Diabetes control during Ramadan fasting

REVIEW ARTICLE

RAVEENDRAN A. V., MBBS, MD and

ABDUL HAMID ZARGAR, MBBS, MD, DM

CLEVELAND CLINIC JOURNAL OF MEDICINE
VOLUME 84 NUMBER 5 MAY 2017

Department of Family Medicine

Adviser: Dr. A. Zendeh Del, MD, Internist

Presented by: Sedighe S. Ghorashi, MD, FM resident

Introduction

- An estimated 50 million patients with diabetes worldwide practice daily fasting during Ramadan, which lasts 29 or 30 days.

- According to the Multi-Country Retrospective Observational Study, conducted in 13 countries:
  - 94.2% of Muslim diabetic patients fasted at least 15 days,
  - and 67.6% of these fasted every day

- this poses medical challenges, increasing the risk of acute metabolic complications.

Goal of caring DM in Ramadan fasting

- help patients to fast without major complications
- empower them to modify their lifestyle in order to achieve this goal

METABOLIC COMPLICATIONS

- Hypoglycemia
- Hyperglycemia
- Diabetic ketoacidosis
- Dehydration and thrombosis

Hypoglycemia

- type 1 diabetes: fasting increases the risk of hypoglycemia 4.7 times
- type 2 diabetes : the risk is 7.5 times higher
- often underreported
- as mild to moderate hypoglycemia
- does not usually require medical assistance
- Precipitating factors : long fasting hours,
  missing the *Suhur* meal,
  failure to modify drug dosage and timing

Hyperglycemia

- type 1 diabetes: 3.2 times higher
- type 2 diabetes : the risk is 5 times higher
- Precipitating factors :
  - lack of diet control during the *Iftar* meal
  - excessive reduction in the dosage of diabetes medications due to fear of hypoglycemia.

Diabetic ketoacidosis

- **Precipitating factors:**

- Lack of diet control during the Iftar meal
- Excessive reduction in the dosage of insulin due to fear of hypoglycemia
- Acute stress
- Illness or infection

Dehydration and thrombosis

- **Precipitating factors:**

- Long fasting hours in especially hot weather
- Sweating during physical activity
- Osmotic diuresis in poorly controlled diabetes

- **Diabetes is a procoagulant condition, and dehydration increases the risk of thrombosis.**

MANAGEMENT GOALS IN RAMADAN FASTING

- The pre-Ramadan evaluation and risk stratification
- Promoting patient awareness with Ramadan-focused diabetes education
- Providing instruction on dietary modification
- Modification of the dosage and timing of diabetes medication
- Encouraging frequent monitoring of blood glucose levels
- Advising the patient when to break the fast
- Managing complications

PRE-RAMADAN EVALUATION

- level of diabetes control
- presence of acute and chronic complications of diabetes
- comorbid conditions
- patient's social circumstances:
  - knowledge about diabetes,
  - socioeconomic factors, religious beliefs, educational status, diabetes self-management skills,
  - family support in case of hypoglycemia or complications

Risk stratification of complications during Ramadan fasting

- ***Adapted from International Diabetes Federation (IDF) and the DAR International Alliance (Diabetes and Ramadan)***

- **Risk stratification of complications during Ramadan fasting:**

(criteria of the International Diabetes Federation categories)

Category 1: very high risk

Category 2: high risk

Category 3: moderate/low risk

1: very high risk

One or more of the following:

- • Severe hypoglycemia within the 3 months before Ramadan
- • Diabetic ketoacidosis within the 3 months before Ramadan
- • Hyperosmolar hyperglycemic coma within the 3 months before Ramadan
- • History of recurrent hypoglycemia
- • History of hypoglycemia unawareness
- • Poorly controlled type 1 diabetes

1: very high risk (continue)

- • Acute illness
- • Pregnancy with preexisting diabetes, or gestational diabetes treated with insulin or a sulfonylurea
- • Chronic dialysis or stage 4 or 5 chronic kidney disease
- • Advanced macrovascular complications
- • Old age with ill health

2: high risk

One or more of the following:

- • Type 2 diabetes with sustained poor glycemic control
- • Well-controlled type 1 diabetes
- • Well-controlled type 2 diabetes on multiple-dose insulin or mixed insulin
- • Pregnancy with type 2 diabetes or gestational diabetes controlled with diet only or with metformin

2: high risk (continue)

- • Stage 3 chronic kidney disease
- • Stable macrovascular complications
- • Comorbid conditions that present additional risk factors
- • Diabetes and intense physical activity
- • Treatment with drugs that may affect cognitive function

