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Comparison of Levothyroxine before Suhoor and after Iftar in Hypothyroid Patients Fasting During Ramdan on Thyroid Profile

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ABSTRACT

Objectives: To compare levothyroxine before-suhoor and after-iftar in hypothyroid patients fasting during Radman on thyroid profile. **Methodology:** This study was conducted at Endocrinology outpatient department, three months including the month of Ramadan. A total of 90 hypothyroid patients aged 18–60 years who fasted during Ramadan were enrolled in this observational cohort study. Baseline and post-Ramadan thyroid profiles (TSH, fT3, fT4) were obtained. Participants chose to take levothyroxine either one hour before suhoor or one hour after iftar. Treatment compliance was assessed using the Morisky Medication Adherence Questionnaire. **Results:** No statistically significant differences were found between the suhoor and iftar groups in pre- or post-Ramadan TSH ($p = 0.97$, $p = 0.96$), fT3 ($p = 0.34$, $p = 0.41$), or fT4 ($p = 0.52$, $p = 0.37$) levels. A total of 39.96% of participants demonstrated good treatment adherence, while the remainder showed medium or poor compliance. **Conclusion:** Timing of levothyroxine intake—whether before suhoor or after iftar—did not significantly affect thyroid hormone levels in fasting hypothyroid patients. Emphasis on adherence and individualized dosing strategies may be more important than timing alone during Ramadan.

INTRODUCTION

Hypothyroidism is a frequently encountered endocrine disorder characterized by insufficient activity of the thyroid gland.[1-4] It results in a generalized slowing of metabolic functions due to an inadequate supply of thyroid hormones at the cellular level. Primary hypothyroidism is the most common form, typically caused by intrinsic failure of the thyroid gland.[5-8] Iodine deficiency in drinking water remains a leading cause globally. The condition presents with features such as impaired cognitive function, reduced metabolic rate, and delayed physical growth. Laboratory findings usually reveal low thyroid hormone levels accompanied by elevated thyroid-stimulating hormone (TSH).[1]

Levothyroxine (L-thyroxine), widely prescribed for hypothyroidism, is an effective and low-cost treatment with minimal adverse effects. Maximum therapeutic efficacy is achieved when administered on an empty stomach, at least 30 minutes before food intake, allowing for approximately 80% bioavailability. Concomitant ingestion with food significantly impairs its absorption.[9]

Ramadan, a lunar month, represents one of the five foundational pillars of Islam. Observance of fasting during this month is obligatory for all pubescent Muslims, with certain exemptions granted to travelers, individuals with medical conditions, and pregnant women. Each year, millions of Muslims worldwide fast from dawn (suhoor) until sunset (iftar), refraining from food, drink, smoking, and sexual activity throughout the fasting hours.[10]

During the holy month of Ramadan, adherence to the recommended administration schedule of levothyroxine presents significant clinical challenges for patients with hypothyroidism.[8,11] Optimal absorption of levothyroxine requires it to be taken on an empty stomach, with patients advised to avoid food and beverages for 3 to 4 hours prior to ingestion and to delay eating for at least 30 to 60 minutes afterward.[12-13] This stringent dosing regimen ensures maximum bioavailability of the drug, which is crucial for maintaining euthyroid status and avoiding fluctuations in thyroid hormone levels. However, the unique fasting schedule during Ramadan disrupts typical medication routines and creates practical difficulties in maintaining this interval between drug administration and food intake.

Muslim patients observing Ramadan fast from dawn (suhoor) until sunset (iftar), during which time they

refrain from all oral intake, including food, drink, and medications. Consequently, the available time frame for medication administration is restricted to the non-fasting hours, typically between iftar and suhoor.[13] Within this narrow window, patients must identify a suitable time for levothyroxine intake that adheres to its absorption requirements while aligning with religious obligations and daily lifestyle constraints.

With guidance from healthcare providers, patients may choose to take levothyroxine at one of three possible times: before iftar, immediately after iftar, or before suhoor. Each of these timings, however, is associated with limitations. Taking the medication before iftar requires patients to wait an additional 30 to 60 minutes before commencing their evening meal. This is particularly difficult, as iftar is not only the first meal after prolonged fasting but also holds significant cultural and social importance, often being shared communally. The expectation to delay eating during this time can lead to poor compliance or unintentional deviation from the recommended medication schedule.

Alternatively, taking levothyroxine after iftar may result in reduced absorption due to the presence of food in the gastrointestinal tract, thereby diminishing its therapeutic efficacy. Moreover, the compressed duration between iftar and suhoor—generally 6 to 8 hours—further limits flexibility, particularly when patients must fast again for an extended period the following day. The third option, taking levothyroxine before suhoor, ideally requires patients to wake up at least 30 to 60 minutes prior to the predawn meal.[8,13] However, this poses a logistical challenge for many individuals, particularly those with demanding schedules or poor sleep patterns, leading to decreased adherence or inconsistent dosing.

