

Ramadan and Hypothyroidism: Impact of Ramadan Fasting on Thyroid Status

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ABSTRACT

Background: Fasting Ramadan is the third pillar of Islam. Patients with primary hypothyroidism need levothyroxine replacement when fasting.

The aim of this study is to investigate the impact of fasting on thyroid hormone balance in patients with hypothyroidism under levothyroxine.

Methods: This was a prospective study carried out during Ramadan of the Hegira years 1439 and 1440. We included all the patients with hypothyroidism who fast and take levothyroxine, with a normal rate of ultra-sensitive thyroid-stimulating hormone (TSH us) before Ramadan. The study was conducted in two phases: a first phase before Ramadan when we evaluated the thyroid status by measuring TSH us and a second phase after Ramadan when we evaluated the thyroid status, the therapeutic compliance, the respect of the interval during the month of Ramadan. Treatment compliance was assessed using Morisky's questionnaire.

Results: We collected 65 patients. Treatment adherence was good in 82.1% of cases, moderate in 12.5% of cases, and poor in 5.4% of patients. After Ramadan, 80% of patients remained in euthyroidism while 9% of patients were in hyperthyroidism and 10% patients in hypothyroidism.

Conclusion: Our study highlighted the importance of treatment adherence and respect of interval between the meal and levothyroxine intake to maintain euthyroidism.

Keywords

Hypothyroidism, Ramadan fasting, Thyroid hormone balance.

Introduction

Ramadan is about fasting during the daytime and abstaining from food and fluid intake from dawn (Suhoor) to sunset (Iftar) for one month. It's the third pillar of Islam.

The average duration of fasting varies between thirteen hours and eighteen hours depending on the seasons and geographical

location. The Suhoor is the first meal before dawn and the last meal after sunset is the Iftar.

Fasting during the month of Ramadan affects several fundamental aspects of human physiology including sleeping, body temperature patterns, circadian rhythmicity, fluid balance, energy balance, and glucose homeostasis. It represents a major shift from normal ways

of eating as well as in sleep and wakefulness patterns [1].

Ramadan fasting differs from other common forms of fasting. Indeed, since no food or drink is allowed in daylight hours, the time between meals during Ramadan is more prolonged than during the other months of the year. This has an important impact on physiology, with changes in the rate and magnitude of fluctuations in several homeostatic and endocrine processes [2]. There are physiological changes concerning the duration of fasting [3]. Sleep disturbances during the Ramadan fast are related to the dawn meal and the time devoted to prayers, especially in the evening and early morning [4]. It is therefore expected that circadian and hormonal rhythms may alter. Several hormonal changes during the month of Ramadan have been described in recent years. In reviewing the literature on hormones and hormone changes during Ramadan fasting, it is important to consider the effects on different factors including pulsatile secretion, circadian rhythmicity, stress response, and also the effect of eating and timing of meals. Other important factors to consider are gender and weight. The hormonal effects of Ramadan may have inter-individual variability related to gender, age, and weight [5]

Patients with primary hypothyroidism need to take levothyroxine replacement even if they fast [6]. It is recommended that it should be taken with some amount of water at least half an hour before breakfast on an empty stomach to prevent drug interaction and to increase intestinal absorption [7,8]. During Ramadan, respecting the interval between the treatment and meal can be difficult and impact thyroid hormone balance. Studies focusing on the medical management of hypothyroidism during the fasting month of Ramadan are limited [9,10].

In the present study, we aimed to investigate the impact of fasting during the month of Ramadan on thyroid hormone balance in patients with hypothyroidism under levothyroxine.

Materials and Methods

Study design

This was a prospective study carried out during the month of Ramadan of the Hegira years 1439 (May-June 2018) and 1440 (May-June 2019), at the department of endocrinology and diabetology of the Sheikh Khalifa Ibn Zaid Hospital of Casablanca, Morocco.

We included all the patients with hypothyroidism who fast during the month of Ramadan and take levothyroxine, with a normal rate of ultra-sensitive thyroid-stimulating hormone (TSH us) at the period preceding Ramadan. We excluded patients with disturbed TSH us. Patients undergoing substitution treatment after thyroidectomy for thyroid cancer were also excluded since the objectives of TSH us are not the same.

Data collections

The study was conducted in two phases: the first phase (one week before Ramadan), the second phase (during the first week after

Ramadan). We have put together information about patients, through a structured questionnaire. We collected demographic characteristics, medical history, the concomitant intake of other drugs to assess multi-medication, history of the hypothyroidism, the treatment dose, and the schedule of treatment intake. Weight (with light clothing) and standing height (without shoes) were measured using standard equipment. Weight was measured to the nearest 0.5 kg [11]. We performed a TSH us the first week after the end of the month of Ramadan as the TSH us occurs change every six weeks on average (4-8 weeks) [12]. We measured the post-Ramadan TSH us value and assess the experience of our patients during this month including; fasting progress, treatment schedule, respect of the therapeutic interval, compliance, and the occurrence of complications requiring a temporary or permanent breaking the fast.

