

الله الرحمن الرحيم



# Diabetes and Ramadan



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# Introduction

In Islam, Ramadan is the holy month of fasting and falls on the ninth month of the lunar calendar and varies in its timing from year to year. Fasting during Ramadan involves not eating or drinking anything from dawn to sunset, and in some parts of the world this can last up to 20 h. However, not all Muslims can fast during Ramadan; people that are ill or unwell can be exempted from fasting and can participate in Ramadan through giving charity to those that are less fortunate. Nevertheless, there is a strong desire to participate in fasting during Ramadan, even amongst those that are deemed ill or unwell. Muslims comprise almost a quarter of the world's population and in 2016 there were nearly 1.8 billion followers of Islam worldwide . Crucially, we note that the current and future prevalence of diabetes in these regions are high .

# Benefits

Fasting during Ramadan may provide enduring benefits. It can be an opportunity for a **better lifestyle, weight loss** and the **cessation of unhealthy habits such as smoking**. For people with diabetes who choose to fast, Ramadan may also help to strengthen the therapeutic alliance with physicians and may help to improve general diabetes management.

the onset of Ramadan can lead to a sudden change to one's usual lifestyle — this can include a shift in mealtimes and diet, changes to usual sleeping schedules and adjustments to physical activity patterns. For people with diabetes further changes are also required, these may involve a need for education, a knowledge of diabetes management plans and adaptations to self-monitoring of blood glucose (SMBG) schedules and medication regimens.

Potential health hazards include hypoglycemia, hyperglycemia , dehydration and acute metabolic complications such as diabetic\_ ketoacidosis (DKA).

For HCPs the challenges involve ensuring that individuals with diabetes that are seeking to fast can do so safely.

The *IDF-DAR Diabetes and Ramadan Practical Guidelines 2021* will help to provide real-world recommendations to both individuals with diabetes that are seeking to fast and to HCPs that provide care. This update includes the addition of new guidance based on a greater and more recent body of evidence and the introduction of a novel clinical risk calculator to assist physicians in classifying risk. This new information comprises the impact of fasting during Ramadan on both one's physical and mental wellbeing; the management of type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM)

# Changes to energy balance and weight

## What happens to the body?

With major changes to meal times and content and sleeping times, there are also changes in activity patterns during Ramadan. Daytime and overall activity are reduced, although there does not appear to be significant changes in **resting metabolic rate**. As sleeping time also decreases, there is no significant change in total (24 h) daily energy expenditure. There is, on average, a reduction in total daily energy intake and a net **weight loss of around 1 kg** by the end of Ramadan. Though weight loss is not a universal outcome and weight change with Ramadan shows a great deal of inter-individual variability.

# Changes to circadian and hormonal rhythms

studies have shown alterations occurring to CLOCK circadian rhythm-controlling genes during Ramadan. These can affect hormones including:

**Cortisol**, [which can in turn affect insulin sensitivity and thus glucose levels.] Generally, rises in cortisol are associated with rises in blood glucose levels.

**leptinin** [fasting cause decrease in leptin levels but] evening levels are similar to that of pre-Ramadan

**adiponectin**; higher levels of adiponectin are associated with increased insulin sensitivity .

Adiponectin levels are reported to decrease in the morning days of Ramadan .

**Ghrelin**[ is an important hormone involved in the regulation of appetite, but] no differences in Ghrelin levels among individuals of a healthy weight were observed during the RF. **overweight** and **obese** individuals show a marked reduction in ghrelin in the last week of Ramadan.

**Growth hormone** is also important in regulating fat metabolism and can affect insulin sensitivity morning and evening growth hormone may decrease during RF



# Insulin sensitivity

As the Ramadan day time fasting hours progress, there is a gradual shift from carbohydrates to lipids as the main source of fuel. An increase in insulin resistance in RF has been shown in several studies. This, together with insulin deficiencies can lead to excessive **glycogen breakdown** and **increased gluconeogenesis** among people with diabetes. Eating large quantities after *Iftar* can cause further rises in blood glucose levels. As a result, the risks facing people with diabetes are heightened during Ramadan. These include **hyperglycemia, diabetic ketoacidosis (DKA), dehydration** and **thrombosis**.

# Glucose variability and Ramadan fasting in diabetes

[(CGM) studies in Ramadan report stable blood glucose levels in healthy individuals (without diabetes) during fasting hours. At Iftar, a modest rise in interstitial glucose (and therefore blood glucose) is observed, but this increase remains within normal ranges.]

.The Iftar glucose peak is exaggerated in diabetes and is thought to represent the response to a carbohydrate rich meal at Iftar. Although there is much intra- and inter-individual variability in glycemic profile changes with RF, there are no overall significant differences in markers of glycemic control between Ramadan and non-Ramadan periods .Likewise, no significant differences in the number of high or low glucose excursions, time spent in range, hypoglycemia, and hyperglycemia have been observed .

