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Effect of hatha yogic practices on the level of triiodothyronine (T3) in patients of hyperthyroidism

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Abstract
According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases. In this tied up life, most of the people are not taking care about their lifestyle. As a result, the human being is suffering from various diseases, out of which endocrinal disorders are very common worldwide and it is very common in India as well. Change in the level of endocrinal secretion leads to many diseases. Thyroid gland is one of the important endocrine gland situated in the throat and it has number of significant role in the human body.
Yoga makes changes in lifestyle of the person. With the background that a number of studies being conducted to observe the effect of complementary therapies to balance the secretions of the bodily hormones, the present study aimed to find the impact of Hatha Yogic Practices on the level of Triiodothyronine (T3) Hormone in the patients of Hyperthyroidism.
Forty (40) subjects of age group 20 to 50 yrs were taken in the study from Pitale clinic, Nagpur having Hyperthyroidism. They were then divided into two subgroups, experimental and control group having equal 20 subjects in a group. They were voluntarily wanted to join in the study for their wellbeing. In this experimental - control research study, Hatha Yogic practices including Asana, Pranayama, Mudra and Bandha were introduced to them. The volunteers practiced for 90 days including Sunday and holidays. The impact of the Hatha Yogic practices showed a significant decrease in the level of Triiodothyronine (T3) Hormone in the patients of Hyperthyroidism.

Keywords: Hatha yogic practices and triiodothyronine (T3)

1. Introduction
The thyroid is a two inch long endocrine gland, weighing less than one ounce, Located in the front of the neck below the larynx, or voice box, it has two lobes, one on each side of the windpipe [2] Thyroid hormones regulate how the body breaks down food and either uses that energy immediately or stores it for the future. Every cell in the body depends upon thyroid hormones to maintain thermogenic and metabolic homeostasis [3]. The thyroid gland absorbs iodine, found in foods, iodized salt and supplements and converts it into thyroid hormones: thyroxine (T4) and triiodothyronine (T3), by combining with the amino acid tyrosine. The T3 and T4 molecules are then released into the blood stream and are transported throughout the body to regulate metabolism, the conversion of oxygen and nutrients into energy at the cellular level. Release of thyroid hormone also stimulates mental activity and increases the activity of other hormone-producing glands [3]
Typical adult limits for these hormones are:

TSH serum (units)	:	0.45 – 4.50 uIU/mL;
T4 serum (nanograms)	:	4.5 – 12.0 ng/dl; and
T3 serum (nanograms)	:	70 – 190 ng/dl [4].

Thyroid hormone levels in the body are maintained by the brain through a finely controlled feedback mechanism involving the hypothalamus and the pituitary gland [3]. The hypothalamus, in the base of the brain, constantly monitors the pace of many of the body's functions and many external factors such as temperature, stress and so on. In response to any of these factors, the hypothalamus secretes Thyrotropin-releasing Hormone (TRH) that control the anterior pituitary gland which in turn secretes Thyroid Stimulating Hormones (TSH) that then directs the thyroid to make thyroid hormones T4 and T3.

These are released into the bloodstream carried by a plasma protein known as thyroxine-binding globulin or TBG. Once in the blood stream, the thyroid hormones interact with receptors located inside the nucleus of specific cells, in turn triggering a certain function that directs the rate at which that organ needs to operate [3]. The concentration of thyroid hormones (T_3 and T_4) in the blood regulates the pituitary release of TSH; when T_3 and T_4concentrations are low, the production of TSH is increased, and, conversely, when T_3 and T_4 concentrations are high, TSH production is decreased [5].

1.1 Hyperthyroidism

Hyperthyroidism, or overactive thyroid, is the overproduction of the thyroid hormones triiodothyronine (T3) and thyroxine (T4) [6]. It presents with symptoms such as a thyroid goiter, protruding eyes (exophthalmos), palpitations, excess sweating, diarrhea, weight loss, muscle weakness and unusual sensitivity to heat. The appetite is often increased [8]. The diagnosis of hyperthyroidism is confirmed by blood tests that show a decreased thyroid-stimulating hormone (TSH) level. TSH is a hormone made by the pituitary gland in the brain that tells the thyroid gland how much hormone to make. When there is too much thyroid hormone, the TSH will be low [7].

In modern medical system, Beta blockers are used to decrease symptoms of hyperthyroidism such as increased heart rate, tremors, anxiety and heart palpitations, and anti-thyroid drugs are used to decrease the production of thyroid hormones. These medications take several months to take full effect and have side-effects such as skin rash or a drop in white blood cell count, which decreases the ability of the body to fight off infections. These drugs involve frequent dosing (often one pill every 8 hours) and often require frequent doctor visits and blood tests to monitor the treatment, and may sometimes lose effectiveness over time. Due to the side-effects and inconvenience of such drug regimens, some patients choose to undergo radioactive iodine-131 treatment. Radioactive iodine is administered in order to destroy a portion of or the entire thyroid gland, since the radioactive iodine is selectively taken up by the gland and gradually destroys the cells of the gland. Alternatively, the gland may be partially or entirely removed surgically, though iodine treatment is usually preferred since the surgery is invasive and carries a risk of damage to the parathyroid glands or the nerves controlling the vocal cords. If the entire thyroid gland is removed, hypothyroidism results [9].

