

## Risk stratification of Ramadan fasting in person with diabetes

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### Abstract

The world population comprises of 23% Muslims. Ramadan is the holy month of the Islamic year during which all healthy Muslims observe fasts. Although children and sick people are exempted from fasting but many of this group, want to observe fasts despite the medical advice against it. This includes a subset of people with diabetes which carries a considerable risk. Hypoglycaemia and hyperglycaemia are among the main hazards. Majority of Muslims with diabetes can fast safely during Ramadan; However some are placed at a greater risk.

Pre-Ramadan risk assessment, structured education and selection of appropriate medication has shown to minimize the risks associated with fasting among people with diabetes.

**Keywords:** Diabetes, Risks, Ramadan and fasting.

### Introduction

According to a 2009 demographic study, Islam has 1.57 billion adherents, making up 23% of the world population of 6.8 billion, and which is growing by ~3% per year.<sup>1</sup> Fasting during Ramadan, a holy month of Islam, is a duty for all healthy adult Muslims. The high global prevalence of type 2 diabetes ~ 6.6% among adults aged 20 -79 years in Muslim countries,<sup>2</sup> in addition to the results of the large population-based Epidemiology of Diabetes and Ramadan (EPIDIAR) study, which included 12,243 people with diabetes from 13 Islamic countries , reported that about 43% of patients with type 1 diabetes and 79% of patients with type 2 diabetes fast during Ramadan.<sup>3</sup> This gave an estimate of more than 50 million people with diabetes observing fasts during Ramadan worldwide.

Ramadan is a lunar-based month, and its duration varies between 29 and 30 days. Muslims who fast during Ramadan must abstain from: eating, drinking, use of oral medications, and smoking from predawn to after sunset. However, there are no restrictions on food or fluid intake between sunset and dawn. The duration of fasting varies according to seasons, In the summer months, fasting can be as long as 18 hours, which can in some countries lead to severe dehydration.

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During Ramadan there is a major change in the dietary pattern compared with other times of the year; this can be a cause for inappropriate diet and over-eating.

Most people consume two meals per day during this month, one after sunset (Iftar) and the other before dawn (Suhur). But what has been observed that following traditions, a large amount of sweets and high calorie drinks are consumed at the time of breaking the fast at sunset (Iftar).

Fasting is not meant to create excessive hardship on the Muslim individual according to religious tenets. The Islamic regulation allows plenty of flexibility and many groups of people are exempted from fasting (Table-1).<sup>4</sup>

**Table-1:** Exemption from fasting during Ramadan.

Children under the age of puberty
Those who are mentally incapacitated
The old, frail and acutely unwell person
Those with chronic illnesses with diabetes complications
Those travelling a distance greater than 50 miles
Menstruating women
Pregnant and breastfeeding women

However, many patients with diabetes insist on fasting during Ramadan, thereby creating a medical challenge for themselves and their health care providers. It is very important that medical professionals be aware of potential risks associated with fasting during Ramadan and how to avoid those risks. Unfortunately recommendations for management of diabetes in patients who insist to fast during Ramadan are not well documented and no large trials have been conducted. The rules are based only on expert opinions and small studies.

### The Potential risks of fasting

To know the risks of fasting for a diabetic person it should be understood as to how Ramadan affects fasting in diabetes. Insulin secretion, which promotes the storage of glucose in liver and muscle as glycogen, is stimulated by feeding in healthy individuals. During fasting, circulating glucose levels tend to fall, leading to decreased secretion of insulin.

Concurrently, levels of glucagon and catecholamines rise, stimulating the breakdown of glycogen, and at the same

time gluconeogenesis is augmented.<sup>5</sup> When fasting is prolonged for more than several hours, glycogen stores become depleted, and the low levels of circulating insulin stimulate increased fatty acid release from adipocytes. Oxidations of fatty acids produce ketones that can be used as fuel by skeletal and cardiac muscle, liver, kidney, and adipose tissue, thus sparing glucose for continued utilization by brain and erythrocytes. The transition from the fed state through brief fasting and into prolonged starvation is mediated by a series of complex metabolic, hormonal, and glucoregulatory mechanisms. Felig<sup>6</sup> conveniently divided the transition from a fed to a fasted state into three stages:

- 1) The postabsorptive phase, 6-24 hours after beginning fasting
- 2) The gluconeogenic phase, from 2-10 days of fasting
- 3) The protein conservation phase, beyond 10 days of fasting.

Although most religious fasts rarely reach 24 hours, the variability of the duration of every phase may lead to different physiological responses to fasting. This variability may explain the feasibility of prolonged fast even in subjects with type 1 diabetes in some studies.<sup>8</sup> After an overnight fast, the average rate of glucose utilization by a healthy human is 7g per hour. It was estimated that, the 70-80 g of glycogen present in the liver can provide glucose to the brain and peripheral tissues for about 12 hours.<sup>7</sup> In a person without diabetes, these processes are regulated by a delicate balance between insulin level and counter regulatory hormones that help maintain glucose concentrations in the physiological range. In a person with diabetes, glucose homeostasis is affected and disturbed by the underlying pathophysiology or by the pharmacological agents. In a person with type 1 diabetes, glucagon secretion may fail to increase appropriately in response to hypoglycaemia. Epinephrine secretion is also defective in some patients with type 1 diabetes because of recurrent hypoglycaemia.<sup>5</sup> In patients with severe insulin deficiency, a prolonged fast in the absence of adequate insulin can lead to excessive glycogen breakdown and increased gluconeogenesis and ketogenesis, leading to hyperglycaemia and ketoacidosis. Patients with type 2 diabetes may have similar disturbances in response to a prolonged fast but ketoacidosis is uncommon, and the severity of hyperglycaemia depends on the extent of insulin resistance or deficiency.