In individuals on multiple antidiabetic medication, an increase in the mean amplitude of glycemic excursions (MAGE) has been observed in the early stages of Ramadan compared to that of before Ramadan but not in late-Ramadan and post-Ramadan periods .An important concern among fasting individuals on insulin or its secretagogues is hypoglycemia.

# Effects of RF on mental wellbeing

[There are many spiritual and mental benefits of Ramadan – an opportunity to self-reflect on aspects of life that need improving, the ability to grow spiritually through prayers, a time where there is an emphasis placed on good deeds and a chance to spend more time with loved ones and people within the community.] Actively participating in Ramadan can lead to declining rates of depression, anxiety, stress and improvements in memory and overall mental wellbeing. Other studies have found the opposite. **People with pre-existing feelings of depression might also experience poorer glycemic control when fasting during Ramadan**. The changes that occur to energy intake during RF has also been linked to fatigue, deteriorated mood and greater irritability. A fear of complications, particularly hypoglycemia, is also an important issue among people seeking to fast during Ramadan. Altogether, the effects of fasting during Ramadan on one's overall mental wellbeing can be varied.



LIFESTYLE CHANGES OCCURRING WHEN FASTING DURING RAMADAN	PHYSICAL AND MENTAL BENEFITS OF FASTING DURING RAMADAN	POTENTIAL ADVERSE PHYSICAL AND MENTAL EFFECTS OF FASTING DURING RAMADAN
<ol style="list-style-type: none"> <li>1. Sleeping schedules</li> <li>2. Meal plans and diet</li> <li>3. Physical activity patterns</li> <li>4. Reduction of vices such as smoking</li> <li>5. Medication adjustments</li> </ol>	<ol style="list-style-type: none"> <li>1. Sense of fulfilment in participating in all aspects of Ramadan</li> <li>2. Improvements in weight or BMI</li> <li>3. Improvements in self-control and ability to resist temptations</li> <li>4. Greater sense of empathy with those less fortunate</li> <li>5. Participation in <i>Sunnah</i> practices for greater spiritual benefits</li> <li>6. Greater sense of community and an opportunity to strengthen relationships</li> <li>7. Reducing potentially harmful vices, such as smoking, for greater physical and mental wellbeing</li> </ol>	<ol style="list-style-type: none"> <li>1. Sleep deprivation and disruption of circadian rhythm leading to an increase in fatigue and reduction in cognition</li> <li>2. Glucose excursions causing feelings of being unwell</li> <li>3. Greater feelings of lethargy,</li> <li>4. Heightened feelings of fear for diabetes related complications</li> <li>5. Temporary changes in weight</li> <li>6. Short term feelings of stress anxiety, irritability and agitation</li> </ol>

# THE IMPORTANCE OF DIABETES AND RAMADAN EDUCATION

[Diabetes self-management education and support (DSMES) addresses the practical, clinical, psychosocial, and behavioral aspects of care needed for daily self-management and is essential for safe fasting during Ramadan. ]The objective of Ramadan-focused education is to raise awareness of the risks associated with diabetes and fasting, and to provide strategies for effective prevention. The timing of this education is also important and should be given well before Ramadan commences. Yet, only **two thirds** of people with diabetes that do fast receive such counselling as shown in the Epidemiology of Diabetes and Ramadan (EPIDIAR) study .It has been estimated that only **30-67%** of physicians used a Ramadan focused educational program .[Education should be delivered in simple, clear local languages and should be engaging, motivational, culturally sensitive and be delivered by well-informed individuals. Ramadan-focused education should target three major groups: the general population, people with diabetes and HCPs .]

# Evidence supporting the use of Ramadan focused education

[ Various studies from the last decade have demonstrated the benefits of Ramadan focused education on outcomes during Ramadan, for people with diabetes.] It was found that education sessions were associated with a decrease in the incidence of hypoglycemia and HbA1c levels when compared to controls. Interestingly, education sessions prior to Ramadan were also associated with improvements in HDL and LDL profiles .These benefits can also be effective in helping higher risk individuals people with diabetes that included individuals with chronic kidney disease (CKD), ischemic heart disease and pregnant women with gestational diabetes. Education sessions were **90 min** in duration and took place **4–6 weeks** prior to Ramadan.

