Managing people with diabetes during Ramadan

MAJID ALABBOOD MB ChB, FICMS, CABMS, DM
BERNARD CHAMPION BEc, MB BS, BSc(Med)(Hons 1), FRACP, MMedEd

The immediate management and investigation of an acute endocrine presentation in general practice is discussed in this section. It is inspired by, but not based on, a real patient situation.

Diabetes is one of the most important public health challenges in the 21st century. Globally, the number of people with diabetes has doubled over the past 20 years rising to more than 400 million in 2015.[1] Fasting during Ramadan is one of the five pillars of Islam, and all healthy adult Muslims are obliged to refrain from eating and drinking from sunrise to sunset during this lunar month. Although exemptions from fasting exist for people with serious medical conditions, including diabetes, many still choose to fast. Fasting in people with diabetes can cause disruption of normal glucose homeostasis and lead to hypoglycaemia, hyperglycaemia, diabetic ketoacidosis, dehydration and thrombosis. This article discusses the most common acute presentations of people with diabetes who fast during Ramadan with two clinical case scenarios.

ENDOCRINOLOGY TODAY 2017; 6(2): 38-40

Dr Alabbood is a Scholar of Doctorate of Advanced Medicine in Endocrinology at Macquarie University. Associate Professor Champion is an Associate Professor in Medicine and Endocrinologist at Macquarie University, Sydney, NSW.

Case 1

Ali is a 57-year-old man who has had type 2 diabetes for the past 20 years. He has taken a premixed insulin (aspart 30% and aspart protamine 70%) 20 units at breakfast and 20 units at dinner for the past five years. He also takes a slow-release preparation of metformin 2 g daily and gliclazide 60 mg daily. He is a regular patient at your clinic and today he visits you for follow up about his blood glucose control. His last HbA_{1c} measurement six months ago was 5.4% (36 mmol/mol). During the consultation, you notice Ali is sweating profusely with shaky hands. His pulse rate is 112 beats per minute. He admits that he is fasting for Ramadan and had his last meal at 4 am that morning before sunrise; it is now 5 pm. He took his usual dose of insulin 20 units at the sunset meal (iftar) and 20 units at the sunrise meal (suhoor).

What should you do first in this situation?

Answer: People with type 2 diabetes taking insulin and a sulfonylurea are at moderate risk of hypoglycaemia (Box 1). Ali has not eaten since 4 am and has now been fasting for 11 hours. The most likely cause of his symptoms is an episode of hypoglycaemia. The immediate action should be to give him 15 to 20 g of a fast-acting carbohydrate in the form of glucose tablets or gel and simultaneously check his capillary blood glucose level (BGL). Other sources of glucose such as orange juice, honey or a lolly are also effective. Before giving Ali the glucose load, you must explain to him that he should break his fast immediately otherwise he may be at risk of life-threatening hypoglycaemia if he waits till sunset to eat the iftar meal. Also, you may explain to him that Islamic rules exempt sick people from fasting and allow them to break their fast when their life is in danger from continuing to fast. Glucose load should be given immediately even before checking BGLs using a glucometer.[2] BGLs should be checked 15 minutes later and, if still below 3.9 mmol/L, another 15 to 20 g of fast-acting carbohydrate should be given.

How can Ali prevent subsequent hypoglycaemic episodes over the next 24 hours and beyond?

Answer: Ali has taken a premixed insulin preparation and gliclazide. The effect of these drugs is expected to continue even after correction of hypoglycaemia. Therefore, you should advise him to wait for 30 minutes before he drives, eat a snack or a meal as soon as he gets home and monitor his BGLs regularly (every two hours or if any recurrence of symptoms) for the next 24 hours. In addition, he should temporarily relax his glycaemic targets. Renal and liver function tests should be ordered as both renal and hepatic impairment may precipitate or prolong hypoglycaemia in people with diabetes.

In future, Ali should be encouraged to frequently monitor his capillary BGLs during fasting hours and to break his fast whenever his BGL falls below 3.9 mmol/L, above 16.6 mmol/L or symptoms develop. There is a misconception held by some Muslim communities that finger-prick testing during fasting hours might invalidate fasting. This needs to be clarified and the patient assured that finger-prick testing does not interfere with fasting.[3] Patients at high risk

of hypoglycaemia should be actively discouraged from fasting (Box 1).[4]

Ali understands your concerns but says that he wants to fast for the remaining days of Ramadan.

What further modifications in Ali's medications should be carried out to avoid another hypoglycaemic event?

