



Neurological Dysfunctions in Hypothyroidism a Clinico-Investigational Appraisal in Hypothyroid Patients

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Abstract

Background: Thyroid hormones have a major influence on all major organs/systems and adequate levels are important for optimal function. This study was done to evaluate the clinical features, and investigations from neurological point of view in recently detected hypothyroidism patients. **Results:** We conducted this study on 100 patients of 16–60-year age group with hypothyroidism. Detailed clinical evaluation was combined with electrophysiological and radiological evaluation. **Conclusions:** Out of 100 patients who fulfilled the criteria for study 40% were male and 60% were female. Average age of the participants was 44.2 years and average weight of patients was 64.5 kg. Complaint of pain in hand was present in 40% of total assessed patients. Paresthesia in hand was present in 42% of patients. The complaints of sensory loss in hand and muscle cramps were 28% and 56% respectively. Nervousness was present in 42% of the patients. Tests like Electrophysiology was abnormal in about 58% of the total assessed patients, of which 65% were female subjects and 35% were male subjects, which is quite a significant proportion of patients. Similarly tests for Carpel Tunnel Syndrome also suggested that about 42% of the patients tested positive for CTS, of which 62% were female subjects and 38 % were male subjects. Neuroimaging test showed only 12% of total patients tested positive, of which again female percentage was more than males 64% and 36% respectively. Similarly, Phallen's sign was elicited in 26% of the total patients, of which 60% were female and 40% were male. **Conclusion:** This study quite firmly indicates that many patients who are diagnosed with Hypothyroidism also have neurological manifestations. Approach with this set of mind can help the clinicians to detect these neurological findings early and associate them with hypothyroidism for initiation and management of patient complaints.

Keywords:- Hypothyroidism, Neurological Dysfunctions, Electrophysiology.

INTRODUCTION

Thyroid hormones have a major influence on all major organs/systems and adequate levels

are important for optimal function. Thyroid dysfunction is a common condition that affects between 3 and 21% of the population with prevalence being more common in women and

in older individuals.^[1] Based on the estimation from various studies, it has been projected that about 42 million people in India suffer from thyroid diseases.^[2] It may have varied clinical picture and present with a wide variety of symptoms pertaining to different bodily systems. These results, at times, can cause diagnostic delays and dilemmas; hence it is important for the clinician to be familiar with the neurological manifestations also. This study was done to evaluate the clinical features, and investigations from neurological point of view in recently detected hypothyroidism patients.

Thyroid gland is crucial for many of reactions in tissue metabolism and development. It secretes thyroxin (3,5,3'5'-tetraiodothyronine), which is abbreviated as T₄, and small amounts of 3,5,3'-triiodothyronine, abbreviated T₃. Thyroid hormones regulate protein synthesis by affecting gene transcription and mRNA stabilization. Both have systemic effects. Inadequate thyroid hormone levels leads to hypothyroidism. Inadequate thyroid hormone during development leads to congenital hypothyroidism (also known as cretinism) is associated with irreversible brain damage. Hypothyroidism in both child and adult can lead to affection of brain, peripheral nerve and muscles.^[3,4]

This study was done to understand the prevalence of neuromuscular signs and symptoms in patients with newly diagnosed hypothyroidism; and to correlate with electro-diagnostic evidence of neuromuscular dysfunction.

MATERIAL AND METHODS

Study Settings and Participants

In this cross-sectional study at Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh., patient diagnosed to have hypothyroidism, both In Outpatient department and In patient department from August 2018 to August 2020 were included. The study was conducted in accordance with the principles of the Declaration of Helsinki, International Council on Harmonization Good Clinical Practice (ICH GCP) guidelines, and Indian regulatory guidelines (Indian Council of Medical Research and Indian GCP guidelines).

Any patient in age group 16- 60 diagnosed to have Hypothyroidism according to biochemical criteria was evaluated in detail clinically and with other investigations. Biochemical testing of thyroid function is fundamental to establish a diagnosis of thyroid dysfunction including hypothyroidism.²⁸ The tests include measurement of circulating TSH and thyroid hormones in the serum. A Reference range of TSH, T₃ and T₄ at our hospital: is TSH: 0.49 - 4.67 uIU/ml T₃: 0.95 - 2.5 mmol/l T₄: 60.0-150.0 mmol/l.^[5]

Patients having other possible causes of neuropathy or neuromuscular diseases (for example, diabetes mellitus, alcoholism, liver and kidney disease, use of drugs known to cause neuropathy or myopathy, malignancy, or other serious illness (for example, cardiac failure or HIV infection), or a family history of neuropathy were excluded.