## The main areas of diabetes education that should be provided prior to Ramadan

- Risk quantification and exemptions, and removing misconceptions
- Blood glucose monitoring
- Fluids and dietary advice
- Physical activity and exercise advice
- Medication adjustment and test fasting
- When to break the fast
- Recognition of hypo and hyperglycaemia symptoms



## RECOGNISED FACTORS THAT MAY INFLUENCE THE DEVELOPMENT OF PERSONALISED CARE FOR PEOPLE WITH DIABETES THAT FAST DURING RAMADAN

Ramadan related factors	Diabetes related factors	Factors concerning the individual
Length of fasting hours	Type of diabetes	Age (adolescents and elderly)
Season of fasting	Duration of diabetes	Gender
Weather	Diabetic complications	Occupation
Geographical location	Antidiabetic therapies	Pregnancy/Lactation
Social changes	Previous control	Meal pattern
Past experiences	Proneness to hypoglycemia	Exercise nature/timing
	Hypoglycaemic unawareness	Motivation
	Access to care	Personal preferences

# Risk stratification of individuals with diabetes for fasting during Ramadan

[Risk stratification is an important step in the process of providing guidance to individuals with diabetes seeking to fast during Ramadan. It forms the basis of all subsequent guidance and decision making. ]The Risk stratification process has gradually evolved from the 4 tier categories in the 2005 and 2010 American Diabetes Association (ADA) recommendations to the three-tier traffic light system in the IDF-DAR guidelines in 2016 However, in light of emerging evidence showing people previously categorized as “high-risk” as being able to safely conduct RF, and with a high proportion of individuals conducting the fast despite these risk categorizations , many felt that the previous risk scoring systems were too rigid. The resulting score will determine the overall risk level ].The risk levels are **high** risk, **moderate** risk and **low** risk. Individuals who insist on fasting, despite their risk category, must follow the relevant guidance and recommendations throughout.

# Risk Element

# Risk Score

## ➤ Diabetes type and duration

- |                   |   |
|-------------------|---|
| • Type 1 diabetes | 1 |
| • Type 2 diabetes | 0 |

## ➤ Duration of Diabetes

- |                           |   |
|---------------------------|---|
| • A duration of $\geq 10$ | 1 |
| • A duration of $< 10$    | 0 |

# Risk Element

# Risk Score

## ➤ Presence of hypoglycemia

- Hypoglycemia unawareness 5
- Recent Severe hypoglycemia 4
- Daily mild hypoglycemia 3
- Hypoglycaemia 1–6 times per time per week 2
- Hypoglycemia less than 1 time per week 1
- No hypoglycemia 0

## ➤ Level of glycemic control

- HbA1c levels > 9% (75 mmol/mol) 1 2
- HbA1c levels 7.5–9% (58.5–75 mmol/mol) 2 1
- HbA1c levels < 7.5% (58.5 mmol/mol) 3 0



# Risk Element

# Risk Score

## ➤ Type of treatment

- |  |     |
|--|-----|
| • Multiple daily mixed insulin Injections    | 3   |
| • Basal Bolus/Insulin pump                   | 2.5 |
| • Once daily Mixed insulin                   | 2   |
| • Basal Insulin                              | 1.5 |
| • Glibenclamide                              | 1   |
| • Gliclazide/MR or Glimepride or Repeglanide | 0.5 |
| • Other therapy not including SU or Insulin  | 0   |

# Risk Element

# Risk Score

## ➤ Self-Monitoring of Blood Glucose (SMBG)

- Indicated but not conducted 2
- Indicated but conducted sub-optimally 1
- Conducted as indicated 0

## ➤ Acute complications

- DKA/ HHS in the last 3 months 3
- DKA/ HHS in the last 6 months 2
- DKA/ HHS in the last 12 months 1
- No DKA or HHS 0

# Risk Element

# Risk Score

## ➤ Chronic Complications/Comorbidities

- Unstable angina/Heart failure/eGFR < 30 mL/min 6
- eGFR 30–45 mL/min 4
- Stable CVD/eGFR 45–60 mL/min 2
- No CVD and normal eGFR 0

## ➤ 10. Pregnancy

- Pregnant not within targets 4
- Pregnant within targets 2
- Not pregnant 0

# Risk Element

# Risk Score

## ➤ Frailty and Cognitive function

- Impaired cognitive function
- Frail
- > 70 years old with no home support
- No frailty or loss in cognitive function