Definitions

-TSH us dosing: Highly sensitive third-generation immunometric assays (sandwich or non-competitive assays), which can detect TSH levels <0.01 mIU/L [13]. The marker may be isotopic (RIA), enzymatic (ELISA), or luminescent (chemiluminescence) which is very sensitive.

We referred to the standards of the laboratory of our hospital:

-Hypothyroidism: We considered in hypothyroidism patients with a TSH us higher than 4.40 uUI/ml.

-Hyperthyroidism: We considered in hyperthyroidism patients with a TSH us lower than 0.40 uUI/ml.

-Compliance: Treatment compliance was assessed using Morisky's questionnaire. We used the version with eight questions listed below:

- 1-Do you sometimes forget to take your medicine?
- 2- Thinking in the last two weeks, were there any days when you did not take your treatment?
- 3- Have you ever reduced the dose or stopped taking your medication without telling your doctor because you felt that you were less well by taking them ?
- 4- When traveling or leaving home, do you ever forget to take your medication with you?
- 5- Did you take your treatment yesterday?
- 6- When you feel much less, if not more at all, your symptoms, do you sometimes stop taking your medication?
- 7- Having to take medication every day is a real disadvantage for some people. Do you sometimes get upset to comply with treatment?
- 8- Do you sometimes have difficulty remembering to take all your medications?

Adherence is considered good for those with a score of 8 or more, medium for those with a score of 6 or 7, and bad for those who get a score less than 6 [14].

Ethics

Data confidentiality and patient anonymity were maintained at all stages of the study respecting Helsinki's ethics charter. We deleted

patient-identifying information before analyzing the database. We provided all patients a form with information about the study and obtained oral consent from all patients before inclusion.

Statistical analysis

We described continuous variables as medians with interquartile ranges (IQRs) and categorical variables as percentages and frequencies. The normality of continuous variables distribution was conducted using the Kolmogorov–Smirnov test.

The McNemar test was used to examine categorical data and the student test for paired samples was performed to compare quantitative variables before and after Ramadan. The Wilcoxon test was used to analyze normally undistributed data. Statistical analyses were performed using SPSS 20.0. All P-values were two-sided, and those lower than 0.05 were considered statistically significant.

Results

We collected 65 patients followed for hypothyroidism on levothyroxine; we lost sight of 13% of our patients. The remaining number of patients was 56. The median (IQR) age was 54.5 (38-61.75) years. 89.3% of patients were females and 10.7% of them were males. The median of disease's duration was 5 (2-10) years. Among our patients, 26.8% were multi-medicated and 73.2% were not multi-medicated. Assessment of adherence to treatment using Morisky's questionnaire, showed that adherence was good in 82.1% of cases, moderate in 12.5% of cases and poor in 5.4% of cases. About treatment's schedule, 51.7% of patients took the treatment before the fasting meal (Iftar) and 48.3% of them took it before the dawn meal (Suhour). 64.3% of patients respected an interval of 30 minutes between treatment and the meal, and 35.7% of them did not respect it. 5.5% of patients reported forgetting to take the treatment at least once during Ramadan while 94.5% patients were fully compliant. Fifty-three percent of patients had primary hypothyroidism due to Hashimoto's autoimmune thyroiditis requiring levothyroxine substitution and 47% of our patients had iatrogenic hypothyroidism (thyroidectomy or iratherapy) (Table).

The median (IQR) of TSH us value before Ramadan was 1.82 uUI/ml (1.06-2.79) and 2.47 (1.00-3.00) uUI/ml after Ramadan. After the fasting month, 80% of patients remained in euthyroidism while 9% patients were in hyperthyroidism and 10% of patients in hypothyroidism. Three percent of patients reported weight loss during the fasting month, 12.5% of patients gained weight and 84.5% kept the same weight.

Discussion

Ramadan is the third pillar of the Islamic religion. Muslims fast from pre-dawn (Suhour) to sunset (Iftar) for one month. Since taking oral medication is forbidden, patients with hypothyroidism who fast will take their treatment after the fast is broken [15].

In addition, Muslims start eating immediately with their family, after adhan al maghrib which corresponds to sunset. This social

constraint added to the hunger and thirst implies that the interval of thirty minutes is difficult to respect. This increases the risk of dysthyroidism because the absorption of thyroxine declines from 80% in the fasting condition to 60% in the fed condition. Indeed, The American Thyroid Association recommends a 60 min interval between intake of LT4 and eating or 3 h intervals after the previous meal [16].