Long before medical science ever knew about the existence of thyroid glands, the yogis had devised practices which not only maintained healthy glands and metabolism, but also formed part of a system of enlightenment. The good health of the neuro-endocrine system was understood to be vital to higher awareness [10]. Real comfort lies in good health. Disease free condition and contentment at the level of mind are essential components of happiness. Yoga has got the potential to bring prosperity and happiness to anybody from any profession [11]. Physical and mental cleansing and strengthening is one of yoga's most important achievements. What makes it so powerful and effective is the fact that it works on the holistic principles of harmony and unification. According to medical scientists, yoga therapy is successful because of the balance created in the nervous systems and organs of the body [12]. It has now been observed beyond doubt that Yogic Science not only helps to maintain normal Physical and Mental health but it is extremely useful in some diseases [13].

Yogic practices are capable to make changes in the secretions of the bodily hormones. Numbers of researches have been done related to Yoga and thyroid disorders. In a study, "A study of the effect of Yogic practices in Hypothyroid disease" the effect of Yoga package including Asanas- sarvangasana, Matsyasana, Singhasana, each for three minutes, Pranayamas- Nadishodhan, Ujjayi, sheetli, each for four minutes and Jalandhar Bandha studied on hypothyroid disease. Result shows the significant effect of these Yogic practices on hypothyroid disease [14]. Another study titled, "The effect of Yoga on subclinical Hypothyroidism: a case report" says that in the Hypothyroidism, the T3, T4 and TSH level may be affected through Yoga therapy. They also suggested that yoga can be an effective adjunct therapy in thyroid conditions and further studies in larger samples are needed to confirm these findings and to better understand the mechanisms behind such beneficial effects in patients of thyroid disorders [15]. Rawal S.B. *et al* (1994) in their study, "Effect of Yogic exercises on thyroid function in subjects resident at sea level upon exposure to high altitude", studied the effect of Yogic schedule included prayer (3 minute), Hatha Yoga asanas (50 minute), pranayam (5 minute), meditation (5 minute). Yoga exercise of month was found to cause a significant reduction in the concentration of radio-iodine in the thyroid of subjects at sea level. One month of yogic exercises at sea level has been observed to cause a significant reduction in the trans-thyroidal availability of radioiodine [16].

Consequently, the researcher selected the topic entitled "Effect of Hatha Yogic Practices on the level of Triiodothyronine (T3) Hormone in the patients of Hyperthyroidism" among subjects with 20-50 years age group.

2. Material and Methods

Seventy three (73) subjects were selected from the Pitale Diabetes and hormone centre, Nagpur, India. Forty six (46) subjects were eligible for the study. A senior Endocrinologist referred all the patients after examining their physical health and medication status. Each subject was assigned to one of the two groups: (i) Yoga+ medication, (ii) medication. After assigning the subjects in both groups, subjects in yoga and non-yoga groups were (n = 23). Both the groups were kept for a stable dose of medications for six (6) months. Approximately similar medications (Methimazole (Tapazole), Propylthiouracil (PTU) etc.) were provided to both the groups. After three months of yogic intervention yoga (n = 20) and non-yoga (n = 20) groups completed the study protocol. Subjects who did not participate in yogic intervention classes (>80% yogic practice classes) were excluded from the study. Patients, who dropped the study, also did not differ significantly in terms of age and sex. Having cervical spondylitis and age <20yrs. and >50yrs. was the exclusion criteria for the study. Before study all the subjects were asked to maintain their routine activities and not initiate any new physical activities for this duration. Those patients with clinical history of Hyperthyroidism and age limit 20—50 years were included for the study and patients with other co-morbid conditions like malignant hypertension, diabetes mellitus, Chronic obstructive pulmonary disease (COPD), asthma, diseases of

nervous system, endocrinal disorders, and congenital heart diseases, patients with known complications of CAD, atrioventricular (AV) block etc., on pace maker and undergone bypass surgery were excluded from the study. Patients were registered from October 2013 to December 2013, who fulfilled the inclusion criteria and willing for compliance were invited to participate in the yogic interventional prospective study. After informed consent by the subjects, bio-chemical measurement was taken.

2.1 Laboratory evaluation of Triiodothyronine (T3) Hormone

Diagnostic lab test performed on a blood sample include: - Triiodothyronine (T3) hormone.