3: moderate/low risk

Well-controlled type 2 diabetes treated with one or more of the following:

- • Lifestyle therapy
- • Metformin
- • Acarbose
- • Thiazolidinediones (eg. Pioglitazone)
- • Second-generation sulfonylurea (eg. Gliclazide)
- • Incretin-based therapy (eg. Ziptin, Victoza)
- • Sodium-glucose cotransporter 2 inhibitor (eg. Canagliflozin)
- • Basal insulin (eg. Lantus)

Table 1. IDF-DAR risk categories and recommendations for patients with diabetes who fast during Ramadan

Risk category and religious opinion on fasting*	Patient characteristics	Comments
Category 1: **very high risk** **Listen to medical advice** **MUST NOT fast** 	One or more of the following: • Severe hypoglycaemia within the 3 months prior to Ramadan • DKA within the 3 months prior to Ramadan • Hyperosmolar hyperglycaemic coma within the 3 months prior to Ramadan • History of recurrent hypoglycaemia • History of hypoglycaemia unawareness • Poorly controlled T1DM • Acute illness • Pregnancy in pre-existing diabetes, or GDM treated with insulin or SUs • Chronic dialysis or CKD stage 4 & 5 • Advanced macrovascular complications • Old age with ill health	If patients insist on fasting then they should: • Receive structured education • Be followed by a qualified diabetes team • Check their blood glucose regularly (SMBG) • Adjust medication dose as per recommendations • Be prepared to break the fast in case of hypo- or hyperglycaemia • Be prepared to stop the fast in case of frequent hypo- or hyperglycaemia or worsening of other related medical conditions
Category 2: **high risk** **Listen to medical advice** **Should NOT fast** 	One or more of the following: • T2DM with sustained poor glycaemic control** • Well-controlled T1DM • Well-controlled T2DM on MDI or mixed insulin • Pregnant T2DM or GDM controlled by diet only or metformin • CKD stage 3 • Stable macrovascular complications • Patients with comorbid conditions that present additional risk factors • People with diabetes performing intense physical labour • Treatment with drugs that may affect cognitive function	
Category 3: **moderate/low risk** **Listen to medical advice** **Decision to use licence not to fast based on discretion of medical opinion and ability of the individual to tolerate fast** 	• Well-controlled T2DM treated with one or more of the following: — Lifestyle therapy — Metformin — Acarbose — Thiazolidinediones — Second-generation SUs — Incretin-based therapy — SGLT2 inhibitors — Basal insulin	Patients who fast should: • Receive structured education • Check their blood glucose regularly (SMBG) • Adjust medication dose as per recommendations

Exemption from fasting during Ramadan

- Even though the recommendation is to avoid fasting
  if the risk is very high or high,
  many patients fast.

- But patients should be advised about Islamic regulations exempting people from fasting

Exemption from fasting during Ramadan

Generally exempted from fasting:

- Children
- Elderly people
- People with acute illness
- Pregnant women
- Developmentally disabled people

(with serious physical handicaps, intellectual disability)

- People with chronic illness with multiple complications
- People who must travel long distances daily

Exemption from fasting during Ramadan

Diabetes-related exemptions from fasting:

- Type 1 diabetes
- Type 2 diabetes with unstable disease
- Complications of diabetes
- Pregnancy and diabetes
- Older age with diabetes

Exemption from fasting during Ramadan

Breaking the fast is recommended in the following cases:

- • If blood glucose < 60 mg/dL or symptoms of hypoglycemia
- • If blood glucose > 300 mg/dL
- • If blood glucose < 70 mg/dL in the morning, if patient is already on insulin or a sulfonylurea

RAMADAN-FOCUSED DIABETES EDUCATION

- Patient's awareness of the risks of Ramadan fasting
- Education:
  - Information on diet and exercise,
  - changes in the timing and dosing of medications,
  - signs and symptoms of hypoglycemia and hyperglycemia,
  - the importance of monitoring blood glucose levels

on fasting days,

  - the importance of breaking the fast in case of complications

DIET AND EXERCISE

- Eat the predawn meal on fasting days

- a balanced diet,
- with complex carbohydrates with slow energy release for the predawn meal
- and simple carbohydrates for the sunset meal

- Foods with a low glycemic index and high fiber content
- Avoid saturated fats

DIET AND EXERCISE

- Drink plenty of fluids

between sunset and sunrise

to avoid dehydration

- Usual physical activity, including moderate exercise

- Avoid excessive physical activity especially toward evening hours to prevent hypoglycemia.

