Hypothyroidism in Ramadan fasting

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Abstract

Introduction: Every adult healthy Muslim must fast during the holy month of Ramadan. Several studies have reported that both fasting and energy restriction can alter thyroid hormone metabolism and may impinge upon the clinical features and well-being of hypothyroid patients. Hypothyroidism is relatively common in communities; its prevalence is 4-8\%, in the general population and is more prevalent in women and elderly people. Despite a large body of animal studies on fasting, a few human studies have undertaken in regard to fasting in Ramadan and its impacts on hypothyroid patients.

Material and Method: Key words including Ramadan, fasting, hypothyroidism and food restriction were looked for in Pubmed & Google scholar databases. Animal and human studies that were most relevant to the topic were selected.

Results: 4 animal studies and 7 human studies were included in this article.

Discussion: Fasting both in animal and human can change the concentration of thyroid hormones, TSH level and their metabolism. Some hypothyroid patients who fast in the month of Ramadan especially women and elderly persons may suffer from the changes of thyroid hormones. Levothyroxine dose should be increased by 25-50 µg/day from the beginning of Ramadan until 15-20 days after the end of this month. Levothyroxine can be taken at bedtime at least 2 hours after meal or at last half hour before eating in the dawn.
**Conclusion:** An increased dose of Levothyroxine during the month of Ramadan especially for women and elderly patients is recommended.

**Key words:** Ramadan, Fasting, Hypothyroidism, Food restriction

**Introduction**

Thyroid hormones reduction lead to the clinical state termed hypothyroidism. Hypothyroidism in regards of the underlying causes may be due to permanent loss or destruction of the thyroid gland itself which called primary hypothyroidism and / or may be due to hypothalamic and/or pituitary defects with insufficient secretion of TRH or TSH or defect in the TSH molecule which called central Hypothyroidism. In case of severity, hypothyroidism is divided into overt and subclinical forms; the latter now is called mild thyroid failure(1).

Hypothyroidism is relatively common in communities, its prevalence is 4-8%, in the general population and is more prevalent in women and elderly people (2). The female to male ratio is 3:1, although in some reports the prevalence in female has been reported to be 10 times more than male(3). Postpartum hypothyroid, a transient phase of hypothyroidism after delivery is found in 5-10% of women (2) and may need to thyroxin therapy like other forms of hypothyroid states.

Fasting during the month of Ramadan is one of the fundamental principles of Islam. Every Muslim who is adult and is not sick must fast during the holy month of Ramadan with the exception of women during their menstrual periods. Muslims who practice this religious duty are commanded to abstain from eating, drinking and sexual relationship.
Fasting is started from dawn in the last quarter in the night and ended to the sunset in the evening. This period of time is variable in different geographical areas in the world and also in different seasons of the year. Duration of breaking fast may be a few hours (about 4 hours) in summer in a country such as England to about 12-14 hours in winter in a country such as Iran.

A large number of Muslim people do fast all over the world; a fraction of them may suffer from hypothyroidism. Several studies have reported that both fasting and energy restriction can alter different aspects of thyroid hormone metabolism and may impinging upon the clinical features and well-being of hypothyroid patients. In this article the probable changes in thyroid hormones in fasting are discussed.

**Discussion**

**Alteration of thyroid hormones in animal studies of fasting**

It was reported that 2 days fasting in rat decreased the production of T3 from T4 in the liver homogenate by 47%, when fasting rats were fed by carbohydrate and amino acids, T3 concentration raised to a higher level in comparison to fasted rat, while feeding the animals with lipids did not increase the T3 level(4). Furthermore, chronic food restriction decreased thyroid hormones in rats; a six months food restriction at the level of 60% ad libitum decreased serum T3 level and altered circadian rhythm of T3 in fasted animals(5). It has been reported that 2 days feeding in rat did not change the content of hypothalamic TRH but pituitary TSH was significantly decreased; moreover, 5 days fasting significantly decreased serum TSH and the percent of $^{131}$I in T4 and T3 decreased. In this study serum TT4, free T4, TT3, free T3 all were decreased both by 2 and 5 days fasting(6).
In an animal study, the hypothyroidism due to thyroidectomy and congenital secondary hypothyroidism in dwarf mouse, conversion of T4 to T3 was decreased in liver but this conversion in the starved rats was not increased by thyroid hormone replacement therapy. Therefore it was suggested that reduction of hepatic conversion of T4 to T3 following starvation is not the result of hypothyroidism and the underlying mechanisms of lower T3 production that exist in starvation and hypothyroidism are not the same (4).

According to Cheikh R.B et al. to assess lipolysis in epididymal adipocytes of wistar rats, hypothyroidism severely prevented lipolysis while it was weakly activated by fasting. It is interesting that in fasted hypothyroid rats lipolysis was reduced slightly and by administration of thyroid hormones lipolysis could restore. This is reflective of dual regulation of lipolysis by fasting and hypothyroidism. A large body of similar animal studies is available in the literature (7).