4  
3  
1  
0

## ➤ Physical Labour

- Highly Intense physical labour
- No physical labour

1  
0

## ➤ Previous Ramadan Experience

- Overall negative experience
- No negative or positive experience

1  
0

## ➤ Fasting hours (location)

- $\geq 16$  h
- $< 16$  h

1  
0

**SCORE 0 TO 3**

**LOW RISK**

**SCORE 3.5 TO 6**

**MODERATE RISK**

**SCORE > 6**

**HIGH RISK**



Risk score/level	Medical Recommendations	Religious Recommendations
<p><b>Low Risk</b></p> <p><b>0-3 points</b></p>	<p><b>Fasting is probably safe</b></p> <ol style="list-style-type: none"> <li><b>1. Medical Evaluation</b></li> <li><b>2. Medication adjustment</b></li> <li><b>3. Strict monitoring</b></li> </ol>	<ol style="list-style-type: none"> <li><b>1. Fasting is obligatory</b></li> <li><b>2. Advice not to fast is not allowed, unless patient is unable to fast due to the physical burden of fasting or needing to take medication or food or drink during the fasting hours</b></li> </ol>
<p><b>Moderate Risk</b></p> <p><b>3.5-6 points</b></p>	<p><b>Fasting safety is uncertain</b></p> <ol style="list-style-type: none"> <li><b>1. Medical Evaluation</b></li> <li><b>2. Medication adjustment</b></li> <li><b>3. Strict monitoring</b></li> </ol>	<ol style="list-style-type: none"> <li><b>1. Fasting is preferred but patients may choose not to fast if they are concerned about their health after consulting the doctor and <u>taking into account</u> the full medical circumstances and patient's own previous experiences</b></li> <li><b>2. If the patient does fast, they must follow medical recommendations including regular blood glucose monitoring</b></li> </ol>
<p><b>High Risk</b></p> <p><b>&gt;6 points</b></p>	<p><b>Fasting is probably unsafe</b></p>	<p><b>Advise against fasting</b></p>

Based on risk scoring, people with diabetes can be categorized as:

- High risk, where fasting is probably **unsafe**
- Moderate risk, where the fasting **safety is uncertain**
- Low risk, where fasting is probably **safe**

# When to break the fast

## ALL INDIVIDUALS SHOULD BREAK THEIR FAST IF:

- Blood glucose  $<70$  mg/dL (3.9 mmol/L)
  - Re-check within 1 hour if blood glucose is between 70–90 mg/dL (3.9–5.0 mmol/L)
- Blood glucose  $>300$  mg/dL (16.6mmol/L)\*
- Symptoms of hypoglycaemia, hyperglycaemia, dehydration or acute illness occur

# Hypoglycemia

- Trembling
- Sweating/chills
- Palpitations
- Hunger
- Altered mental status
- Confusion
- Headache

# Hyperglycemia

- Extreme thirst
- Hunger
- Frequent urination
- Fatigue
- Confusion
- Nausea/vomiting
- Abdominal pain



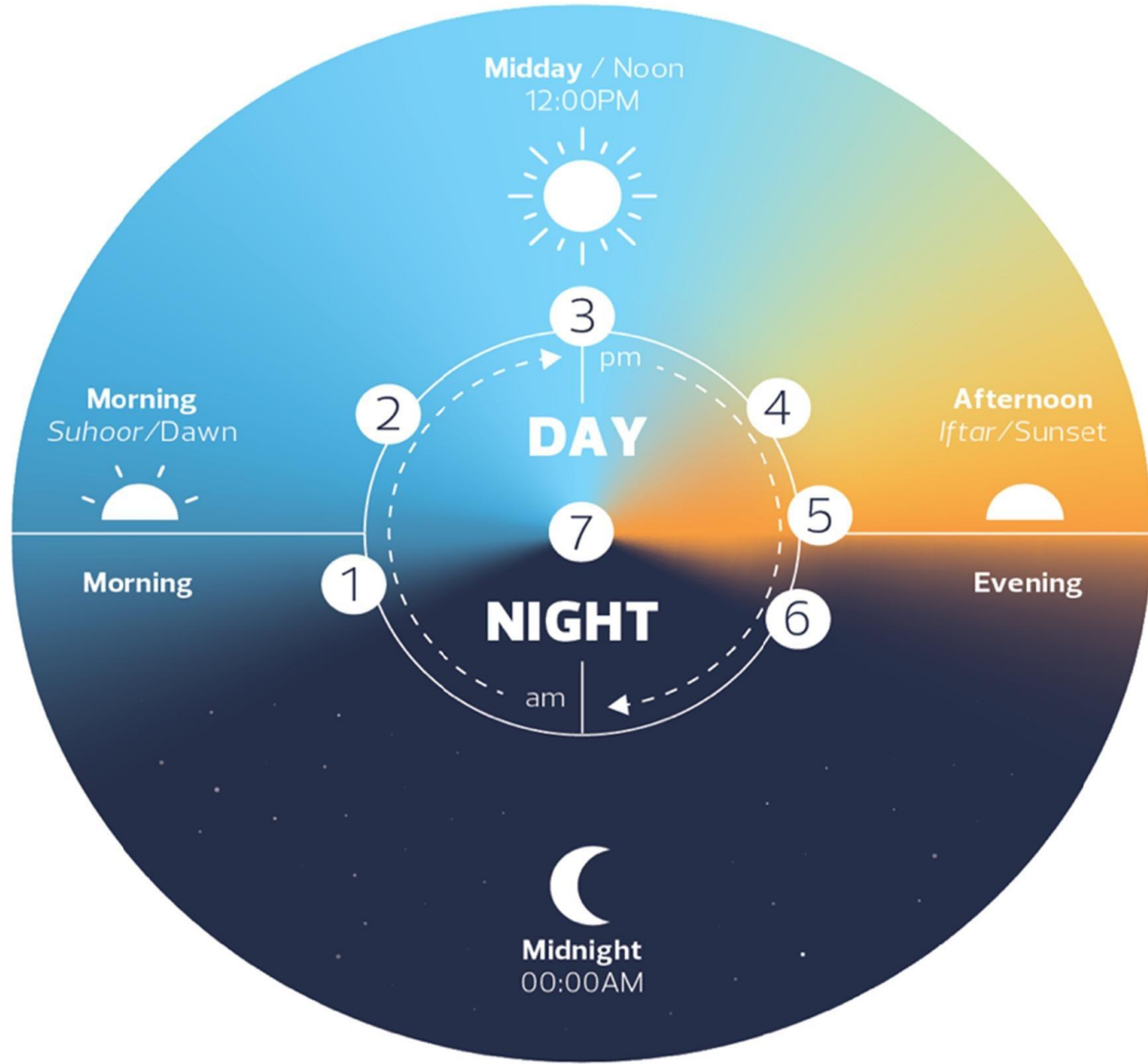
# Self-Monitoring of blood glucose (SMBG)