ADJUSTING DIABETES MEDICATIONS

Oral diabetes drugs

- **Drug with lower risk of hypoglycemia**:
  - Metformin,
  - alpha glucosidase inhibitors (Acarbose),
  - Thiazolidinediones (Pioglitazone),
  - the short-acting insulin secretagogue (Nateglinide),
  - dipeptidyl peptidase 4 inhibitors (Sitagliptin),
  - and glucagon-like peptide 1 receptor agonists (Victoza)
- **can be used during Ramadan fasting without significant changes in the daily dose.**

ADJUSTING DIABETES MEDICATIONS

Oral diabetes drugs

Metformin

- Risk of hypoglycemia is low, so usually no dosage modification required
- Split the dose: one-third predawn, the rest at sunset

ADJUSTING DIABETES MEDICATIONS

Oral diabetes drugs

- **Thiazolidinedione**

Pioglitazone

- Risk of hypoglycemia is low, so usually no dosage modification required
- If taken with other antidiabetic drugs,

take one-fourth of the dose predawn,

the rest at sunset

ADJUSTING DIABETES MEDICATIONS

Oral diabetes drugs

❑ Sulfonylureas

- High risk of hypoglycemia
- Glimepiride, gliclazide, and glipizide are preferred over conventional sulfonylureas

such as glibenclamide because of comparatively fewer hypoglycemic events

ADJUSTING DIABETES MEDICATIONS

Oral diabetes drugs

Nonsulfonylurea secretagogues (Meglitinides)

- Low risk of hypoglycemia, so no adjustment required for twice-daily dosing
- Because of faster onset and shorter duration of action, nateglinide is preferred over repaglinide during Ramadan fasting as the risk of fasting hypoglycemia is low

ADJUSTING DIABETES MEDICATIONS

Oral diabetes drugs

- **Dipeptidyl peptidase 4 inhibitor**

Sitagliptin (Ziptin)

- Risk of hypoglycemia is low,
- so no dosage modification required

ADJUSTING DIABETES MEDICATIONS

Oral diabetes drugs

- **Sodium-glucose cotransporter 2 inhibitor**

(Canagliflozin)

- Avoid during Ramadan fasting due to risk of :
  - osmotic diuresis
  - dehydration
  - ketoacidosis

ADJUSTING DIABETES MEDICATIONS

injectable diabetes drugs

- **Glucagon-like peptide 1 receptor agonist**

Liraglutide (Victoza)

- Risk of hypoglycemia is low,
- so no dosage modification required if taken alone
- If taken with sulfonylurea, dose reduction required

ADJUSTING DIABETES MEDICATIONS

Insulin

- **High risk of hypoglycemia**
- **Premixed 70/30 insulin** during Ramadan fasting more likely to cause hypoglycemic episodes than **premixed 50/50**

- An analogue **premix** containing **75%** neutral protamine lispro and **25%** insulin lispro resulted in better glycemic control during Ramadan fasting.

- Usual morning dose at sunset, and half of nighttime dose predawn

ADJUSTING DIABETES MEDICATIONS

Insulin

- **Insulin analogues** are associated with a lower risk of hypoglycemia than human insulin
- Reduce dose of **long-acting insulin analogues** by 20%
- During Ramadan fasting, a basal- bolus regimen is preferred, including : (eg. Lantus + Novorapid)
- A long-acting basal insulin (eg, glargine, detemir, degludec) with a short-acting insulin (eg, glulisine, aspart, lispro) before meal

FREQUENT MONITORING OF BLOOD GLUCOSE DURING FASTING

- Reduces the risk of both hypoglycemia and hyperglycemia
- Helps control blood sugar levels during Ramadan fasting
- In patients with well-controlled diabetes without complications, testing once or twice a day is enough
- Patients with poorly controlled diabetes and those with complications should test more often.

ADVICE REGARDING WHEN TO BREAK THE FAST

- If signs or symptoms of hypoglycemia develop,

- the patient should break the fast in order to avoid serious complications.