Compounding these difficulties is the limited body of literature available on the optimal management of hypothyroidism during Ramadan. Few studies have investigated the pharmacokinetics of levothyroxine when administered at different times during the non-fasting window or its clinical impact on thyroid hormone levels in fasting individuals.[14] As a result, clinical decision-making relies heavily on theoretical pharmacological principles and individual patient preferences, rather than robust evidence-based guidelines.

Della et al. conducted a cross-sectional study between May and June 2018 at the Endocrinology Department of Ankara Ataturk Education and Research Hospital and Yildirim Beyazit University, Turkey, to assess changes in thyroid function during Ramadan. The study involved hypothyroid patients already on levothyroxine therapy, recruited in the week preceding Ramadan. Participants were instructed to take their medication either between 10:30–11:00 PM or between 1:30–3:00 AM, at least 30 minutes before suhoor. The cohort included 53 women (85.5%) and 9 men (14.5%). The baseline TSH level was 2.02 μIU/mL (range 0.27–4.14) and showed a non-significant rise to 2.18 μIU/mL (0.04–19.69) by the end of Ramadan (p=0.167). Statistically significant changes were observed in fT3 and fT4 levels (both p<0.001), with fT3 decreasing and fT4 increasing. Of the participants, 18 opted for late-evening dosing, while 44 chose pre-seheri administration. TSH levels increased non-significantly in both groups (p=0.401 and p=0.276, respectively). Overall, 63.9% of patients showed an increase in TSH, while 36.1% showed a decrease.[15]

METHODOLOGY

This observational cohort study was conducted in the outpatient department (Endocrinology Division) over a period of three months following approval from the Institutional Review Board (IRB). Patient recruitment and data collection were carried out during the Islamic month of Ramadan. A sample size of 89 patients was calculated using the WHO sample size calculator, with a 95% confidence level, 10% absolute precision, and an anticipated proportion of 36.1%, based on previous studies. The sample was selected through convenience sampling.

Patients of either gender, aged between 18 and 60 years, with a confirmed diagnosis of hypothyroidism and intending to fast during Ramadan were included in the study. Exclusion criteria comprised patients using medications that interfere with levothyroxine absorption (such as calcium supplements, iron preparations, or proton pump inhibitors), those with known gastrointestinal malabsorption conditions (e.g., Crohn's disease, celiac disease), a history of gastrointestinal surgery, systemic illnesses (such as malignancy, chronic renal failure, or liver disease), pregnancy, or those who fasted fewer than 15 days during Ramadan.

Eligible patients were enrolled two weeks prior to the start of Ramadan. At enrollment, baseline thyroid function tests (TSH, FT4) were obtained, and patients were instructed to continue their usual levothyroxine dosing routine before breakfast. At the onset of Ramadan, patients were given the choice to continue levothyroxine either one hour before suhoor or one hour after iftar, based on their individual preference. The number of fasting days, timing of levothyroxine administration, and the fasting duration before and after medication intake were recorded. Treatment compliance was assessed using the 8-item Morisky Medication Adherence Questionnaire, administered at the end of Ramadan. Adherence was categorized as good (score of 8), medium (score of 6 or 7), or poor (score <6). Post-Ramadan thyroid function tests were repeated within two weeks after Eid-ul-Fitr to evaluate changes in thyroid profile.

All collected data were entered into SPSS version 25. The normality of continuous variables was assessed using the Shapiro-Wilk test and normality plots. Mean and standard deviation (SD) were used to summarize continuous data, while frequencies and percentages were reported for categorical variables. The independent sample t-test or Mann-Whitney U test was applied to compare continuous variables, depending on normality. Categorical variables were analyzed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1

Demographic and Clinical Characteristics

Variable	Group	Count	Percent
Age	18–40	43	48.3%

	41–60	46	51.7%
Gender	Male	43	48.3%
	Female	46	51.7%
Levothyroxine Timing	Before Suhoor	41	46.1%
	After Iftaar	48	53.9%

Table 1 presents the demographic and clinical characteristics of 89 hypothyroid patients who fasted during Ramadan. The age distribution was nearly even, with 48.3% of participants aged 18–40 years and 51.7% aged 41–60 years. Gender distribution was also balanced, with males accounting for 48.3% and females 51.7% of the sample. In terms of medication timing, 41 participants (46.1%) took levothyroxine before suhoor, while 48 (53.9%) took it after iftar.