In addition, there are modifications in gastric motility caused by fasting for a long period and the appeasement of hunger with heavy meals may cause fluctuations of the circadian rhythm. Therefore, deiodinase activity and subsequently LT4 metabolism may also be influenced [17]. To overcome this problem some authors suggest taking levothyroxine at night. Indeed, Raza and al. suggested that LT4 intake at bedtime prevents those issues [9]. Another study conducted by Karoli et al. [6] examined the impact of bedtime levothyroxine supplementation on serum TSH us levels during Ramadan and found that 62% of patients had changes greater than 2 mUI/l of serum TSH us by the end of Ramadan. However, these changes are mainly related to the interval between taking levothyroxine and the last meal.

Therefore, during Ramadan, the proper administration of levothyroxine could be achieved if it is taken half an hour before suhour. However, most patients would have trouble getting up that early and would miss the dose or take it with the meal of suhour.

Moreover, during Ramadan alteration of treatment absorption can occur because of the increase in consumption of fat and fiber-rich food [18]. As well, some drugs can disturb TSH us value, such as statins, antiplatelet drugs, and proton pump inhibitors that interfere with levothyroxine absorption [19].

In the present study, we investigated the impact of fasting during the month of Ramadan on thyroid hormone balance in patients with hypothyroidism under levothyroxine. 80% of patients remained in euthyroidism after Ramadan. This could be explained by the large number of patients that respected the interval between taking treatment and the first meal after the fasting period. In addition, 94.5% of our patients were fully compliant to treatment during Ramadan.

Azizi et al. [20] conducted a study showing that during Ramadan, proper administration of levothyroxine is achieved if it is taken either one hour before Iftar or one hour before Suhour. However, most of the patients find it difficult to wait before Iftar or to wake up that early before Suhour and therefore miss the dose or take it with the meal. This problem can be easily managed if levothyroxine is taken at bedtime. However, the patient should not take any food for at least 2h before bedtime.

In our study, 9% of patients had hyperthyroidism after Ramadan and 10% of them had hypothyroidism. Some data from published research on hypothyroidism and Ramadan fasting suggest increasing the dose of LT4 by 25-50 mcg daily from the beginning

of Ramadan and continuing the increased dose until 15-20 days after Ramadan [21].

The dysthyroidism can be explained by all the modifications during Ramadan mentioned above.

To the best of our knowledge, this is the first study examining the influence of Ramadan fasting on thyroid function tests in hypothyroidism patients who are fasting in Morocco. However, our study had some limitations. First, the study was conducted in a single center. Second, no comparison was made in terms of the TSH profile with individuals without hypothyroidism. Due to our small sample of patients, observations of this study do not provide a strong recommendation on the ideal time of administration of levothyroxine during Ramadan fasting to manage hypothyroidism.

Conclusion

Our study highlighted the importance of treatment adherence and respect interval between the meal and levothyroxine intake to maintain euthyroidism. Further studies must assess the optimal dose adjustment and ideal timing dose of intake levothyroxine during the fasting month, to upgrade the management of hypothyroidism.

Table : Results.

Variable	Median (IQR) or N (%)
Age	54.5 (38-61.75)
Sex	
Female	50 (89.3%)
Male	6 (10.7%)
Disease duration	5 (2-10)
Multi-medication	
Yes	15 (26.8%)
No	41 (73.2%)
Treatment adherence during Ramadan	
Good	46 (82.1%)
Moderate	7 (12.5%)
Poor	3 (5.4%)
Treatment schedule	
Before Iftar	29 (51.7%)
Before Suhoor	27 (48.3%)
Respect of 30 minutes interval	
Yes	36 (64.3%)
No	20 (35.7%)
Forgetting treatment	
Yes	3 (5.3%)
No	53 (94.6%)
Etiology of hypothyroidism	
Hashimoto's autoimmune thyroiditis	30 (53%)
Iatrogenic hypothyroidism	26 (47%)

