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# Effect of yogic practices on thyroid hormones: A review

Shuchi Mohan, Rameswar Pal

## Abstract:

The beneficial effect of Yoga on the parameters of thyroid hormone has been evaluated through the various clinical trials. Since its review has not been recorded earlier, this study has been performed to investigate the effectiveness of Yogic practices on thyroid hormones, more specifically T3, T4, and TSH. Searches were performed through February–June, 2020 using the PUBMED and GOOGLE. The keyword used for search was Yoga and thyroid or thyroid disorder. Only experimental studies were selected which were reported in English, printed in prevailed publications, and inspecting the effectiveness of the regular practice on thyroid hormones in these studies. A total of 41 studies were selected through various searches, among which 11 met criteria for the final review. Hypothyroid patients showed decrease in thyroid-stimulating hormone (TSH), hyperthyroid patients showed decrease in tetraiodothyronine (T4), polar tri-iodothyronine (T3) syndrome population also showed positive effect of Yoga. Perimenopausal women showed not so significant change in these parameters. Healthy middle-aged individuals showed increase in TSH in the male population and near significant increase in this hormone was shown in the female population, also there was decrease in basal T3 and T4 in both male and female. All these changes were in normal range. Other two studies on healthy individuals did not show any significant change in T3, T4 or TSH. 1 study was done on hypothyroid patients using hand mudra only, showed significant changes in level of these parameters. In conclusion, it may stated that yogic practice may regularize thyroid hormone functioning and improve total health.

## Keywords:

Thyroid disorder, thyroid, yoga

## Introduction

The thyroid gland is an endocrine gland that has two lobes connected with the thyroid isthmus (a thin band of tissue). It is located in the anterior part of the neck around the trachea. It releases thyroid hormones tri-iodothyronine (T3), tetraiodothyronine (T4), and calcitonin, which are released directly in the bloodstream and carried to every tissue in the body. The thyroid hormones are essential for growth and development, for the nervous system, metabolism, and organ functions. It influences the functioning of all organ systems and functions throughout the lifetime. Normal value in adult for

thyroid-stimulating hormone (TSH) is 0.4–4.0 mIU/L, for total T3 is 80 – 220 ng/dL, and for total T4 is 5.4–11.5 mcg/dL.

The production of thyroid hormone is regulated by TSH (thyroid-stimulating hormones) which is released from the anterior pituitary. The TSH production itself is regulated by the thyrotropin-releasing hormone.

Common thyroid diseases or disorders are: hypothyroidism, hyperthyroidism, thyroid cancer, Graves' disease, and polar T3 syndrome. Thyroid disorders are also seen in the case of perimenopausal women and menstrual abnormalities in females of reproductive age. Thyroid function is also disturbed in people who are exposed to high altitudes. In general, along with other

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systems of the body, the endocrine system is also affected by the normal aging process, exposure to high altitudes, and severe temperature changes.

Yoga is one of the most ancient sciences. The origin of Yoga and its practices has been speculated to back in the pre-Vedic period. It is expected that the origin of Yoga can be as early as 3000 BC as per archeological evidence. Many scientific studies have been conducted on the different components of Yoga such as asanas (physical postures), pranayama (breathing practices), meditation, and yoga-based relaxation techniques for the last few decades.<sup>[1]</sup>