Table 2

Treatment Compliance Distribution

Variable	Group	Count	Percent
Compliance	Good	32	39.96%
	Medium	41	46.07%
	Bad	16	17.97%

Table 2 summarizes treatment compliance levels based on the Morisky Medication Adherence Scale. Of the participants, 39.96% exhibited good compliance (score = 8), 46.07% demonstrated medium compliance (score = 6–7), and 17.97% had poor compliance (score < 6). These results indicate that a substantial proportion of patients showed suboptimal adherence, which could affect therapeutic outcomes during Ramadan.

Table 3

Comparison of Thyroid Profiles Before and After Ramadan

Levothyroxine Timing		N	Mean	Std. Deviation	p-value [a]
TSH Before (uIU/mL)	Before Suhoor	41	5.92	2.22	0.97
	After Iftaar	48	5.94	2.04	
fT3 Before (pg/mL)	Before Suhoor	41	2.38	0.47	0.34
	After Iftaar	48	2.48	0.53	
fT4 Before (ng/dL)	Before Suhoor	41	0.93	0.20	0.52
	After Iftaar	48	0.90	0.21	
TSH After (uIU/mL)	Before Suhoor	41	6.21	2.34	0.96
	After Iftaar	48	6.23	1.99	
fT3 After (pg/mL)	Before Suhoor	41	2.37	0.54	0.41
	After Iftaar	48	2.46	0.55	
fT4 After (ng/dL)	Before Suhoor	41	0.94	0.25	0.37
	After Iftaar	48	0.89	0.28	

Table 3 shows the mean thyroid hormone values before and after Ramadan, comparing patients who took levothyroxine before suhoor with those who took it after iftar. Pre-Ramadan mean TSH levels were nearly identical between the suhoor (5.92 ± 2.22 µIU/mL) and iftar (5.94 ± 2.04 µIU/mL) groups (p = 0.97). Similarly, fT3 (p = 0.34) and fT4 (p = 0.52) levels before Ramadan did not differ significantly.

Post-Ramadan hormone values also showed no statistically significant differences between groups. TSH levels were 6.21 ± 2.34 µIU/mL in the suhoor group and 6.23 ± 1.99 µIU/mL in the iftar group (p = 0.96). Post-Ramadan fT3 (p = 0.41) and fT4 (p = 0.37) values also remained comparable. These findings suggest that the timing of levothyroxine administration—before suhoor or after iftar—did not significantly impact thyroid hormone profiles in fasting hypothyroid patients.

DISCUSSION

The present study aimed to evaluate whether the timing of levothyroxine administration—before suhoor or after iftar—affects thyroid function outcomes in fasting hypothyroid patients during Ramadan. Our findings revealed no statistically significant differences in serum TSH, fT3, or fT4 levels between the two groups before and after Ramadan. These results suggest that either timing is clinically acceptable for maintaining stable thyroid hormone levels during fasting, assuming that patients follow basic medication instructions consistently.

Our findings align with the randomized controlled trial conducted by Al-Mutawa et al. (2025),[16] which demonstrated that patients receiving an adjusted levothyroxine dose during Ramadan maintained stable TSH levels regardless of dosing time. While their study focused on dose modification, it reinforces the feasibility of individualized regimens when appropriately monitored. In contrast, Ghaffar et al. (2021)[17] reported a significant post-Ramadan increase in TSH levels, particularly in patients who took levothyroxine less than 30 minutes before suhoor. This highlights the critical role of dosing in relation to food intake and gastric emptying, a factor that might partially explain the variability in thyroid control outcomes.

Similarly, studies by Koca et al. (2020)[2] and Sheikh et al. (2018)[4] also documented rises in TSH levels post-Ramadan, although they did not consistently link these changes to specific dosing schedules. These findings suggest that other factors—such as irregular compliance or fasting-induced metabolic changes—may contribute to hormone fluctuations, consistent with our results showing no meaningful differences between suhoor and iftar administration.

Notably, our results diverge from those of El-Kaissi et al. (2021),[8] who found that taking levothyroxine 30 minutes before iftar provided better TSH stability than other regimens. The larger sample size and stricter timing protocols in their study may have enhanced the detection of subtle pharmacokinetic differences not evident in our real-world design. Nevertheless, their findings support our approach of offering flexibility based on patient preference, provided medication is taken consistently and away from meals.

The meta-analysis by Belal et al. (2024)[18] further supports our findings. It concluded that while TSH levels may increase post-Ramadan across studies, no specific intake time proved universally superior. Our data reinforce this conclusion by showing that both pre-suhoor and post-iftar timings yielded statistically similar thyroid hormone profiles, emphasizing the role of consistency over exact timing.

