Ramadan fasting and Diabetes: 10 pitfalls to avoid

Le jeûne de Ramadan et le diabète : 10 pièges à éviter

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RÉSUMÉ

Le jeûne du mois de Ramadan est l'une des croyances essentielles des musulmans. Toutefois, pour la personne atteinte de diabète sucré, le jeûne représente un défi majeur. En effet, le jeûne du Ramadan peut prédisposer les patients diabétiques à plusieurs risques tels que l'hypoglycémie, l'hyperglycémie et la déshydratation. Les professionnels de santé doivent être prêts à préparer leurs patients à cette période délicate afin d'éviter ces risques. Ce document fournit aux médecins un outil résumant les 10 pièges à éviter afin d'améliorer la prise en charge et l'éducation thérapeutique des patients diabétiques qui ont décidé de jeûner.

Mots-clés

Religion –Nutrition - Education

SUMMARY

Fasting during the month of Ramadan is one of the essential beliefs amongst Muslims. For the person with diabetes mellitus (DM), however, fasting presents a major challenge. Indeed, Fasting Ramadan may predispose patients with DM to several risks such as hypoglycemia, hyperglycemia and dehydration. Physicians should be ready to prepare their patients to this period in order to avoid risks. This paper provides physicians with 10 pitfalls to avoid when educating patients with DM who decided to fast Ramadan.

Key-words

Religion – Diet - Education

INTRODUCTION

Muslims comprise nearly a quarter of the world's population with nearly 2.18 billion followers (1,2). Ramadan fasting (RF) is one of five pillars of Islamic practices. Nevertheless, the Quran states fasting should be avoided in some circumstances: "So everyone of you who is present during that month should spend it in fasting, but if anyone is ill, or on a journey, the prescribed period (should be made up) by days later" (3). Based on worldwide population of 425 million patients with diabetes mellitus (DM) in 2017 (4), one can estimate that around 150 million Muslims with DM fast during Ramadan.

Even though the Quran exempts sick persons from fasting, many patients with DM still fast during this religious period (2). According to Epidemiology of Diabetes and Ramadan (EPIDIAR) study in 13 Islamic countries showed that about 43% of patients with type 1 DM and 79% of patients with type 2 DM fast during Ramadan (2).

Patients living with DM who want to fast as part of their religious or cultural faith need to be mindful of their actions and the safety in relation to their own health. There is some evidence to suggest that, as long as they are otherwise stable and healthy, they can do so safely. However, strict medical supervision and focused education on how to control their glycemic levels and adapt their medication and nutritional plan is essential (5). Therefore, physicians are likely to encounter such circumstances and should be guided on how to manage DM patients who decided to fast.

This paper aimed to review ten pitfalls that physicians should avoid when managing patients with DM who insist to fast.

Pitfall 1. To ban all patients with DM from RF

Unlike healthy subjects that do not seem likely to present complications during the fast of Ramadan, the practitioner with chronic diseases, such as DM is exposed to many risks such as hypoglycemia, hyperglycemia, dehydration and thrombosis (2,6,7) (Table 1). Those risks should be considered in type 1 as well as in type 2 DM. Physicians are required to explain to the patient the risks and consequences of RF. International Diabetes Federation (IDF) and Diabetes and Ramadan (DAR) International Alliance have therefore come together to deliver

Table 1. Risks associated with Ramadan fasting for patients with diabetes mellitus

Risks	Study	comments
Hypoglycemia	1. Salti et al. EPIDIAR (2)	-T1DM: x4.7 fold increase, *p*=0.14 -T2DM: x7.5 fold increase, *p*=0.03
	Jabbar et al. CREED(6)	During Ramadan, 16.8% of the T2DM cohort treated with insulin alone had a hypoglycemic episode, compared with 5.3% treated with oral anti diabetic drug alone
Hyperglycemia	Salti et al. EPIDIAR (2)	T1DM: x 3.2 fold increase, *p*=0.16 T2DM: x5.0 fold increase, *p*=0.05
Diabetic ketoacidosis	Masood et al. (10) Hermansen et al. (11)	Multiple studies showed higher rates of diabetic ketoacidosis during Ramadan when compared to preceding Lunar month but without any significant difference
Dehydration and thrombosis	Salti et al. EPIDIAR (2)	Peripheral arterial disease (10.0%)
	Jabbar et al. CREED(6)	Peripheral arterial disease (3.4%)
	Javanmardi et al.(7)	The cerebral venous sinus thrombosis (CVST) – cerebrovascular disease ratio in Ramadan and other months was estimated to be 0.4 and 0.02, respectively (p value < 0.05). During Ramadan, the increased risk of CVST can be explained by the effect of dehydration and hyper viscosity. Also, some women take oral contraceptive pills to prevent menstruation during Ramadan fasting.

