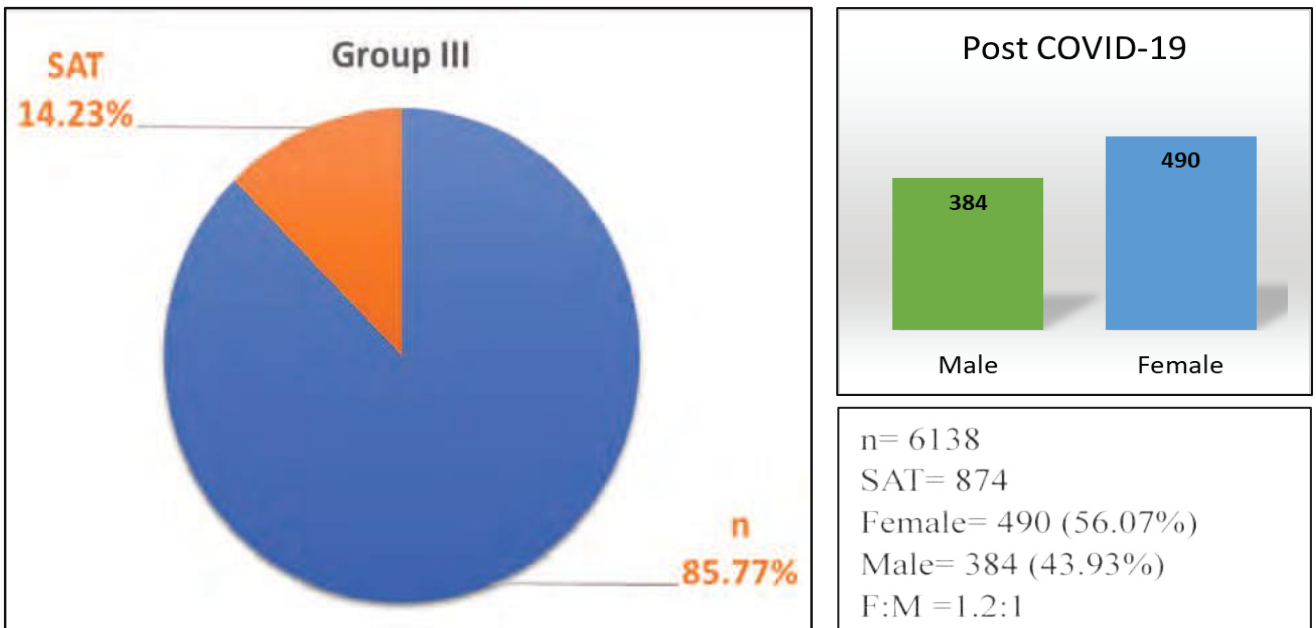


Figure 3: Percentage of subacute thyroiditis patients in post COVID-19 period

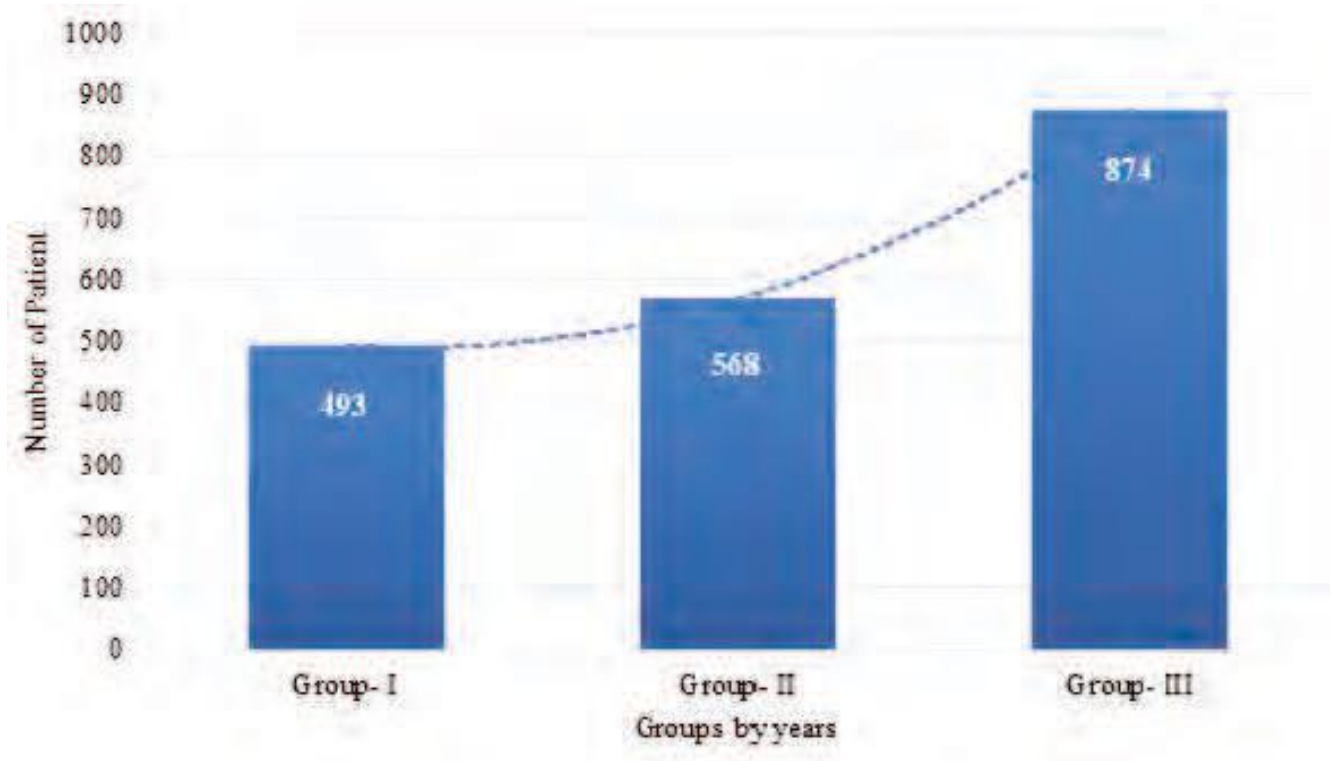


Figure 4: Rising pattern of features suggestive of subacute thyroiditis among the three groups of patients

Figure 4 illustrates the gradual increase of the prevalence of patients with SAT because of COVID-19 and vaccinations. The number of patients with SAT before covid was 6.6%, after covid and vaccination it increased to 14.23%.

DISCUSSION

This study demonstrates that subacute thyroiditis affects women more frequently. Another study by Salehi et al. (6) revealed that between 75 and 80 percent of occurrences of subacute thyroiditis (SAT) are in women. The study also found that following viral infections and vaccines, subacute thyroiditis has increased in frequency; examples include Epstein-Barr virus, coxsackievirus, influenza virus and COVID-19 (7). Similar tendencies were also observed in our investigation. After individuals had vaccines or viral infections, we saw an increase in the occurrence of subacute thyroiditis. This confirms the theory that these occurrences may be associated with a higher risk of subacute thyroiditis. The coronavirus (SARS-COV-2) damage the thyroid follicular cell through direct cell invasion via angiotensin-converting enzyme-2. This occurrence could be attributed by abnormal T-cell response and the generation of inflammatory cytokines, which result in symptoms.

In line with earlier studies, we found lower levels of

thyroid-stimulating hormone (TSH) and reduced thyroid uptake of radioactive iodine in our study participants (8). These findings indicate changes in thyroid function during subacute thyroiditis. Understanding these patterns is important for managing thyroid-related issues, especially in the context of viral infections and vaccinations.

Lower RTC could have other causes we don't consider, which was the limitation of this study. NINMAS is a referral-based institute for further follow-up of the patient's need multidisciplinary approach, including internal medicine, endocrinology, and nuclear medicine.

CONCLUSION