Answer: As Ramadan is a lunar month, it starts 11 days earlier each year and coincides with a different season every nine years. Therefore, the duration of the fast may last from 11 to 19 hours depending on geographical location and season of year in which Ramadan falls. Most hypoglycaemic episodes occur during fasting hours in the daytime. Therefore, during the month of Ramadan, it is recommended for patients such as Ali with type 2 diabetes who take a premixed insulin twice daily to reduce the morning suhoor dose by 25 to 50%, and take the normal evening dose at the sunset iftar meal, as a large meal is normally eaten at the end of the fasting day.[3,5,6] If postprandial hyperglycaemia develops, changing the type of premix insulin to a 50:50 premix might be considered.[4] Gliclazide should be taken at the same dose at sunset.[4] As metformin has low hypoglycaemic potential, the dose may be left unchanged.[4]

Ali asks you about exercising during Ramadan and how he should alter his diet. What do you recommend?

Answer: Regular light or moderate activity exercise is allowed during Ramadan. The best time to exercise is after breaking the fast and before the suhoor meal (i.e. during night to avoid hypoglycaemia and dehydration).[4] Ali should be encouraged to divide daily calories between suhoor and iftar. He should also be advised to eat meals that are well balanced and include foods with a low glycaemic index but high in fibre such as plenty of fruit, vegetables and salads. Finally, he should be encouraged to avoid caffeinated and sweetened drinks.[3]

What is the best type or regimen of insulin for use in people during Ramadan that is associated with a lower risk of hypoglycaemia?

Answer: Use of an insulin pump with continuous subcutaneous insulin infusion or an insulin pump enhanced by continuous glucose monitoring, especially with the newly added features of sensing and automatically suspending infusion in the presence of hypoglycaemia, is the best option of insulin therapy during Ramadan particularly for people with type 1 diabetes.[3] However, people with type 2 diabetes are not eligible for public funding for an insulin pump. Patients taking the long-acting insulin analogue glargine have been shown to be able to fast safely with no significant increases in hypoglycaemic episodes. Rapid-acting insulin lispro has been shown to provide better glycaemic control and a lower incidence of hypoglycaemia than regular human insulin. Biphasic insulin aspart (30:70 premix) has also been shown to significantly reduce all glycaemic indices following Ramadan without an increase in risk of hypoglycaemia.

Case 2

Mona, a 19-year-old woman, was diagnosed with type 1 diabetes at the age of 15 years. She presents to your general practice with insidious onset of polyuria and polydipsia associated with malaise, nausea and vomiting for the past five hours. She complains of diffuse abdominal pain and loss of appetite. Her usual medication includes glargine 24 units at night with lispro 6 units before each meal. On further questioning, she admits that she is currently fasting for the month of Ramadan. Due to the change in her dietary habits, she deliberately reduced her dose of glargine to 12 units and took lispro only before iftar thinking that she needed less insulin during Ramadan. On examination, she looks ill with dry skin and laboured breathing.

What other signs would you look for on examination?

Answer: Mona reduced her insulin dose because she thought that she would require less insulin during Ramadan due to her reduced food and water intake. The most important diagnosis to exclude in this situation is diabetic ketoacidosis (DKA). Given her carbohydrate restriction during the days of Ramadan, euglycaemic DKA (characterised by normal BGL in the presence of ketoacidosis) should also be considered. Examination findings may include characteristic acetone breath with Kussmaul breathing, tachycardia, hypotension and dehydration. The abdomen may be very tender and even rigid simulating an acute abdomen.[6] Examination for meningeal irritation signs (neck stiffness and Kernig's sign) is mandatory in any suspected case of DKA to exclude meningitis as the precipitating factor.[6]

1. Risk categories for people with diabetes who fast during Ramadan

High risk

- Severe and recurrent episodes of hypoglycaemia within three months before Ramadan
- History of hypoglycaemia unawareness
- Poor glycaemic control before the month of Ramadan
- Ketoacidosis episode or hyperosmolar hyperglycaemic state within three months before Ramadan
- Acute illness
- Pregnant women
- Comorbidities such as chronic kidney disease or cardiovascular disease

Moderate risk

- Well-controlled type 2 diabetes treated with sulfonylurea, insulin or a combination of these

Low risk

- Well-controlled type 2 diabetes treated with one or more of the following: diet alone, metformin, dipeptidyl peptidase-4 inhibitors, glucagon-like peptide-1 receptor agonists, sodium–glucose cotransporter-2 inhibitors or thiazolidinediones

What are the immediate tests that you should order?

Answer: Mona needs urgent referral to the emergency department (ED) at the local hospital. If you have facility to do so, checking of BGLs and blood ketone levels will be useful for her ED triage. Additional tests required in the ED setting include measurement of electrolyte levels, bicarbonate level, complete blood count, renal function and urine and blood cultures, plus an electrocardiography and arterial blood gas analysis should be performed if feasible.

Mona is taken by ambulance to the ED at the local hospital. The initial work-up for Mona is shown in the Table.