comprehensive guidance on this subject. The IDF-DAR Practical Guidelines proposed to classify patients into three risk categories (5) (table 2):

- If the risk is moderate or low, RF is possible with modifications necessary therapies and glycemic monitoring during the month of Ramadan.
- If the risk is high, the attending physician will decide if RF is possible depending on the educational level of the patient and the possibilities of self-monitoring during the month of Ramadan
- If the risk is very high, physician should convince patients to not fast. Nevertheless, if the patients insist on fasting, they should be made aware of the complications and should follow strict dietary and therapeutic modifications as well as glycemic monitoring before and during RF.

Before RF, patients with DM must be educated as well as their health professionals and their entourages. The program of this education could be performed by physicians in group sessions, or one-to-one sessions, with the collaboration of dieticians and/or community link workers (5).

A controlled interventional study that aimed to examine the impact of the Ramadan Targeted Education Program (before and after Ramadan) showed a positive impact on drug adaptation according to the dose and timing of fasting during Ramadan in diabetic patients with less risk of hypoglycemia (8).

Pitfall 2. To maintain without any risk the same oral antidiabetic agents (OAD) used before Ramadan

This is only true for some OAD. Indeed, based on IDF-DAR practical guidelines (5) and Tunisian consensus (9), no treatment modification is required for metformin, acarbose, thiazolidinediones and dipeptidyl peptidase-4 inhibitors except for three-time dosing which could be reduced to twice daily as the number of meals is reduced during Ramadan. Glucagon-like peptide-1 receptor agonists also does not require treatment modification during Ramadan provided that it has been well dose-titrated at least six weeks before Ramadan.

Nevertheless, more modifications are needed for the class of Short-acting insulin secretagogues and Sulphonylureas in order to avoid hypoglycemia. Table 3 resumes daily times and dose modifications before and during Ramadan for each OAD.

Pitfall 3. To maintain without any risk the same insulin regimen used before Ramadan

During Ramadan, it is advised to maintain essential levels of basal insulin to avoid fasting hyperglycemia. This can be achieved by administrating long or intermediary acting insulin with of short-acting insulin (10). However, in the Tunisian Consensus (9), using human intermediate insulin is not encouraged during RF because of higher risk of hypoglycemia compared to insulin analogues (9,11,12). Reducing doses is also important to avoid hypoglycemia. Indeed, a multi-center trial including diabetic patients with glargine showed that reducing the dose by 20% may reduce the risk of hypoglycemia (13). Rapid insulin dosage should be re-adjusted with Shour and Iftar timings.

A systematic review and meta-analysis of observational studies compared the benefits and risks of continuous subcutaneous insulin infusion or multiple daily injections in patients with type 1 DM who fast during Ramadan. There are no differences in the change in hemoglobin A1c, weight or lipids, but there were insufficient data to assess the incidence of hypoglycaemia or diabetic ketoacidosis (14).

The adaptation of insulin according to the type, dose, and protocol is proposed in Table 4.

Pitfall 4. To advise glycemic monitoring only in case of discomfort

Patients who insist on fasting must be aware of all the potential risks associated with RF. They must provide a rigorous surveillance. Monitoring of blood glucose should not be done only in case of hypoglycemia. Blood glucose levels should be measured several times a day. According to the Tunisian Consensus (9), physical treated by diet and metformin must do at least two capillary blood tests; one before *Iftar* and one two hours later. For patients on insulins or insulin secretagogues, at least four glycemic examinations are required (9):

- In the middle of the day (11-12h) or at the moment of the prayer of “Dhohr”
- In the afternoon (16-17h) or at the time of the prayer of “Asser”
- Before Iftar
- 2 hours after Iftar

During Ramadan, with regular monitoring, patients can become more aware of their eating habits and impact on their blood sugar levels than in other periods of the year, which could potentially limit harmful behaviours.

Pitfall 5. To advise breaking fast only in case of discomfort

In order to better manage DM, all patients must be familiar with situations that require a temporary or lasting break in fasting. In addition to common sign of hypoglycemia, it is recommended to break fast when (15):

- Glycemia ≤ 0.80 g / L (4.44 mmol / L) in the first hours after beginning of fasting
- Glycemia ≤ 0.70 g / L (3.88 mmol / L) for any time of the day
- Glycemia > 3.00 g / L (16.65 mmol / L)
- Intercurrent illness.