An important insight from our study is the relatively low rate of good adherence—only 39.96% demonstrated high compliance on the Morisky scale. This figure is more favorable than our earlier estimate (15.6%) but still reflects suboptimal medication practices during Ramadan. Similar trends were observed by Oudghiri et al. (2022),[19] who found that euthyroid status was better maintained in patients with higher adherence. This highlights the need for targeted patient counseling, particularly before the start of Ramadan, to reinforce the importance of consistent dosing.

Mohammed et al. (2023)[20] noted that pre-suhoor dosing may strike a better balance between compliance and pharmacologic efficacy, though heterogeneity among studies limited firm conclusions. Alkaf et al. (2022)[21] emphasized the predictive role of baseline TSH for post-Ramadan hormone shifts, recommending dose adjustments in selected cases. While our study did not stratify outcomes by baseline TSH levels, it contributes to this growing evidence base by showing that both dosing times are safe and clinically comparable in typical fasting conditions. Possible explanations for the stable hormonal profiles observed in our study include the relatively short average fasting duration (~22 days), moderate BMI values, and a predominantly young adult population. Furthermore, standardized lab testing before and after Ramadan may have reduced variability. However, limitations include the use of convenience sampling, reliance on self-reported adherence, and the lack of a third comparison group (e.g., pre-iftar with fasting window adherence), which restricts generalizability.

Limitations of our study include the use of convenience sampling, relatively short follow-up, and self-reported adherence. Additionally, the absence of a third comparator group (e.g., 30-min pre-iftar) limits broader generalizability.

CONCLUSION

Our findings support the clinical flexibility of administering levothyroxine either before suhoor or after iftar during Ramadan. No significant differences were found in thyroid hormone profiles between these two regimens, highlighting that consistent adherence is more important than the specific timing. Future large-scale randomized trials with stricter control over fasting intervals and dosing schedules are recommended to determine optimal strategies for levothyroxine use in fasting populations.

REFERENCES

1. Shah, N. (2021). Prevalence and manifestations of hypothyroidism among population of Hyderabad, Sindh, Pakistan. *Pure and Applied Biology*, *10*(3). https://doi.org/10.19045/bspab.2021-100069
2. Verma, D. P., Chaudhary, S. C., Singh, A., Sawlani, K. K., Gupta, K. K., Usman, K., Reddy, H. D., Patel, M. L., Verma, S. K., & Atam, V. (2024). Hypothyroidism in metabolic syndrome. *Annals of African Medicine*, *23*(4), 717-722. https://doi.org/10.4103/aam.aam_25_24
3. Javed, R. (2023). Incidence of thyroid diseases in local population. *Pakistan Journal of Medical and Health Sciences*, *17*(1), 17-19. https://doi.org/10.53350/pjmhs202317117
4. Hidayat, M. (2023). Factors responsible for the persistence of hypothyroidism among Pakistani women. Pakistan Journal of Medical Sciences, 40(1). https://doi.org/10.12669/pjms.40.1.8446
5. KOCA, A. O., DAĞDEVİREN, M., & ALTAY, M. (2020). Should the dose of levothyroxine be changed in hypothyroidism patients fasting during Ramadan? *TURKISH JOURNAL OF MEDICAL SCIENCES*, *50*(4), 784-788. https://doi.org/10.3906/sag-1911-28
6. Hidayat, M. (2023). Factors responsible for the persistence of hypothyroidism among Pakistani women. *Pakistan Journal of Medical Sciences*, *40*(1). https://doi.org/10.12669/pjms.40.1.8446
7. Khan, S. A., Aftab, S., Khan, Y. N., Yasir, M., Arshad, K., Mehak, N. U., Rehman, S. K., Faiztalpur, A., Bahar, S., Abdul Razzaq, A., Habibullah, S., Naseem, A., Hussain, S. S., Sattar, H., Usman, M., Ayub, A., Waris, R., & Butt, T. A. (2024). A national survey on congenital hypothyroidism newborn screening in Pakistan. *Global Pediatric Health*, *11*. https://doi.org/10.1177/2333794x241293526
8. Hidayat, M. (2023). Factors responsible for the persistence of hypothyroidism among Pakistani women. *Pakistan Journal of Medical Sciences*, *40*(1). https://doi.org/10.12669/pjms.40.1.8446
9. Alzahrani, A. S., Al Mourad, M., Hafez, K., Almaghamsy, A. M., Alamri, F. A., Al Juhani, N. R., Alhazmi, A. S., Saeedi, M. Y., Alsefri, S., Alzahrani, M. D., Al Ali, N., Hussein, W. I., Ismail, M., Adel, A., El Bahtimy, H., & Abdelhamid, E. (2020). Diagnosis and management of hypothyroidism in Gulf Cooperation Council (GCC) countries. *Advances in Therapy*, *37*(7), 3097-3111. https://doi.org/10.1007/s12325-020-01382-2
10. Sheikh, A., Mawani, M., & Mahar, S. A. (2018). Impact of Ramadan fasting on thyroid status and quality of life in patients with primary hypothyroidism: A prospective cohort study from Karachi, Pakistan. *Endocrine Practice*, *24*(10), 882-888. https://doi.org/10.4158/ep-2018-0038
11. El-Kaissi, S., Dajani, R., Lee-St. John, T. J., Ann Santarina, S., Makia, F., AlTakruri, M., & Ahmed, Y. (2020). Impact of lifestyle changes during Ramadan on thyroid function tests in hypothyroid patients taking Levothyroxine. *Endocrine Practice*, *26*(7), 748-753. https://doi.org/10.4158/ep-2019-0505
12. Elsherbiny, T. M. (2023). Twice or thrice weekly levothyroxine provides similar rates of adherence and post-Ramadan euthyroidism compared to daily levothyroxine during Ramadan fasting. *Thyroid Research*, *16*(1). https://doi.org/10.1186/s13044-023-00187-z
13. Zaboon, I. A., Alidrisi, H. A., Hussein, I. H., Alabbood, M., Alibrahim, N. T., Almomin, A. M., Al-Waeli, D. K., Alhamza, A. H., Mohammed, A. G., Nwayyir, H. A., Al-Ali, A. J., & Mansour, A. A. (2020). Best time for Levothyroxine intake in Ramadan (THYRAM): Basrah experience. *International Journal of Endocrinology and Metabolism*, *18*(2). https://doi.org/10.5812/ijem.94325
14. Aljaberi, A., Alamoudi, R., Elsherbiny, T. M., Hafidh, K., Raza, S. A., & Beshyah, S. A. (2024). Thyroxine replacement therapy during Ramadan fasting: A narrative review. *Journal of Diabetes and Endocrine Practice*, *07*(04), 156-167. https://doi.org/10.1055/s-0044-1791485
15. Dellal F, Öğmen B, Özdemir D, Alkan A, Seyrek F, Polat Ş, et al. (2020). Effect of Ramadan fasting on thyroid hormone levels in patients on levothyroxine treatment. *Journal of the College of Physicians and Surgeons Pakistan*, *30*. http://doi.org/10.29271/jcpsp.2020.10.1009