Thyroid profile estimation was done in Department of Biochemistry, Saraswathi Institute of Medical Sciences, Hapur, Uttar

Pradesh. Estimation was done by a fully automated Biochemistry Analyzer ABBOTT AxSYM. For Thyroid Profile estimation 2.0 ml of blood is required. This blood is then subjected to centrifugation, and then the serum obtained is put in ABBOTT AxSYM SYSTEM.

For the neurological history a standardized symptom questionnaire was used with special attention given to sensory symptoms, weakness, cramps, muscle pain, fatigability, and difficulty climbing stairs, and rising from a low seat. Duration of symptoms was estimated in months before referral. Finally, the patients were asked whether neuromuscular symptoms, when present, were their first or main complaint (s).

The clinical neurological examination was performed by one experienced examiner (DPS), who was not blinded to the diagnosis hypothyroidism, because of the often evident clinical signs that suggested the diagnosis.

In addition to thyroid dysfunction, patient having paresthesia, muscle paresis, wasting or weakness were subjected for Nerve Conduction Velocity Test (NCV) and Electromyography (EMG).

In patients having Headache, drowsiness, altered behavior, central nervous system

Table 1: Demographic characteristics.

Demographic characteristics	Number of patients	Percentage of total no. of patients
Male	60	60
Female	40	40

Table 2: Clinical Symptoms

Clinical Symptoms	Number of patients with positive history	Number of patients with negative history	Percentage of total no. of patients with positive history
Fatigue, exhaustion	60	40	60

defect, visual complaint were subjected for Imaging including MRI Brain or CT Head.

In patient having swelling in neck, neck pain, changes in voice were subjected to Direct and/or Indirect laryngoscopy. In patient having hearing impairment /tinnitus were subjected to Pure tone Audiometry.

The data was analyzed with the help of Epi-Info version 6.0 & Microsoft Excel for Windows.

Chi-square test was used to ascertain statistical significance among the proportions. A p-value of <0.05 was considered as statistically significant unless mentioned otherwise. Confounding factors was dealt with appropriate method of adjustment.

RESULTS

In this study at Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh., we enrolled 100 patient diagnosed to have hypothyroidism, both In Outpatient department and In patient department from August 2018 to August 2020 were included. The baseline demographic characteristics of these patients are shown in [Table 1]. Of all the enrolled patients, results of clinical evaluation are compiled in [Table 2, 3]. Investigations results are given in [Table 4].

Feeling run down and sluggish	58	32	58
Depression	40	60	40
Difficulty in concentration	28	62	28
Unexplained or excessive weight gain	32	68	32
Dry, coarse or itchy skin	24	76	24
Constipation	52	48	52
Muscle cramps	56	44	56
Nervousness	42	58	58
Irritability	44	56	44
Paresthesias excluding hands (numbness, tingling, burning)	42	62	42
Pain in hand	40	60	40
Paresthesias in hand (numbness, tingling, burning)	42	58	42

Table 3: Clinical signs

Clinical signs	Number of patients with positive finding	Number of patients with negative finding	Percentage of total no. of patients with positive finding
Muscle weakness excluding hands	36	64	36
Sensory impairment	30	70	30
Weakness in hand	32	62	32
Phallen's sign	26	74	26
Sensory loss in hands	28	72	28

Table 4: Investigations

Investigation	No. of patients with abnormal finding	No. of patients with normal report	Percentage of total no. of patients with abnormal finding
Electrophysiology	58	42	58
NCV-Positive for CTS	42	58	42
Neuroimaging	12	88	12

DISCUSSION

In this cross-sectional study at Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh., patient diagnosed to have hypothyroidism, both In Outpatient department and In patient department from August 2018 to August 2020 were included. Total 100 patients in age group 16- 60

diagnosed to have Hypothyroidism according to biochemical criteria was evaluated in detail clinically and with other investigations. Patients having other possible causes of neuropathy or neuromuscular diseases (for example, diabetes mellitus, alcoholism, liver and kidney disease, use of drugs known to cause neuropathy or myopathy, malignancy, or

other serious illness (for example, cardiac failure or HIV infection), or a family history of neuropathy were excluded.