Pitfall 6. To ban physical activity during Ramadan

Encouraging proper exercise and physical activity during RF is one of the pillars of the DAR-IDF guidelines for patients with DM who insist

Table 2. Risk categories for patients with diabetes who fast during Ramadan

(Adapted from IDF-DAR practical guidelines and from Tunisian consensus of diabetes and Ramadan (5,9))

Risk category	Patient characteristics
Category 1: very high risk	One or more of the following: - Severe hypoglycemia, or diabetic ketoacidosis, or hyperosmolar hyperglycemic coma within the 3 months prior to Ramadan - History of recurrent hypoglycemia - Poorly controlled T1DM - Acute illness - Pregnancy in pre-existing diabetes, or gestational diabetes mellitus - Chronic dialysis or chronic kidney disease stage 4 and 5 - Advanced macrovascular complications - Old age with ill health
Category 2: high risk	One or more of the following: - T2DM with sustained poor glycemic control - Well-controlled T1DM or T2DM on multiple dose insulin or mixed insulin - Chronic dialysis or chronic kidney disease stage 3 - Stable macrovascular complications - Patients with comorbid conditions that present additional risk factors - Patients with diabetes performing intense physical labor - Treatment with drugs that may affect cognitive function
Category 3: moderate/low risk	Well-controlled T2DM treated with one or more of the following: – Lifestyle therapy – Metformin – Acarbose – Thiazolidinediones – Second-generation Sulphonylureas – Incretin-based therapy – Sodium-glucose co-transporter-2 inhibitors – Basal insulin

IDF-DAR : International Diabetes Federation and Diabetes and Ramadan International Alliance ; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus

to fast (5). Indeed, there are dramatic changes in dietary patterns and activity levels for fasting Muslims during Ramadan compared to other months of the year. Reduced physical activity may be considered, in addition to increased caloric intake, a major factor for glycemic disorders and weight gain.

However, some caution is needed when physical activity is performed in order to avoid hypoglycemia as well as dehydration, especially with excessive exercise (16). Education is needed to choose intensity, duration, and time of physical activity, depending on the patient risk level. According to the Tunisian Consensus, physical activity should be avoided in the afternoon (9). It is advised to exercise after *Iftar,* for example thirty minutes of walking. *Prayer of Taraweeh,* which is a part of the customs of Ramadan, could be included in the physical activity program (18).

Pitfall 7. To advise one meal a day during Ramadan

To avoid glycemic risks during RF, it is not recommended to take a single meal but rather a balanced and diversified diet divided into two

Table 3. Dose adjustments of oral antidiabetic drugs during Ramadan

Oral antidiabetic drug	Before Ramadan	During Ramadan
Metformin Acarbose	Once daily dosing	No daily dose modification Take at *Iftar*
	Twice daily dosing	No daily dose modification Take at *Iftar* and *Shour*
	Three-time daily dosing	Reduce to twice daily dosing* and take at *Iftar* and *Shour*
Thiazolinediones	Once daily dosing	No daily dose modification Take at *Iftar*
Dipeptidyl peptidase-4 inhibitors	Once daily dosing	No daily dose modification Take at *Iftar*
	Twice daily dosing	No daily dose modification Take at *Iftar* and *Shour*
Short-acting insulinsecretagogues	Once daily dosing	No daily dose modification Take at *Iftar*
	Twice daily dosing	Take one dose at *Iftar* and take the other dose at *Shour* or reduce it by 30-50%
	Three-time daily dosing	Reduce to twice daily dosing. Take one dose at *Iftar* and take the other dose at *Shour* or reduce it by 30-50%
Sulphonylureas	Once daily dosing	Take at *Iftar and* reduce it by 30-50%
	Twice daily dosing	Maintain the dinner dose and take it at *Iftar* and reduce the morning dose by 30-50 % and take it at *Shour*
	Three-time daily dosing	Reduce to twice daily dosing. Maintain the dinner dose and take it at *Iftar* and reduce the morning dose by 30-50 % and take it at *Shour*

*Reduction is needed not because of hypoglycemic risk but because the number of major meals is reduced in Ramadan.