[An extremely important aspect of fasting during Ramadan for people with diabetes is SMBG. ]There needs to be a greater rate of SMBG in order to keep on top of any changes to glycemia so that hyperglycemia or hypoglycemia can be prevented. People with diabetes need to be given education on when and how to monitor their blood glucose levels.

**It is important to emphasize that pricking the skin to test blood glucose levels DOES NOT break the fast.**

This example of a **7** point SMBG guide can be adapted for individuals with better controlled diabetes or those using continuous measurement methods (CGM).

## Self-Monitoring of Blood Glucose (SMBG) – 7 point guide for Ramadan



### When to test?

Number of blood glucose monitoring differs according to the case.

1. Pre-dawn meal (*suhoor*)
2. Morning
3. Midday
4. Mid-afternoon
5. Pre-sunset meal (*iftar*)
6. 2 hours after *iftar*
7. At any time when there are symptoms of hypoglycaemia/ hyperglycaemia or feelings of being unwell

# Type 1 diabetes mellitus

[Fasting becomes obligatory for children or adolescents from the age of puberty, however, much like in adults those with medical conditions that can be compromised by fasting are exempt from this obligation.] Generally, all people with T1DM have been discouraged from fasting but despite this many, even the younger individuals, insist on fasting against HCP advice. some studies showing that 60% of study participants fasting for the whole month of Ramadan .

## That risk stratification for a person with type 1 diabetes

- Pre-Ramadan glucose control
- The duration of T1DM – for example those newly diagnosed may be within the ‘honeymoon period’
- Hypoglycemia risk
- Level of hypoglycemia awareness
- The level of diabetes related education
- Motivation for self-monitoring of blood glucose (SMBG)
- The ability to take appropriate decision making
- The feasibility of, and access to, continuous glucose monitoring and advanced insulin delivery technology
- The presence of diabetes related complications and/or associated autoimmune disorders such as Celiac disease and thyroid disorders

**Various studies have demonstrated that both adolescents and adults can achieve safe fasting during Ramadan with no worse outcomes than prior to Ramadan.**



# Fasting during Ramadan in people with T1DM

- [A pre-Ramadan clinical evaluation and a full review of an individual's glucose profile should be completed.] If poor glycemic control is found (**HbA1c >9%** and or **wide glucose fluctuation**), the insulin treatment regimen should be adjusted as necessary and re-evaluated once again before the start of fasting.
- Individuals with T1DM, regardless of their age, and their carers or guardians should be taught about the potential adverse effects of fasting, including hypoglycemia, hyperglycemia and dehydration, and appropriate preventative measures to minimize the risks of these occurring. Additionally, the rationale for the revised insulin regimen should be explained and emphasized.
- There should be a nutritional assessment reviewing carbohydrate (CHO) intake and recommendations about the proper food options for the two main meals of the day. Carbohydrate counting techniques should also be discussed.[ An emphasis needs to be placed on the importance of a scheduled time for meals rather than following a looser erratic and frequent eating pattern. Also, an adequate intake of sugar-free beverages, especially with the pre-dawn meal, should be stressed.]

While there is still a debate about the best insulin regimen for during fasting, a basal insulin dose reduction by **10-30%** has been recommended by the majority of experts and medical societies.[ More importantly, an individualized regimen should be considered and based on a review of the individual's glucose profile within the first few days of fasting.]

Frequent glucose testing is fundamental to ensure early recognition of abnormal glucose readings and that the proper measures in controlling them are taken. The use of **CGM** is superior to the traditional BG monitoring and should be the method of choice if available.