A rising pattern of suggestive SAT was observed in the context of post COVID-19 period compared to the pre COVID-19 era. The link between COVID-19 and an increased incidence of SAT emphasizes the intricate interplay between viral infections and the endocrine system, particularly the thyroid gland. Also, while vaccinations play a pivotal role in preventing and mitigating the impact of infectious diseases, physicians must be attuned to potential side effects, including those affecting the thyroid. This knowledge will enable doctors to treat patients which will improve patients' health.

REFERENCES

1. Kojima M, Nakamura S, Oyama T, Sugihara S, Sakata N, Masawa N. Cellular Composition of Subacute Thyroiditis. An Immunohistochemical Study of Six Cases. *Pathology - Research and Practice*. 2002 Jan;198(12):833–7.
2. Feghali K, Atallah J, Norman C. Manifestations of thyroid disease post COVID-19 illness: Report of Hashimoto thyroiditis, Graves' disease, and subacute thyroiditis. *Journal of Clinical and Translational Endocrinology: Case Reports*. 2021 Dec;22:100094.
3. Sato D, Nishiguchi S, Tanaka E. Successful Management of Subacute Thyroiditis Following SARS-CoV-2 Infection. *Intern Med*. 2021 Nov 15;60(22):3573–6.
4. Chen W, Tian Y, Li Z, Zhu J, Wei T, Lei J. Potential Interaction Between Sars-Cov-2 and Thyroid: A Review. *Endocrinology*. 2021 Mar 1;162(3):bqab004.
5. Zornitzki T, Mildiner S, Schiller T, Kirzhner A, Ostrovsky V, Knobler H. Subacute Thyroiditis—Still a Diagnostic Challenge: Data from an Observational Study. *Int J Environ Res Public Health*. 2022 Jul 31;19(15):9388.
6. Salehi AM, Salehi H, Mohammadi HA, Afsar J. SARS-CoV-2 and Subacute Thyroiditis: A Case Report and Literature Review. *Case Rep Med*. 2022 Jun 30;2022:6013523.
7. Meftah E, Rahmati R, Zari Meidani F, Khodadadi S, Chitzan-Zadeh K, Esfahanian F, et al. Subacute thyroiditis following COVID-19: A systematic review. *Front Endocrinol*. 2023 Apr 5;14:1126637.
8. Fatourehchi V, Aniszewski JP, Fatourehchi GZE, Atkinson EJ, Jacobsen SJ. Clinical Features and Outcome of Subacute Thyroiditis in an Incidence Cohort: Olmsted County, Minnesota, Study. *The Journal of Clinical Endocrinology & Metabolism*. 2003 May 1;88(5):2100–5