Table 4. Adaptation of insulin during Ramadan (adapted from IDF-DAR practical guidelines and Tunisian consensus diabetes and Ramadan (5,9))

Type of insulin	Number of injections	Changes in doses during Ramadan*
Determir/glargine/degludec	Once-daily	- Reduce dose by 15–30% - Take it at *Iftar*
NPH/determir/glargine	Twice-daily	- Take usual morning dose at *Iftar* - Reduce evening dose by 50% and take it at *Shour*
Short-acting insulin		- Take dinner usual dose at *Iftar* - Omit lunch-time dose - Reduce breakfast dose by 25–50% and take it at *Shour*
Premixed insulin	Once-daily dosing	- Take usual dose at *Iftar*
	Twice-daily dosing	- Take dinner dose at *Itar* - Reduce morning dose by 25–50% and take it at *Shour*
	Three times daily dosing	- Omit afternoon dose - Adjust *Iftar* and *Shour* doses

* Doses of insulin should be titrated according to the glycaemic surveillance

IDF-DAR : International Diabetes Federation and Diabetes and Ramadan International Alliance, NPH : Neutral Protamine Hagedorn

to three meals. A late compensatory meal with high levels of calories, carbs, and lipids may result in hyperglycemia and weight gain. To improve the glycemic balance it is recommended to (5,17):

- Limit the consumption of food with high level of carbs and lipids
- Divide the daily calorie intake into Iftar (40-50%), Shour (30-40%) and snacks between meals (10–20%)
- Focus on high glycemic index and high carbohydrates at the time of breaking the fast and lower one at Shour.
- Eat fruits and vegetables in every meal
- Eat slowly which increases the feeling of satiety
- The shour meal should be consumed as late as possible, especially when fasting for more than 10 hours

Pitfall 8. To advise drinking water at the moment of *Iftar* as the solution to avoid dehydration

Dehydration is a major risk of fasting especially in countries with prolonged fasting hours and hot climates. One of the ten principles of the Ramadan nutrition plan, a mobile and web-based application designed by DAR-IDF group to help healthcare professionals individualize medical nutrition therapy for patients with diabetes during Ramadan fasting, is maintaining adequate hydration by drinking enough water (5). *Iftar* should begin with plenty of water to overcome dehydration from fasting. However, drinking water only at *Iftar* will not be enough to overcome dehydration. It is important for patients to stay hydrated between sunset and sunrise by drinking water or other non-sweetened beverages (5).

Pitfall 9. To encourage sleeping during daytime in order to balance sleep disturbance during the night

Sleeping during daytime is not always possible due to work schedules and fatigue. The disruptive effects of Ramadan on sleep patterns are well-known (19,20). Short-term spiritual adrenaline is not sufficient to correct these effects. Excessive eating, particularly high-carbohydrate diet and sugar-sweetened beverages, leads to sleep disorders and increased acid reflux into the oesophagus, which affects sleep quality (21,22). There are also some habits to consume coffee after *Iftar* meals which may contribute to disturbing sleep patterns.

Hence, if patients want to sleep well in Ramadan, it can be argued that an improved sleep quality in Ramadan requires further efforts with regards to moderation and quality of meals, which is consistent with the spiritual goals of this religious practice (22).

Pitfall 10. To advise overweight patients to fast in order to lose weight

Changes in physical activity and sleeping patterns (discussed in pitfall 9) can affect the metabolism and may contribute to weight gain. Caloric intake increases at night, meal times are shifted, and cortisol and insulin levels become increased at night in Ramadan (23). The observed disturbance in sleeping patterns and circadian rhythms during Ramadan can affect a person's metabolic state (24). Most of studies showed temporary weight loss for most fasters, which typically reversed after Ramadan, gradually returning to pre-Ramadan status (18). A cross-sectional study conducted in Saudi Arabia showed a significant increase in caloric, fat, carbohydrate, and protein intake, as well as a significant increase in body weight, despite a significant reduction in meal frequency during Ramadan (25). This can be attributed to excessive caloric intake during the night (25). Therefore, although RF provides an opportunity for weight loss, structured and consistent lifestyle modifications are necessary to maintain this weight loss.

To conclude, health providers Health care providers are required to follow patients with DM who insist on fasting Ramadan. They should demonstrate a lot of patience and empathy. They should make sure the patients understand the risks of fasting by assessing their overall health status and associated comorbidities. Risks of RF can be reduced by an appropriate education and by avoiding pitfalls developed in this paper for practical purposes. In addition, new treatments associated with lower risk of hypoglycemia offer opportunities for healthcare providers to better manage patients with DM. Such structured strategy enables patients to follow their spiritual practices of fasting during RF with minimized risks.

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