A good number of research articles are published on the effect of the transcendental meditation (TM) program on the hormonal level. After practicing TM for 4 months, the level of cortisol and TSH were decreased, whereas there was an increase in growth hormone.<sup>[2]</sup> A researcher also found an increase in alpha waves and a significant decrease in serum cortisol during the practice of Yoga.<sup>[3]</sup> In a study, scientists found a significant improvement in systolic blood pressure (BP), body mass index and high-density lipid cholesterol, heart rate, body weight, diastolic BP, total cholesterol, triglycerides after regular practice of Yoga.<sup>[4]</sup> Studies conducted by scientists found that irrespective of gender and BMI, regular pranayama and meditation practice for 15 days can result in a convincing decrease in systolic BP, diastolic BP, and mean arterial BP. A decrease in resting pulse rate was also noted.<sup>[5,6]</sup> Another study, an effect of Santhi Kriya on certain psychophysiological parameters found an increased alpha wave activity.<sup>[7]</sup> A study was conducted to evaluate the effect of sukha pranayama: A slow and deep breathing technique on maternal and fetal cardiovascular parameters found when done with 6 breaths/min for as less as 10 min is good for high BP and pregnant ladies as it shifts the autonomic balance toward parasympathetic, increases vagal modulation, improves baroreflex sensitivity. Furthermore, there was a decrease in strain on the maternal heart.<sup>[8]</sup> Another study conducted on the geriatric population found that the practice of both suryanadi and chandranadi pranayama results in a decrease in BP even in people with high BP. Hence, we can say that Yoga is mainly about balance. Furthermore, the practice of suryanadi pranayama decreases auditory-visual reaction time significantly resulting in more alertness.<sup>[9]</sup> The study reported that both day and night attacks of asthma were significantly reduced by Yoga, while no such effects were observed in the control group<sup>[10]</sup> Scientists evaluated the effect of Yoga on balance and quality of life in postmenopausal women with osteoporosis and found improved balance in yoga group. The pain was significantly decreased and there was an increase in household activities too.<sup>[11]</sup> A study found yoga group following eight weeks of hath

Yoga showed significantly greater improvement on the executive function's measures of working memory, shorter reaction time, and greater accuracy.<sup>[12]</sup> Scientists found 16 weeks of Bikram Yoga significantly improved perceived stress, general self-efficacy, and health-related quality of life in sedentary, stressed adults<sup>[13]</sup> A study found that the students, who practiced Yoga performed better in academics as Yoga helps to decrease stress. It was also found that with lower stress students were able to function in an improved way than those with a higher level of stress.<sup>[14]</sup> Scientists found a significant increase in left ventricular ejection fraction after 12 weeks of practice of pranayama and meditation.<sup>[15]</sup> Another study found that the practice of Yoga improves the musculoskeletal system by increasing strength, flexibility also improves physical fitness by improving performance, etc.<sup>[16]</sup> Scientists from a study suggested that regular Yogic practice for 3 months decreases BP, heart rate, and autonomic function and decrease emotional arousal and practitioner goes toward parasympathetic dominance.<sup>[17]</sup> Hence, it can be said without doubt that yogic science not only helps to maintain and improve normal physical and mental health, but it is extremely useful in some diseases.

Even though some studies have reported that Yoga practices can have beneficial effects on people suffering from a thyroid disorder, their definite effectiveness remains unclear. Hence, we reviewed to evaluate the effectiveness of Yoga practices as a complementary therapy for patients suffering from a thyroid disorder.

## Material and Methods

The articles for this systematic review were obtained by searching through PUBMED and Google. The keywords Yoga, thyroid, and disorder were used while accessing these databases, where full text was available and was downloaded from that site as well from the reference list of relevant journal articles through the institute's library database. Where full paper was not available, the concerned author was E-mailed to request for the same. A waiting period of 10 days was fixed, if a response was not received within 10 days from the corresponding author, abstracts were looked through to verify if they had enough information.

## Study selection

The inclusion criteria selected for this review were that the study should be written in English and published in peer-reviewed journals. Articles with other complementary treatment such as naturopathy, allopathic treatment, and diet along with Yoga were also included. Articles with case study were excluded. Articles which did not include parameters such as T3, T4, and TSH were also excluded.

### Data abstraction and quality assessment

Using the technique as shown in Figure 1, 41 studies were selected and considered for initial evaluation. Four studies were removed because they were case study, 1 study was removed as that was done with Ayurvedic treatment only. Nineteen studies were excluded due to their intervention and three studies were also excluded because it was a commentary. Full text was not available for 1 article and abstract did not have complete information, so that was also excluded. Two papers were dissertation article so those were also excluded. A total of 11<sup>st</sup>udies met the criteria for the final review. The quality of the paper was also assessed using Cochrane risk of bias tool (REF) and mentioned in Table 1.