References

1. Bahammam A, Alrajeh M, Albabtain M, et al: Circadian pattern of sleep, energy expenditure, and body temperature of young healthy men during the intermittent fasting of Ramadan. 10.1016/j.appet.2010.01.011.
2. Lessan N, Tomader A. Energy Metabolism and Intermittent Fasting: The Ramadan Perspective. *Nutrients*. 2019; 11(5):1192. 10.3390/nu11051192.
3. Al-Arouj M, Assaad-Khalil S, BUSE J. Recommendations for Management of Diabetes during Ramadan Update 2010. *Diabetes Care*. 2010; 33(8):1895–1902. 10.2337/dc10-0896.
4. BaHammam AS, Almeneessier AS. Recent Evidence on the Impact of Ramadan Diurnal Intermittent Fasting, Mealtime, and Circadian Rhythm on Cardiometabolic Risk: A Review. *Front Nutr*. 2020; 7: 28. 10.3389/fnut.2020.00028.
5. Lessan N, Al Islam M, Faris E, et al. Diabetes and ramadan; practical guidelines 2021, Chapter 3, What happens to the body? *Physiology of fasting during Ramadan*. International diabetes federation. www.idf.org.
6. Karoli R, Jalees F, Chandra A, et al.: Levothyroxine replacement and Ramadan fasting, *Indian J Endocrinol Metab*. 2013; 17 (2):318-9.10.4103/2230-8210.109700.
7. Bach-Huynh TG, Nayak B, Loh J, et al. Timing of levothyroxine administration affects serum thyrotropin concentration. *Journal of Clinical Endocrinology and Metabolism*. 2009; 94:3905-3912. 10.1210/jc.2009-0860.
8. Jonklaas J, Bianco A, Bauer A, et al. Guidelines for the treatment of hypothyroidism: prepared by the american thyroid association task force on thyroid hormone replacement. *Thyroid*. 2014; 24: 1670. 10.1089/thy.2014.0028.
9. Raza SA, Ishtiaq O, Unnikrishnan AG, et al. Thyroid diseases and Ramadan. *Indian Journal of Endocrinology and Metabolism*. 2012; 16:522-524. 10.4103/2230-8210.98001.
10. Ibrahim M, Abu Al Magd M, Annabi FA, et al. Recommendations for management of diabetes during Ramadan: update 2015. *BMJ Open Diabetes Research and Care*. 2015; 3(1): e000108. 10.1136/bmjdr-2015-000108.
11. Khalis M, Dossus L, Rinaldi S, et al. Body size, silhouette trajectory and the risk of breast cancer in a Moroccan case-control study. 2020; 27(4):748-758. 10.1007/s12282-020-01072-5.
12. Garber JR, Cobin HR, Gharib H, et al. Clinical practice guidelines for hypothyroidism in adults: cosponsored by the american association of clinical endocrinologists and the american thyroid association; *Endocr Pract*; 2012; 18(6):988-1028. 10.4158/EP12280.GL.
13. Soh S, Tar-Choon A. *Annals of laboratory medicine; Laboratory Testing in Thyroid Conditions – Pitfalls and Clinical Utility*. *Ann Lab Med*. 2019; 39(1):314 10.3343/alm.2019.39.1.3.
14. Buxeraud J. L'adhésion au traitement médicamenteux, concepts et moyens pour la maintenir ou l'améliorer. *Cahier de FC de L'actualité pharmaceutique*. 2011; ACTPHA-4-2011-HS1-E-123.
15. Arzu Or Koca, Murat Dağdeviren, Mustafa Altay; Should the Dose of Levothyroxine Be Changed in Hypothyroidism Patients Fasting During Ramadan? *Turk J Med Sci*. 2020; 50(4): 784–788. 10.3906/sag-1911-28.

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16. Sheikh A, Mawani M, Mahar SA. Impact of Ramadan fasting on thyroid status and quality of life in patients with primary hypothyroidism: a prospective cohort study from Karachi, Pakistan. *Endocr Pract.* 2018; 24(10):882-888.10.4158/EP-2018-0038.
 17. Caron P, Grunenwald S, Persani L et al. Factors influencing the levothyroxine dose in the hormone replacement therapy of primary hypothyroidism in adults; *Rev Endocr Metab Disord.* 2021; 1-21.10.1007/s11154-021-09691-9.
 18. Keck FS, Wolf CF, Pfeiffer EF. The influence of circulating thyroxine serum concentration on hepatic thyroxine deiodinating activity in rats. *Experimental and Clinical Endocrinology.* 1990; 96:269-277. 10.1055/s-0029-1211019.
 19. Irving S, Vadiveloo T, Leese GP. Drugs that interact with levothyroxine: an observational study from the Thyroid Epidemiology, Audit and Research Study (TEARS); 2015; 82(1):136-41. *Clin Endocrinol (Oxf).*2014 Aug 14. 10.1111/cen.12559.
 20. Azizi F. Islamic Fasting and Thyroid Hormones. *Int J Endocrinol Metab.* 2015; 13(2): e29248. 10.5812/ijem.13(2)2015.29248.
 21. Hadjzadeh M, Pakdel R, Hayatdavoudi P. Hypothyroidism and Ramadan fasting. *Journal of Fasting and Health.* 2014; 2:80-83. http://jfh.mums.ac.ir/article_3254.html.