Fasting should be broken immediately with hypoglycemia (< 70mg/dL; 3.9 mmol/L) in individuals using MDI, both symptomatic or asymptomatic. Those using CSII may try suspending the pump if glucose drops below 90mg/dL (5 mmol/L) but should also break the fast if glucose is < 70 mg/dL (3.9 mmol/L).

The IDF-DAR guidelines experts feel that the allowance to fast cannot be generalized across to all individuals with T1DM, especially those are considered as high risk. We acknowledge that data on the safety of fasting is incomplete and may be prone to selection-bias in that individuals that are not willing to fast or those that show poor glycemic control are not represented in these studies. It is therefore not possible to quantify or be assured of the exact risk related to fasting, and an individualized risk assessment remains the most appropriate method.

- Frequent glucose testing is fundamental to ensure safe fasting.
- The use of CGM is superior to SMBG monitoring, and should be the method of choice if feasible.
- Fasting should be broken immediately with hypoglycemia (glucose < 70mg/dL; 3.9 mmol/L).

# Pregnant women

Diabetes in pregnancy is associated with an increased risk of both **hyperglycemia** and **hypoglycemia**, with an increased risk for both the mother and the baby .[In recent times, a small number of studies have been conducted on women with Gestational Diabetes Mellitus (GDM), where the majority of women were treated through diet alone or diet with metformin and some those treated with insulin. These studies showed, that while there was an overall improvement in hyperglycemia,there was an associated increase in the risk of **asymptomatic hypoglycemia**.] In a consensus the authors concluded that, despite some encouraging results, there was not enough evidence to change the high-risk status of fasting during Ramadan for women with GDM. Importantly, these studies were conducted on motivated volunteers in centres with a high level of skill and support, including the use of CGM alongside good patient education.

Consequently, fasting for women with **pre-existing T1DM or T2DM would** be even more challenging and accordingly experts consider these individuals as a **high-risk** group for fasting. Women with T1DM or T2DM should be advised **not to fast** until further research is available to support any changes in their risk categorization.

[As with all individuals with diabetes, there should be a pre-Ramadan assessment alongside individualized Ramadan focused education.] There needs to be an **increase in the rate of SMBG** throughout the . Each individual's specific circumstances must be discussed at the pre-Ramadan assessment, but it is recommended that caffeine, sugar and salt should be limited, and the eating of fibrous foods should be encouraged. There needs to be a greater effort made to stay hydrated and pregnant women should aim to drink 2–3 L of water a day.

[The IDF-DAR guidelines have recommended insulin dose and blood glucose monitoring regimen modifications to be aligned with that mentioned above for those with type 1 or type 2 diabetes.]

[Further research studies are needed on pregnant women that fast during Ramadan in order to understand the potential risks and assess different dosing regimens.]



## Recommendations for the management of hyperglycemia in pregnancy during Ramadan fasting

During pregnancy, the vast majority of women with hyperglycemia would be treated with insulin, metformin, or glibenclamide. While the last two agents are not approved by the US Food and Drug Administration, many authorities do not oppose their fair use in pregnancy. However, use of glibenclamide during Ramadan fasting should be discouraged .

Pregnant women must understand that regardless of their fasting status, they need to sustain the standard blood glucose targets during pregnancy of:

- **Fasting between 70-95 mg/dL (3.9 – 5.3 mmol/L).**
- **Post-prandial < 120 mg/dL (6.7 mmol/L).**

Pregnant women must also understand that during pregnancy they should break their fast if any of the following occur:

- **BG levels < 70 mg/dL (3.9 mmol/L) during fasting hours.**
- **Feeling unwell.**
- **Reduced fetal movement.**

# T2DM or GDM controlled by diet alone or with Metformin

1. Regular SMBG to ensure that they are within the recommended targets. At the very least they should test:
  - Before the sunset meal.
  - 1-2 hours after meals (depending on the individual patient's routine of 2 or 3 meals during Ramadan).
  - Once during the day while fasting, particularly in the afternoon.
  - Anytime they feel unwell.
2. There is also the additional risk of post-prandial hyperglycemia [if the meal portions are too large or too rich in carbohydrates. Indeed, a review from a dietitian would be advisable.]
3. Exercise should still be encouraged but the schedule may need altering in its intensity and timing, for example **2h after the sunset meal**.

# Insulin treated pregnant women

Pregnant women that are treated with insulin should adhere to the following:

1. Glucose monitoring - this should be performed as already mentioned, with an emphasis on testing at any time during the day where the patient may be feeling unwell or displaying signs of hypoglycemia or hyperglycemia.