- This is acceptable under Islamic law

REFERENCES:

- 1. **Babineaux SM, Toaima D, Boye KS, et al**. Multi-country retrospective observational
- study of the management and outcomes of patients with type 2
- diabetes during Ramadan in 2010 (CREED). Diabet Med 2015; 32:819–828.
- 2. **Salti I, Benard E, Detournay B, et al; EPIDIAR Study Group**. A populationbased
- study of diabetes and its characteristics during the fasting month of Ramadan
- in 13 countries: results of the Epidemiology of Diabetes and Ramadan
- 1422/2001 (EPIDIAR) study. Diabetes Care 2004; 27:2306–2311.
- 3. **International Diabetes Federation and the DAR International Alliance**.
- Diabetes and Ramadan: Practical Guidelines. Brussels, Belgium: International
- Diabetes Federation, 2016. www.idf.org/guidelines/diabetes-in-ramadan and
- www.daralliance.org. Accessed March 8, 2017.
- 4. **Al-Arouj M, Bouguerra R, Buse J, et al**. Recommendations for management
- of diabetes during Ramadan. Diabetes Care 2005; 28:2305–2311.
- 5. **Masood SN, Masood Y, Hakim R, Alvi SFD, Shera AS**. Ramadan fasting
- related awareness, practices and experiences of a representative group of
- urban Pakistani Diabetics. Pak J Med Sci 2012; 28:432–436.
- 6. **Bravis V, Hui E, Salih S, Mehar S, Hassanein M, Devendra D**. Ramadan education
- and awareness in diabetes (READ) programme for Muslims with type 2
- diabetes who fast during Ramadan. Diabet Med 2010; 27:327–331.
- 7. **Masood SN, Sheikh MA, Masood Y, Hakeem R, Shera AS**. Beliefs of people
- with diabetes about skin prick during Ramadan fasting. Diabetes Care 2014;
- 37:e68–e69.
- 8. **Aravind S, Ismail SB, Balamurugan R, et al**. Hypoglycemia in patients with
- type 2 diabetes from India and Malaysia treated with sitagliptin or a sulfonylurea
- during Ramadan: a randomized, pragmatic study. Curr Med Res Opin
- 2012; 28:1289–1296.
- 9. **Glimepiride in Ramadan (GLIRA) Study Group**. The effi cacy and safety of
- glimepiride in the management of type 2 diabetes in Muslim patients during
- Ramadan. Diabetes Care 2005; 28:421–422.
- 10. **Hassanein M, Abdallah K, Schweizer A**. A double-blind, randomized trial,
- including frequent patient-physician contacts and Ramadan-focused advice,
- assessing vildagliptin and gliclazide in patients with type 2 diabetes fasting
- during Ramadan: the STEADFAST study. Vasc Health Risk Manag 2014;
- 10:319–326.
- 11. **Brady EM, Davies MJ, Gray LJ, et al**. A randomized controlled trial comparing
- the GLP-1 receptor agonist liraglutide to a sulphonylurea as add on to
- metformin in patients with established type 2 diabetes during Ramadan: the
- Treat 4 Ramadan trial. Diabetes Obes Metab 2014; 16:527–536.
- 12. **Ibrahim M, Abu Al Magd M, Annabi FA, et al**. Recommendations for management
- of diabetes during Ramadan: update 2015. BMJ Open Diabetes Res
- Care 2015; 3:e000108.
- 13. **Kassem HS, Zantout MS, Azar ST**. Insulin therapy during Ramadan fast for
- type 1 diabetes patients. J Endocrinol Invest 2005; 28:802–805.
- 14. **Hui E, Bravis V, Salih S, Hassanein M, Devendra D**. Comparison of humalog
- mix 50 with human insulin mix 30 in type 2 diabetes patients during Ramadan.
- Int J Clin Pract 2010; 64:1095–1099.
- 15. **Hassanein M, Belhadj M, Abdallah K, et al**. Management of type 2 diabetes
- in Ramadan: low ratio premix insulin working group practical advice. Indian J
- Endocrinol Metab 2014; 18:794–799.
- 16. **Mattoo V, Milicevic Z, Malone JK, et al; Ramadan Study Group**. A comparison
- of insulin lispro Mix25 and human insulin 30/70 in the treatment of type 2
- diabetes during Ramadan. Diabetes Res Clin Pract 2003; 59:137–143.
- 17. **Pathan MF, Sahay RK, Zargar AH, et al**. South Asian Consensus Guideline:
- use of insulin in diabetes during Ramadan. Indian J Endocrinol Metab 2012;
- 16:499–502.
- 18. **Khalil AB, Beshyah SA, Abu Awad SM, et al**. Ramadan fasting in diabetes patients
- on insulin pump therapy augmented by continuous glucose monitoring:
- an observational real-life study. Diabetes Technol Ther 2012; 14:813–818.
- 19. Holy Qur'an 2:195.
- 20. Holy Qur'an 4:29.
- 21. **Bashir MI, Pathan MF, Raza SA**. Role of oral hypoglycemic agents in the management
- of type 2 diabetes mellitus during Ramadan. Indian J Endocrinol
- Metab 2012; 16:503–507.