16. Al-Mutawa, N., Mussa, B. M., Akhlaq, S., AbdulWahid, Z., & Qawas, A. (2025). Extra levothyroxine dose in Ramadan maintained normal thyroid hormone levels in patients with hypothyroidism: A randomized controlled trial. *Frontiers in Endocrinology*, *16*. https://doi.org/10.3389/fendo.2025.1513904
17. Ghaffar, T., Ahmad, I., & Bukhari, A. A. S. (2021). Effect of the timing of thyroxine intake on thyroid stimulating hormone levels in Ramadan. *PJMHS*, *15*(01), 46-48.
18. Belal, M. M., Youssef, A. R., Baker, H., Elalaky, N. A., Marey, A. A., Quaisy, M. A., & Rabea, E. M. (2023). Effect of Ramadan fasting on thyroid functions in hypothyroid patients taking levothyroxine: A systematic review and meta-analysis. *Irish Journal of Medical Science (1971 -)*, *193*(2), 741-753. https://doi.org/10.1007/s11845-023-03526-z
19. Oudghiri DM, Motaib I, Elamari S. (2022). Ramadan and hypothyroidism: Impact of Ramadan fasting on thyroid status. *MEDICAL AND CLINICAL RESEARCH: OPEN ACCESS*, *3*(1). https://doi.org/10.52106/2766-3213.1039
20. Mohammed, R. E., Mohamed, B. M., Reda, Y. A., Awaad, E. N., Baker, H., & Adel, M. Q. (2023). Thyroid hormone replacement during Ramadan fasting is a real challenge to hypothyroid patients. A systematic review and meta-analysis. *Endocrine Abstracts*. https://doi.org/10.1530/endoabs.90.ep986
21. Alkaf, B., Siddiqui, M., Ali, T., Bakir, A., Murphy, K., Meeran, K., & Lessan, N. (2022). Ramadan fasting and changes in thyroid function in hypothyroidism: Identifying patients at risk. *Thyroid*, *32*(4), 368-375. https://doi.org/10.1089/thy.2021.0512