### Results

A total of 11 out of 41 studies were selected for final review. Among these 2 were on perimenopausal women, 3 were on hypothyroidism, 1 more study was on hypothyroid patients which used hand mudra only, 1 is on hyperthyroidism, 2 were on healthy individual, 1 is on polar T3 syndrome, and 1 is on menstrual abnormalities.

Out of two articles on healthy individuals, one was done on middle-aged population which shows increase of TSH in males and near significant increase in females while there was decrease in basal T3 and T4 in both

male and female. All these changes were within normal range. Other studies included both young and middle aged (22–55 years) population. No significant change was found in TSH. Out of 11 articles, 3 (1 was on healthy population and other 2 were on perimenopausal women) shows no significant changes in T3 or T4 or TSH or all while others shows positive effect of Yoga on the level of T3, T4, or TSH or all. All results are summarized in Table 2 and 3.

### Discussion

Thyroid disorder has become one of the common diseases, affecting people of almost all age groups. Being on medication for a thyroid disorder is a regular affair and one might be on such medication for the rest of their life. Regular yoga practice has shown improvement in thyroid-related disorders. Yoga poses such as sarvangasana, halasana, matsyasana, ushtrasana, and pranayama like ujjayi have amazing response in such conditions. This could be due to neck flexion, extension, compression, or vibration component increasing the blood flow to the neck and adjoining areas including the thyroid gland which possibly result in better functioning of the thyroid gland.

In the present review, three studies found very small or not-so-significant changes in the level of T3, T4, or

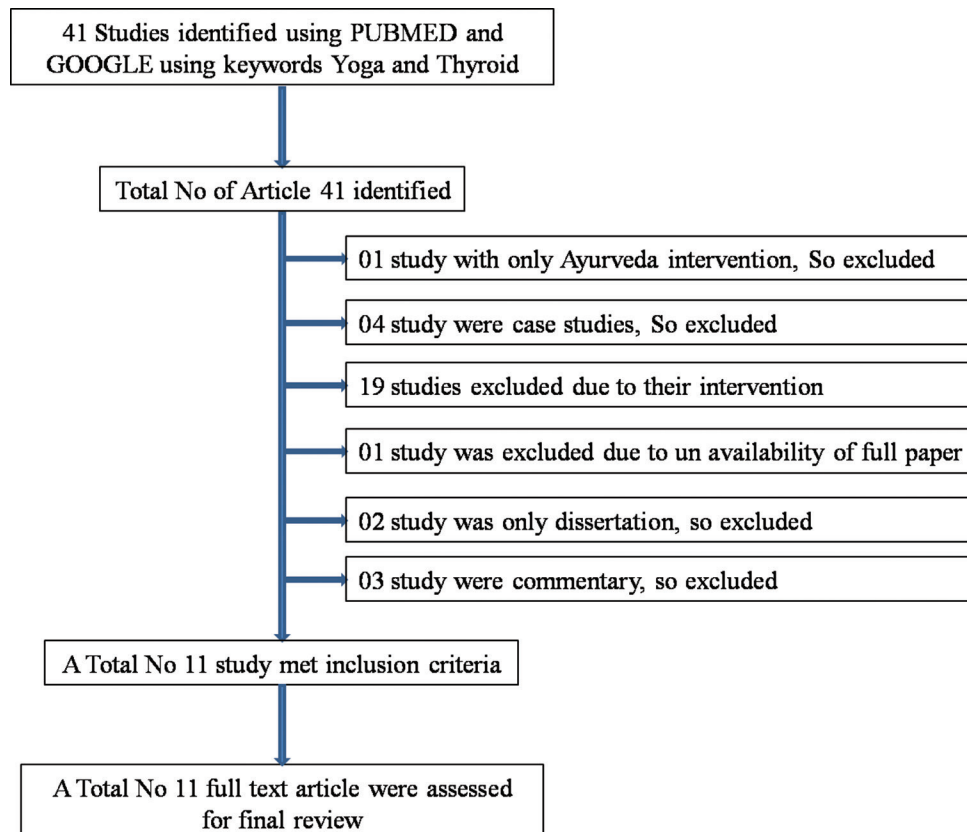


Figure 1: Schematic representation of study searching and selection as per the criteria