Therefore, the major risks of fasting are mainly of

**Table-2:** Major risks associated with fasting in patients with diabetes.

Hypoglycaemia
Hyperglycaemia
Diabetic ketoacidosis
Dehydration and thrombosis

hypoglycaemia and hyperglycaemia.. This was also reported in the results of EPIDIAR<sup>3</sup> that showed a high rate of acute complications, a remarkable 7.5 fold increase in severe hypoglycaemia and a 5 fold increase in hyperglycaemia with or without diabetic ketoacidosis, (Table-2) These risks could be more obvious in hot and humid weather. Patients on insulin or oral hypoglycaemic therapy have a significant risk of hypoglycaemia due to changes in their meal routines. Larger meals, fried and sugary food, more often eaten during Ramadan, can cause greater variability in blood glucose levels and deterioration in glucose control. These risks, dehydration in particular, are greatly increased in the summer months when fasting hours are longer.

### **Risks stratification for people with diabetes in fasting Ramadan**

The medical profession has uniformly discouraged fasting during Ramadan for people with ill health, which would include some people with diabetes, due to increased potential risk of complications mentioned above. However, many patients with various health problems insist on fasting during Ramadan, thereby creating a medical challenge for themselves and their health care providers. It is increasingly important that healthcare professionals are aware of potential risks associated with fasting during Ramadan for some people with diabetes, and that they are able to quantify that risk.

The risk quantification depends on several factors including the type of diabetes, the type of diabetes medications, the individual hypoglycaemia risk, the presence of diabetes complications and other comorbidities.

Unfortunately there is no universal agreement on recommendations for patients with diabetes and fasting Ramadan due to lack of data from large controlled studies but we have an expert consensus for the risk stratification and quantification. The Recommendations for Management of Diabetes During Ramadan in 2005 and its Update 2010, published by the American Diabetes Association (ADA), categorized patients in 4 risk groups (very high risk, high risk, moderate risk and low risk) and recommendations were suggested for each category (Table-3).<sup>9,10</sup>

**Table-3:** Risk Categories in patients with type 1 or type 2 diabetes who fast during Ramadan.

Risk category	Religious and medical advice	
Category 1 Very high risk	Severe hypoglycaemia within the 3 months prior to Ramadan A history of recurrent hypoglycaemia Hypoglycaemia unawareness Sustained poor glycaemic control Ketoacidosis within the 3 months prior to Ramadan Type 1 diabetes Acute illness Hyperosmolar hyperglycaemic coma within the previous 3 months Performing intense physical labour Pregnancy Chronic dialysis	Should NOT fast, has high probability of harm
Category 2 High risk	Moderate hyperglycaemia (average blood glucose 150-300 mg/dl or A1C 10%) Renal insufficiency Advanced macrovascular complications Living alone and treated with insulin or sulfonylureas Patients with comorbid conditions that present additional risk factors Old age with ill health Treatment with drugs that may affect mentation	Should NOT fast, has high probability of harm
Category 3 Moderate risk	Well-controlled diabetes treated with short-acting insulin secretagogues	Should fast, low probability of harm
Category 4 Low risk	Well-controlled diabetes treated with lifestyle therapy, metformin, acarbose, thiazolidinediones, and/or incretinbased therapies in otherwise healthy patients	Should fast, low probability of harm

Note: This classification is based largely on expert opinion and not on scientific data derived from clinical studies.

These recommendations based on the probability of harm in view of the healthcare professionals, who may find it difficult to advise a Muslim person on a religious matter. However, it is more comfortable and reassuring if the religious authorities are in harmony with the medical advice regarding who should not fast in Ramadan if they have diabetes.

In April 2009 in Sharjah, United Arab Emirates (UAE), following a meeting between some diabetes experts and the Organization of the Islamic Conference, consequently a decree accepting and approving the risk categories stated in the ADA 2005 consensus document. Recommendations for who should not fast, were based on the probability of harm. The first two categories of risk are advised that they should not fast

Table-2 summarizes the risk categories and their corresponding religious recommendation on whether to fast or not.

### Why it is important to assess the risk stratification for diabetic patients for fasting in Ramadan?

It is well known that the management for a patient with

diabetes should be individualized and the care given according to the type of diabetes and the medications. Patients with different risk categories will have stratification of risks accordingly. This is essential for helping the health care professionals to provide better care to the patient who is likely to develop complications. The better management will result in safe fasting.

### Conclusion

It is worth mentioning that fasting for patients with diabetes represents an important personal decision that should be made clearly in light of guidelines for religious exemptions and after consideration of the associated risks in consultation with health care providers. Most often, the medical recommendation will not recommend fasting. It should be emphasized that fasting, especially among patients with type 1 diabetes with poor glycaemic control, is associated with multiple risks.

The majority of diabetic Muslim population can fast safely during Ramadan. However some carry a greater risk with fasting. Despite that many diabetics insist on fasting during Ramadan although they are advised not to fast.

Therefore, it is the responsibility of the health care

professionals to stratify the risk for each individual person and to advise them accordingly. Patients who insist on fasting need to be aware of the associated risks of the fasting experience and techniques to decrease this risk.

It is important to reduce the potential risks of fasting by several measures including:

- Pre Ramadan assessment and structured education including diet advice
- Self-glucose monitoring
- Selection of appropriate medication to avoid hypoglycaemia

Furthermore there are several important issues needing special attention such as Individualization, Frequent monitoring of glycaemia and Nutrition.

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