Table. Biochemical investigations for Case 2

Test	Result	Reference range
Plasma glucose (mmol/L)	25.3	4–6.1
Sodium (mmol/L)	132	135–145
Potassium (mmol/L)	4.8	3.5–5
Chloride (mmol/L)	97	96–106
Bicarbonate (mmol/L)	16	22–29
pH	7.21	7.35–7.45
Beta-hydroxybutyrate (mmol/L)	5.2	Less than 1.5
White blood cell count (10^9/L)	18 (neutrophilia)	4–11
Urea (mmol/L)	9.2	2.5–7.1
Creatinine (μmol/L)	125	71–115
Urine ketone	++++	Negative
Urine beta human chorionic gonadotrophin	Negative	Negative
HbA_{1c} (%) (mmol/mol)	10.2 88	4.0–6.0 20–42

What are the criteria for diagnosis of DKA?
Answer: The initial work-up for Mona shows hyperglycaemia, metabolic acidosis (reflected by low bicarbonate level and pH, and anion gap of 24 mEq/L) and moderately positive plasma ketones, which are collectively the three criteria required for the diagnosis of DKA (Box 2).

How should Mona be managed in hospital?
Answer: Any patient diagnosed with moderate or severe DKA should be managed in a hospital setting (Box 2). Mona needs immediate fluid resuscitation with saline infusion to help with hypovolaemia, ketoacidosis and hyperglycaemia. Potassium should be replaced immediately even if levels are normal to avoid hypokalaemia due to intracellular shift of potassium with correction of acidosis. Insulin treatment should start immediately with short- or rapid-acting insulin at a rate of 0.1 units/kg per hour to a maximum of 10 units per hour under the guidance of a DKA protocol.

After resolution of DKA, what should you advise Mona in case she wanted to continue fasting for the rest of Ramadan?
Answer: Mona developed an episode of DKA during fasting for Ramadan, due to lack of oral intake and insulin omission. Also, her glycaemic control is poor as reflected by her high HbA_{1c} (10.2% or 88 mmol/mol). Therefore, she is classified as being in a high-risk group for hypoglycaemia (Box 1) and should be strongly discouraged from continuing to fast. If she insisted on fasting for religious reasons, then you should advise her to reduce her usual dose of glargine by up to 30 to 40% (i.e. 16 units at Iftar), to take the normal dose of lispro (6 units) at iftar and reduce the lispro dose by 25 to 50% at suhoor (4 units), and none during the day when fasting.[3] Also, Mona could consider carbohydrate counting to help her calculate the ongoing correct dose of lispro. She needs more frequent BGL monitoring (every three hours) during fasting.

Summary

Islamic rules exempt Muslims who are sick from fasting during Ramadan. People with an acute illness such as flu can postpone fasting to other days when their illness is resolved. People with chronic illness, such as diabetes, chronic kidney disease or heart disease, and the elderly are not obliged to fast but are able to compensate by donating to a charity as atonement. Fasting for Ramadan is safe in people with diabetes at low or moderate risk of developing acute complications such as hypoglycaemia or hyperglycaemia. Patients who choose to fast should be warned of the serious consequences of complications such as hypoglycaemia and hyperglycaemia. They should also be educated before Ramadan on suitable exercise and dietary modifications. Drug modification is necessary to suit the dietary restriction during the daytime. Patients should be advised to break their fast early if they are feeling unwell and should be encouraged to monitor their BGLs more frequently while fasting. GPs should be familiar with these issues and offer appropriate advice to patients given the high number of people with diabetes in Australia who participate in the Ramadan fast. Finally, a post Ramadan GP follow up is recommended. **ET**

2. Diabetic ketoacidosis: criteria and management goals

Criteria
- Hyperglycaemia >14 mmol/L
- Bicarbonate <18 mmol/L
- pH <7.3
- Ketonaemia and/or ketonuria

Management goals
- Fluid resuscitation
- Reversal of ketosis
- Reduction of blood glucose levels (hyperglycaemia) to normal range
- Correction of electrolytes derangement, especially hypokalaemia
- Determination of the underlying cause

References

1. World Health Organization (WHO). Global report on diabetes WHO Geneva. Geneva: WHO Press; 2016.
2. American Diabetes Association Standards of Medical Care in Diabetes–2010. Diabetes Care 2010; 33(Supp 1): S11-S61.
3. International Diabetes Federation and the DAR International Alliance. Diabetes and Ramadan: practical guidelines. Brussels, Belgium: International Diabetes Federation; 2016. Available online at: www.idf.org/guidelines/diabetes-in-ramadan and www.daralliance.org (accessed March 2017).
4. Hui E, Bravis V, Hassanein M, et al. Management of people with diabetes wanting to fast during Ramadan. BMJ 2010; 340: c3053.
5. Pathan MF, Sahay RK, Zargar AH, et al. South Asian Consensus Guideline: use of insulin in diabetes during Ramadan. Indian J Endocrinolo Metab 2012; 16: 499-502.
6. Savage M, Dhatariya K, Kilvert A, et al. Joint British Diabetes Societies guideline for the management of diabetic ketoacidosis. Diabetic Med 2011; 28: 508-515.

COMPETING INTERESTS: None.