**Table 1: Quality of selected studies**

Study year	Random sampling (selection bias)	Allocation concealment (selection bias)	Binding of participants and personnel (selection bias)	Blinding of outcome assistant (detection bias)	Incomplete outcome data (attrition bias)	Select reporting (reporting bias)
Maske and Barnwal 2016 <sup>[18]</sup>	-	-	-	-	+	-
Nirwan <i>et al.</i> , 2019 <sup>[19]</sup>	-	-	-	-	-	-
Chaturvedi <i>et al.</i> , 2015 <sup>[20]</sup>	-	-	-	-	+	+
Rani <i>et al.</i> , 2013 <sup>[21]</sup>	+	+	+	+	+	+
Vasandhakumar <i>et al.</i> , 2020 <sup>[22]</sup>	-	-	-	-	-	-
Chaturvedi <i>et al.</i> , 2016 <sup>[23]</sup>	-	-	-	-	+	-
Chatterjee and Mondal 2017 <sup>[24]</sup>	+	+	+	+	+	+
Nilakanthan <i>et al.</i> , 2016 <sup>[25]</sup>	-	-	-	-	+	-
Divya <i>et al.</i> , 2017 <sup>[26]</sup>	-	-	-	-	+	-
Banarjee <i>et al.</i> , 2019 <sup>[27]</sup>	-	-	-	-	-	-
Tripathi <i>et al.</i> , 2018 <sup>[28]</sup>	-	-	-	-	-	-

+ indicates low risk of bias, - indicates high risk of bias

**Table 2: Details of the study**

First author and year	Population size and gender	Intervention yoga group	Intervention control group	Duration	Change in related variables in yoga group	Change in related variables control group
Maske and Barnwal 2016 <sup>[18]</sup>	40 females	20 females	20 females	30 min for 90 days	↓TSH*	↓TSH
Nirwan <i>et al.</i> , 2019 <sup>[19]</sup>	14 males	7 males	7 males	1 h daily for 10 months	↓TT <sub>3</sub> * ↓TT <sub>4</sub> * ↓TSH* Normality was maintained	↓T T <sub>3</sub> ↓TT <sub>4</sub> ↑TSH unstable
Chaturvedi <i>et al.</i> , 2015 <sup>[20]</sup>	111 females	111 females	-	45 min per days for 12 weeks	↑TSH	
Rani <i>et al.</i> , 2013 <sup>[21]</sup>	126 females	65 females	61 females	35-40 min per days, 5 times a weeks for 6 months	↓TSH*	↓TSH
Vasandhakumar <i>et al.</i> , 2020 <sup>[22]</sup>	15 females	15 females	-	60 min, 6 days a week for 12 weeks	↓TSH* ↓T <sub>3</sub> * ↓T <sub>4</sub> *	-
Chaturvedi <i>et al.</i> , 2016 <sup>[23]</sup>	216 females	111 females	105 females	45 min per days for 12 weeks	↑TSH	↓TSH
Chatterjee and Mondal 2017 <sup>[24]</sup>	45 males and females	15 males 8 females	15 males 7 females	12 weeks, 45 min-1 <sup>st</sup> week, 90 min-next 6 weeks, 1 h 45 min-8 to 12 <sup>th</sup> week	↑TSH *(males) ↑TSH (females) ↓Basal T <sub>3</sub> * (male) ↓Basal T <sub>3</sub> * (female) ↓Basal T <sub>4</sub> * (male) ↓Basal T <sub>4</sub> * (female)	↑TSH (male) ↑TSH (female) ↓Basal T <sub>3</sub> (male) ↑Basal T <sub>3</sub> (female) ↓Basal T <sub>4</sub> (male) ↑Basal T <sub>4</sub> (female)
Nilakanthan <i>et al.</i> , 2016 <sup>[25]</sup>	22 females	22 females	-	60 min for 4 days a week for 6 months	↓TSH Decrease dose of medication	-
Divya <i>et al.</i> , 2017 <sup>[26]</sup>	50 males and females	22 males and 28 females	-	75 min per days for 41 days	↑T <sub>3</sub> ↑T <sub>4</sub> ↓TSH	-
Banarjee <i>et al.</i> , 2019 <sup>[27]</sup>	150 females	150 females	-	45 min per days for 4 months	↓TSH*	-
Tripathi <i>et al.</i> , 2018 <sup>[28]</sup>	1 male and 6 females	1 male and 6 females	-	100 times each mudra per days for 3 months	↑T <sub>3</sub> * ↑T <sub>4</sub> * ↓TSH*	-