Despite a large body of animal studies on fasting, a few human studies have undertaken in regard to fasting in Ramadan and its impacts on hypothyroid patients. However a large body of evidence exists about fasting and hypothyroidism in different areas of biochemical research. Some of relevant articles have been implied here.

Riad A. conducted a study on male subjects aged 25-50 years who fasted during the month of Ramadan. Blood samples were collected at the first and the last day of Ramadan and seurm TT4, TT3, free T4 and TSH were measured at both days. No significant difference were found for all measure parameters between the first and the 30th day of Ramadan (8).

In a human study during holy month of Ramadan on fasted Muslim patients from a thyroid clinic, the effect of administration of levothyroxine in bedtime instead of morning hours on
TSH levels was evaluated. when taking levothyroxine was compared in fasting state, with breakfast or at bedtime, the fasting state was found the most useful time(9). It was reported that TSH levels significantly correlated with meal levothyroxine interval ($r = -0.032, p = 0.01$). During Ramadan the fiber and fat consumption increases in evening meal and a 2 hours interval between meal and levothyroxine dose is essential, however, about 75% of clients have been reported to not keep this order.

A human study was conducted in holy month of Ramadan in Tehran on healthy subjects, it was found that T4 significantly reduced in both sexes and TSH increased in male subjects, however these alterations were within normal range. Furthermore, the number of fasting days and T4 levels were shown to be positively correlated in women(10). In another study by Sajid,KM et al. on both male and female fasted subjects in the month of Ramadan, they reported that T3 levels not reduced as much as expected during Ramadan, however TSH levels showed significant gradual rise although within the normal range. They showed that the level of TSH in blood sample on the 23rd day after the end of Ramadan was lower than the 26th day of Ramadan and 5 month after Ramadan returned to the level of TSH before the month of Ramadan(11).

It was reported by Sulimani R.A that a biochemical euthyroid state was maintained in fasted individuals. He proposed that insignificant change of T4 and T3 during Ramadan fasting may result from long half-life of these hormones (7 days and 1 day respectively). Refeeding by about 50 gm carbohydrate can return low T3 levels to normal but if the carbohydrate replaced by fat the starvation feature was manifested and protein refeeding can improve T3 production partially. Therefore the composition of refeeding diet may have essential role on later T3 fall level(8). It was reported by Raza et al. that the amount of absorbed thyroxine
will diminish from 80% in fasting state to 60% in fed state in hypothyroid individuals. Taken thyroxine in bedtime may have the same effect as empty stomach so the hypothyroid patients can take their pills at bedtime on an empty stomach(12).

According to Scriba P.C et al. in obese patients there was no evidence of primary hypothyroidism during prolonged fasting and refeeding. After fasting was started rapid reduction of T3 and increment of RT3U accompanied by slower reduction of TBG but could not perfectly explained by it. Furthermore, fasting reduced the level of TBG. It has also been reported that refeeding rapidly returned all changes to normal ranges(13).

**Conclusion:**

Fasting states both in animal and human can change the concentration of thyroid hormones and TSH level. As discussed in the above sections, fasting for only a few days or in long duration may change thyroid hormones and their metabolism; therefore the impact of thyroid hormones on several body systems may alter and could cause a hypothyroid condition. Fasting in the holy month of Ramadan which is accompanied by a phase of food restriction may imping on the level of thyroid hormones and usually give rise to some clinical manifestation of hypothyroidism. At least some hypothyroid patients who fast in the month of Ramadan especially women and elderly persons may suffer from the changes of their thyroid hormones and the dose of levothyroxine should increase for them from the beginning of the month of Ramadan until 15-20 days after the end of Ramadan.
Key points:

1- Fasting in animals and human as a calorie restriction in short or chronic duration is accompanied with changes in thyroid hormone concentration and metabolic pathways of HPT axis; with their consequences on all or part of thyroid hormones target tissues.

2- Many Muslim people with different forms of hypothyroid do fasting in the month of Ramadan.

3- The Ramadan fasting imping upon thyroid hormones and TSH concentration and metabolism, so the symptoms and signs of hypothyroidism may change in the fasted hypothyroid patient and the severity of clinical manifestation may become more evident.

4- We recommend an increased in dose of Levothyroxine for person during the month of Ramadan especially for women and elderly.

5- In our experience in clinic, during the month of Ramadan, fasted patients with hypothyroidism especially women and elderly persons complain of the worsening of their symptoms; the dose of Levothyroxine for these patients are increased by 25-50 µg/day from the beginning of Ramadan until 15-20 days after the end of this month.

6- Levothyroxine can be taken at bedtime at least 2 hours after meal or at last half hour before eating in the dawn.
References