2.2 Sample collection

Five millilitres of venous blood was collected, following informed consent, from all individuals who participated in this study before yogic intervention and again blood was collected after three months of yogic intervention in yoga group and without intervention in non-yoga group. Serum was separated by centrifuge machine (3500-4000 rotations/min) at room temperature.

2.3 Biochemical measurements

The Triiodothyronine (T3) Hormone level in the blood was evaluated in the Biochemistry Laboratory of Pitale Diabetes and Hormone centre, Nagpur, India.

2.4 Yogic intervention

Under the guidance and supervision of yoga expert, subjects performed yogic practices. The Hatha Yogic practices were
Asana- Sarvangasana, Supta-Pawan-muktasana, Yoga Mudrasana, Kandharasana (2 min. each) total 8 min.
Pranayama- Nadi-shodhana, Ujjayi, Sheetli, Bhramari (4 min. each) total 16 min.
Mudra- Vipreetkarni mudra. (3 min.)
Bandha-Jalandhar Bandha (3 min.)

2.5 The schedule for Yogic practices-

Time duration for yogic practice- 90 days
The exposure time for yogic practice- 30 min.

2.6 Statistical analysis

IBM SPSS software was used in the statistical analysis. All statistical tests were 2-tailed and a p value of <0.05 was considered significant. Our main objective was to compare the Triiodothyronine (T3) Hormone level in the two groups (yoga and non-yoga) after the follow-up period of three months.

3. Results

Out of 73 patients 40 have finished the program and completed study protocol. Table 1 summarizes pre and post-intervention changes in the variables. Compared to the non-yoga group, the yoga group revealed a pattern of improvement in T3 level (p<0.0001).

Table 1: Experimental (Yoga group)

	N	Mean	Std. Deviation	SE_D	t	df	r	significance level
Pre	20	190.00	26.5429	5.0139	4.478	19	0.537	p<0.01
Post	20	167.55	13.0201					

Table 2: Controlled (Non-Yoga group)

	N	Mean	Std. Deviation	SE_D	t	df	r	significance level
Pre	20	187.00	20.1781	1.4964	2.038	19	0.946	p>0.05
Post	20	183.95	17.6976					

Table 1 and 2 summarizes the pre and post intervention changes in the experimental and control groups. Compared to the non-yoga group, the yoga group revealed a pattern of improvement in T3 level (p<0.01).

4. Discussion and Conclusion

In this study the effect of Hatha yogic practices was seen on the level of Triiodothyronine (T3) Hormone in the patients of Hyperthyroidism. Significant improvement in level of T3 was observed. Other researchers also corroborate with our findings. In a research conducted in India, a twelve week program of yogic practices was undertaken to observe the Triiodothyronine (T3) level in hypothyroid patients, significant increase in T3 level was observed in the patients with yoga. It was found that yogic practices are useful in preventing and managing disorders related to the body systems.[17] In the present study T3 level significantly decreased after the applying Hatha Yogic practices in yoga group. This study assessed the feasibility of implementing a yoga program among patients of Hyperthyroidism. Practice of Yoga improves the endocrine activity and corrects body metabolism and physiological functions. The rate of testosterone excretion in urine shows a statistically significant increase after the practice of yoga. This increase of excretion of Testosterone in the urine probably reflects the increased production and metabolism of Testosterone. The increased Testosterone activity would cause an improved anabolic activity in the body. These metabolic changes may be due to an improved Endocrine function as a response to some of the yogic practices. The mode of revitalization of the Endocrine glands may perhaps be due to improved microcirculation of the Endocrine glands and other tissues [18]. In a research conducted by Singh *et al* (2011) in their study, "The impact of yoga upon female patients suffering from hypothyroidism", studied the effect of yoga on the quality of life of 20 female hypothyroid patients with the help of WHO Quality of Life Scale (22). Subjects attended one hour yoga sessions daily for a period of one month. A pretest-post-test research design was used for data analysis and they concluded that yoga is valuable in helping the hypothyroid patients to manage their disease-related symptoms. Yoga may be considered as supportive or complementary therapy in conjunction with medical therapy for the treatment of hypothyroid disorder [19].

In the present study the level of Triiodothyronine (T3) hormone significantly decreased after Hatha yogic practices. Table (1) and (2) shows that the practice of Hatha yogic practices decreases the level of Triiodothyronine (T3)

hormone of the patients suffering with Hyperthyroidism significantly. At the end it can be concluded that Hatha Yogic practices significantly decreases the level of Triiodothyronine (T3) Hormone of the patients suffering with Hyperthyroidism. Thus, Hatha Yogic practices can be used as a adjunct therapy with modern medicine. It may be considered as supportive therapy in conjunction with medical therapy for the decrease of T3 level in the hyperthyroidism.

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