\*Significant change. T<sub>3</sub>=Triiodothyronine, TT<sub>3</sub>=Triiodothyronine, T<sub>4</sub>=Tetraiodothyronine, TT<sub>4</sub>=Total tetraiodothyroxine, TSH=Thyroid stimulating hormone

TSH or all. One common finding in two of these articles is that they did not include those asanas which have

neck flexion components such as setubandhasana or halasana in their Yoga intervention. One article with

**Table 3: Details of yogic packages/modules practiced by the participants of each study**

First author and year	List of yogic practices
Maske and Barnwal 2016 <sup>[18]</sup>	Asanas Sarvangasana, Supta-pawan-muktasana, Yogamudrasana Kandharasana (2 min each) total 8 min Pranayamas Nadisodhana, Ujjai, Sheetal, Bharamari (4 min each) total 16 min Mudra Vipreetkarni mudra (3 min) Bandha Jalandhara bandha (3 min)
Chaturvedi <i>et al.</i> , 2015 <sup>[20]</sup>	Asanas Swastikasana, Vajrasana, Suptavajrasana, Tadasana, Trikonasana, Parshavkonasana, Paschimottanasana, Purvotanasana, Janushirshasana, Pavanmuktasana, Bhujangasana, Shalabhasana, Dhanurasana, Vakrasana, Padottanasana, Shavasana Pranayama Anuloma-vilom, Suryabhedhi, Sheetal, Bharamari
Nirwan <i>et al.</i> , 2019 <sup>[19]</sup>	Not clearly mentioned (Sukshmayayama, Asanas, Pranayamas, and guided meditation)
Rani <i>et al.</i> , 2013 <sup>[21]</sup>	Yoganidra
Vasandhakumar <i>et al.</i> , 2020 <sup>[22]</sup>	1 <sup>st</sup> -6 weeks Sukshama vyayama Ankle Bending, Ankle Rotatiom, Knee Bending, Full Butterfly, Hand Clenching, Wrist Joint Rotation, Elbow Bending, Shoulder Socket Rotation, Neck movements Asanas SetuBandhasana, Navasana, Matasyasana, Ustrasana, Bhujangasana Pranayamas Ujjai, Bharamari, Nadisodhana Relaxation Savasana 7 <sup>th</sup> -12 <sup>th</sup> week WARM-UP Surya Namaskar Asanas Setubandhasana, Ushrasana, Dhanurasana, Sarvangasana, Halasana Pranayamas Ujjai, Bharamari, Nadisodhana Relaxation Savasana
Chaturvedi <i>et al.</i> , 2016 <sup>[23]</sup>	Asanas Swastikasana, Vajrasana, Suptavajrasana, Tadasana, Trikonasana, Parshavkonasana, paschimottanasana, Purvotanasana, Janushirshasana, Pavanmuktasana Bhujangasana, Shalabhasana, Dhanurasana, Vakrasana, Padottanasana, Shavasana Pranayama Anuloma-vilom, Surya Bhedi, Sheetal, Bharamari
Chatterjee and Mondal 2017 <sup>[24]</sup>	Not clearly mentioned (Surya Namaskar, Asanas, Sodhana Kriyas, Pranayamas and meditation)
Nilakanthan <i>et al.</i> , 2016 <sup>[25]</sup>	Starting prayer Sukshama vyayamas Hand in and out breathing, Hands strech breathing, Kapol shakti Vikashaka Kriya, Griva shakti vikashaka kriya, Anguli shakti vikashaka kriya etc.(as mentioned) Surya namaskar 6 sets followed by DRT Special technique Mind Sound resonance technique/cyclic meditation once in a week Balancing postures Bakasana, Vrikshasana, Sirsasana, Natrajasana, Ardhamaysyendrasana twist, vashishthasana twist, ardhapadmasana twist, Bhujangasana, Shalabhasana, Dhanurasana, Halasana, Matsyasana, Simha Mudra, Shashankasana Pranayamas and Kriyas Nadisodhana, Vibhagya Pranayama, Bhastrika, Kapalbhati, Bharamari, Ujjai Closing prayaer

Contd...