Type of Insulin Regimen	Adjustment during Ramadan fasting	Monitoring during Ramadan fasting
<b>MDI (basal bolus) with analogue insulins</b>	<p><u>Basal insulin</u>  30-40% reduction in dose and to be taken at <i>Iftar</i></p> <p><u>RAI</u>  Dose at <i>Suhoor</i> to be reduced 30-50%  Pre-lunch dose to be skipped  Dose at <i>Iftar</i> to be adjusted based on the 2hr post iftar glucose reading</p>	CGM
<b>MDI (basal bolus) with conventional insulins</b>	<p><u>NPH insulin</u>  Morning pre-Ramadan dose to be taken at <i>iftar</i>  50% of the pre-Ramadan dose to be taken at <i>Suhoor</i></p> <p><u>Regular insulin</u>  Dose at <i>Iftar</i> to be adjusted based on the 2hr post iftar glucose reading  Suhur dose 50% of the pre-Ramadan evening dose  Afternoon dose to be skipped</p>	5-7 point glucose monitoring
<b>Premixed (analogue or conventional)</b>	Shift the morning pre-Ramadan dose to the <i>Iftar</i>	5-7 point blood glucose monitoring

# Elderly individuals with diabetes

[Previously, elderly individuals with diabetes have been placed among the higher risk categories and advised against fasting]. Indeed, the DAR global survey showed that a greater proportion of those aged < 65 (87%) intended to fast than  $\geq 65$  (71%). It is important to recognize that age in and of itself is not a good reason to categorise individuals as high risk for fasting during Ramadan, but rather it is the associated implications of old age that need consideration. [ Many elderly individuals have enjoyed fasting during Ramadan for many years and should be allowed to continue if their health is stable .The new risk stratification presented in these guidelines have accounted for these issues and provide a better assessment of the health of elderly individuals with respect to the safety of fasting] .Elderly individuals are at a higher risk of having comorbidities. These comorbidities can include **dementia, recurrent falls, hip fractures, amputation and visual impairment** — these all have important implications on the safety of fasting during Ramadan. Likewise, many elderly individuals generally have a longer duration of diabetes and will also be more likely to suffer from diabetes related complications such as hypertension, hyperlipidemia , retinopathy and neuropathy, among others. compares the proportions of diabetes related complications among elderly and younger individuals with T2DM and highlights the increased risk among elderly individuals.

[It is vital that preexisting comorbidities and any history of diabetes related complications are identified by HCPs during the pre-Ramadan assessment and risk stratification process. ]Understanding each individual's circumstances will help provide the best, most appropriate guidance. Importantly, HCPs must also consider an elderly individual's degree of independence as this is crucial in understanding what kind of support may be needed during Ramadan such as with feeding, taking medications and checking blood glucose levels.

The primary concern among elderly individuals is the risk of developing hypoglycemia during Ramadan. It has been found that **the risk of hypoglycaemia is increased among the elderly** and may often present with **neuroglycopenic manifestations** in the form of dizziness, delirium and confusion. [These can all lead to periods of unawareness in hypoglycemia which can be extremely dangerous. Hyperglycemia is also an important issue and has been seen to be higher among the elderly than in younger individuals with T2DM.]

**It is recommended that individuals with hypoglycemia unawareness or a history of unawareness do not fast.**



A key component to avoiding hypoglycemia is **SMBG** and it must be conducted frequently. Moreover, medication doses should also be adjusted appropriately. Any dose adjustments that are made need to be set prior to Ramadan, ideally during the pre-Ramadan assessment. Ramadan focused education also needs to be adapted and individualized to account for these issues.

Specific IDF-DAR guidelines for the elderly with diabetes include the following:

## SMBG

- Increase the frequency of SMBG when fasting during Ramadan than before Ramadan.
- Consider using a continuous means of monitoring blood glucose levels if available.

## Diet

- There needs to be an emphasis on staying properly hydrated, particularly in individuals prone to diabetes related comorbidities.
- It is important to have an adequate intake of nutrients when breaking the fast.
- An individualized nutrition plan should be made prior to Ramadan and adhered to during the Ramadan fast.

## Physical Activity

- Physical activity levels should be curtailed but not halted during fasting hours.
- Activities should be planned ahead of time and thought of holistically

## Medications and regimens

- Have an assessment and discussion prior to Ramadan.
  - o Choose medications that have a lower risk towards hypoglycemia.
  - o Make dose adjustments to lower the risk of hypoglycemia.

- **Social considerations and community support**

Adequate support mechanisms should be in place to ensure that elderly individuals with diabetes wishing to fast receive support from family members, friends, carers or community members. This should provide greater levels of safety and confidence.

- **Risks of complications and awareness**

- There needs to be an active effort to increase the awareness of symptoms of hypoglycemia and hyperglycemia

Symptoms and events should be documented to help with recognition.

- The effects of fasting in people with comorbidities such as dementia, impaired renal function, CVD and others should be seriously considered and discussed prior to conducting Ramadan fasting.