Out of 100 patients who fulfilled the criteria for study 40% were male and 60% were female. Average age of the participants was 44.2 years and average weight of patients was 64.5 kg. Out of the 65 patients studied by Yanez et al male: female ratio was 1:8, 58.46% of patients were middle aged.^[6] Other studies have also reported that females are more commonly affected especially in middle age.^[7,8,9,10]

Our study indicates that many patients who are diagnosed with Hypothyroidism also have neurological manifestations. This is evident from results of this study in which complaint of pain in hand was present in 40% of total assessed patients. Paresthesia in hand was present in 42% of patients. The complaints of sensory loss in hand and muscle cramps were 28% and 56% respectively. It was also seen that in hypothyroid patients complaints of nervousness was present in 42% of the patients. These complaints when subjected to various tests gave confirmatory evidence of prevalence of various neurological dysfunctions in hypothyroid patients. D Raju et al also reported about neurological features. The symptoms in decreasing frequency in their study included tiredness (95.38%), change in voice (61.54%), body ache (52.31%), psychiatric manifestations (24.62%), altered sensorium (6.15%) and seizures (4.62%).^[6] Cakir M et al reported in their study on 137 patients that musculoskeletal disorders often accompany thyroid dysfunction. They noticed Dupuytren's contracture, limited joint mobility and carpal tunnel syndrome were commonest involvement among their patients (21.7%, 8.7%

and 30.4%, respectively).^[11] Singh DP et al reported on 62 patients study, in which complaint of pain in hand was present in 46% of total assessed patients. Paresthesia in hand was present in 54% of patients. The complaints of sensory loss in hand and muscle cramps were 52% and 48% respectively. In their study it was also seen that in hypothyroid patients complaints of nervousness, tinnitus and hearing impairment were present in 52%, 36% and 30% of the patients.

Other authors have also observed that an awareness for musculo-skeletal manifestation in hypothyroidism is prudent as this system is easy to miss in view of many times subtle involvement in early cases.^[12,13,14]

Tests like Electrophysiology suggested that about 58% of the total assessed patients had positive electrophysiological findings, of which 65% were female subjects and 35% were male subjects, which is quite a significant proportion of patients. Similarly tests for Carpal Tunnel Syndrome also suggested that about 42% of the patients tested positive for CTS, of which 62% were female subjects and 38% were male subjects.

Neuroimaging test showed only 12% of total patients tested positive, of which again female percentage was more than males 64% and 36% respectively. Similarly, Phallen's sign was elicited in 26% of the total patients, of which 60% were female and 40% were male. In this study neuromuscular symptoms and signs were present in most patients. About 52% of the hypothyroid patients had predominantly signs of neuromuscular disorder in the course of thyroid disease. In the literature the prevalence of abnormal findings found in neuromuscular

investigations in thyroid dysfunctions varies between 20% and 80 %.^[15,16,17,18]

Weakness in hypothyroidism is more difficult to treat, suggesting myopathy. Hypothyroidism causes signs and symptoms of neuromuscular dysfunction. Hypothyroidism has been associated with the clinical features of myopathy (for example, proximal muscle weakness), mononeuropathy, and sensorimotor polyneuropathy.^[18,19]

The reported prevalence of these signs and symptoms is variable. Few prospective studies on this topic have been performed.^[18,19] In retrospective studies, published in the early 1980s, the prevalence of neuropathy in hypothyroid patients varied between 10% and 70% and that of myopathy between 20% and 80%.^[20,21,22]

The neurological manifestations obtained in this study affirm and support the hypothesis that hypothyroidism causes neurological dysfunctions which causes a lot of suffering and frequent visits by the patient to the doctor. These data would help the clinicians to detect these neurological findings and associate them with hypothyroidism for early initiation and management of patient complaints.^[23]

CONCLUSIONS

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Thyroid hormones have an important role in the functioning of nearly all tissues in the body at all stages. More research is required to fully understand role thyroid function changes its neurological manifestations. This study highlights the clinical aspects and investigations of these diseases. Clinicians must be able to identify characteristic neurologic deficits of thyroid disease so as to predict and possibly prevent neurologic complications. In this study neuromuscular symptoms and signs were present in most patients. Most of the hypothyroid patients had predominantly signs of neuromuscular disorder in the course of thyroid disease. This study quite firmly indicates that many patients who are diagnosed with Hypothyroidism also have neurological manifestations. Approach with this set of minds can help the clinicians to detect these neurological findings early and associate them with hypothyroidism for initiation and management of patient complaints.

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