**Table 3: Contd...**

First author and year	List of yogic practices
Divya <i>et al.</i> , 2017 <sup>[26]</sup>	Asanas ArdhTitaliasana, PurnaTitaliasana, vajrasana, Marjariasana, Pranamasana, PrasarithaPadhasthasana, Trikonasana, ParivritTrikonasana, Padhasthasana, Utkatasana, Tadasana, Merudandasana, VipreetMerudandasana, Uttanpadasana, Halasana, Sarvangasana, Matasyasana, Bhujangasana, Makarasana Shalabhasana, Dhanuasana, Pawanmuktasana, ArdhaMatsayendrasana, paschimottanasana, Kandharasana and Savasana (separate for 5 min) Mudra Braham mudra Pranayama Anulomvilom
Banarjee., 2019 <sup>[27]</sup>	Asanas Tadasana, Navasana, Ardhasarvangasana, Setubandhasana, Matasyasana, Paschimottanasana, Bhujangasana, Salabhasana, Marjaryasana, Adhomukhasana, Garbhasana, Ardhamatsayendrasana, Vrikshasana, Virbhadrhasana, Trikonasana, Pada hastasana Suryanamaskar
Tripathi <i>et al.</i> , 2018 <sup>[28]</sup>	Hand mudra T mudra

DRT=Deep relaxation technique

a healthy population, showed very small changes in the value of T3, T4, and TSH. The reason for this might be due to their age variation (22 – 55 years) or small practice duration (only 41 days). Other eight articles reported Yoga practice helps improve the conditions of a patient with thyroid-related disorders. Six studies were included which have asanas with neck flexion and extension component, ujjayi pranayama, and duration of intervention was at least 12 weeks. One study which found Yoga is helpful for recovery of hypothyroidism associated with obesity in women, did include asanas with neck flexion and extension component but not ujjayi pranayama instead they added diet modification. One article included hand mudra only as their intervention to evaluate the changes in the level of T3, T4, and TSH and found it was very effective.

Yogic practice may improve the functioning of digestive system and absorption of increase. It may also be addressed that yogic practices optimize the iodide level in blood. This may increase the availability of iodine for the synthesis of thyroid hormones which may regulate the hypothyroid condition. Yogic practices may regulate the functioning of hypothalamus and pituitary gland which have the direct importance in the regulation of thyroid gland as well as production of thyroid hormones.

So from these studies, we could say that Yogic intervention which includes neck extension and flexion or compression component, ujjai pranayama, and duration of at least 12 weeks can be beneficial in thyroid-related disorders. Diet modification can also be helpful in thyroid disorders associated with obesity. Hand mudra can also play a significant role in affecting the secretion of thyroid hormones.

Although Yoga has gained great popularity in the last few decades and its benefits have been known and proved through various studies but still, a lot is there to learn, know and understand if we want to serve human well-being. There is a need to find a proper interrelationship between the features of Yoga and the outcome of thyroid-related disorders. More experimental studies are needed to find out the potential of Yoga in different thyroid-related disorders.

### Limitations

While reporting this review, only one study was found from each category, i.e., hyperthyroidism and polar T3 syndrome and hand mudra. Some studies did not elaborate the Yogic practices, which is essential. In some studies, Yoga was not the only intervention. A combination of Yoga and diet and/or conventional medicine was used. Few studies included only one parameter of thyroid.

### Conclusion

It may be concluded that Yogic practice may regularize thyroid hormone secretion, functioning and improve total health of healthy population as well as hyperthyroidism and hypothyroidism patients,

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### Conflicts of interest

There are no conflicts of interest.

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