# Complications of diabetes when fasting during Ramadan

People with diabetes that have **unstable macro-** or **microvascular** complications, and choose to fast during Ramadan, could exacerbate these complications, and therefore these individuals are classified as high risk.

# Macrovascular disease (MVD)

Diabetes is frequently associated with an increased risk of cardiovascular disease and a heightened risk of stroke .Studies have shown that the practice of unsafe fasting including a **high intake of carbohydrates, low levels of activity, poor sleeping patterns, inadequate hydration, and missing doses of essential medicines** could have an impact on the risk of CVD or stroke in people with diabetes .

# Fasting during Ramadan and congestive heart failure (CHF)

Congestive heart failure (CHF) has been investigated by several studies during Ramadan. A multi-centre study conducted in the Gulf region found no difference in the proportion of patients that were hospitalized for heart failure with diabetes during Ramadan and outside of Ramadan, 52% and 48.4% respectively .A retrospective review of clinical data also found that there were no differences in the number of hospitalizations when comparing the month prior to Ramadan, the period of Ramadan and the month after Ramadan .

# Fasting during Ramadan and acute coronary syndrome (ACS)

Evidence suggests that there is no clear association between fasting during Ramadan and an increase in acute cardiac events .Some have also identified improvements in the number of ACS events And a significant reduction in the number of ACS events during Ramadan when compared to times outside of Ramadan .However, these studies need to be replicated through randomized longitudinal studies and among individuals with diabetes.



# Fasting during Ramadan and stroke

Diabetes is an independent risk factor for stroke and the effect of fasting during Ramadan in people with diabetes needs to be established. There have been several studies that have investigated this, and the evidence is conflicting.

Som studies found that people with type 2 diabetes mellitus (T2DM) were no more likely to be hospitalized for ischemic or hemorrhagic stroke during Ramadan than in the months before or after Ramadan .Conversely, others found the opposite, with Ramadan fasting being associated with a significantly higher risk of stroke.

## Macrovascular complication

- **Congestive heart failure (CHF)**
- **Acute coronary syndrome (ACS),**
- **Stroke**
  
- **Recommendations**
- Receive pre-Ramadan education and understand how to properly conduct safe fasting with diabetes
- Obtain individualized advice based on their current health status and treatment regimes
- Practice safe fasting as discussed in these guidelines wherever applicable.
- Make appropriate adjustments to therapies in accordance with their symptoms. For example, **diuretics**, **antihypertensives**, **anti-diabetes medication** and **insulin** regimens will need adjusting to give the greatest chance of achieving safe fasting during Ramadan.
- Make a concerted effort to stay hydrated and get an adequate amount of sleep and nutrition prior to conducting fasting.

The studies that have investigated the safety of fasting during Ramadan among people with macrovascular health issues have limitations. It is recommended that individuals with diabetes that have **unstable macrovascular complications should remain classified as high risk.** Further research is still needed, and these individuals should be discouraged from fasting.

# Fasting during Ramadan and renal function

Some studies have shown that fasting during Ramadan can worsen renal function. Studies showed that individuals with CKD that fasted during Ramadan could experience deterioration in renal function, particularly in those with an estimated glomerular filtration rate (eGFR) of  $<60$  mL/min/1.73 m<sup>2</sup>. The higher the stage of CKD the worse the renal outcomes during Ramadan. However, others have shown that fasting during Ramadan may not be associated with any less bad outcomes or even finding improvements.

# Fasting during Ramadan after renal transplants

[There have been several studies that have investigated the outcomes of individuals that had previously a kidney transplant and fasting during Ramadan. ]The overall outlook is that these circumstances do not make fasting unsafe. Further research in the form of longitudinal and randomized trials are still needed to support this recommendation. Currently the risk for fasting remains **high** in cases of **unstable renal impairment** and these individuals should not fast. This is also true of individuals with poorly controlled diabetes where fasting could be unsafe.

# Microvascular complication

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**Renal impairment**

**Dialysis**

**Renal transplant**

# Recommendations

- All individuals with diabetes (both T1DM and T2DM) and chronic kidney disease (CKD) or with any other renal issues should discuss their intentions to fast during Ramadan with diabetes and renal specialists at **least three months** prior to Ramadan and attend Ramadan focused education.
- Individuals with diabetes (both T1DM and T2DM) and CKD of **stages 3-5**, or on **dialysis** should be considered **high-risk**, and fasting ought to be discouraged.
- Those that are considered high risk and still choose to fast must:
  - be carefully monitored and have **weekly** reviews during Ramadan
  - make a concerted effort to stay hydrated outside of fasting periods
  - monitor electrolyte and creatinine levels at various points during Ramadan to ensure safe fasting is being conducted and whether it should continue
  - avoid foods with high potassium or phosphorous content.



