

# “Risk approach strategy” in diabetics on fasting-evidence base through narrative review with a special focus on Ramadan fasting

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## ABSTRACT

The past two decades have seen a rise in the number of investigations examining the health-related effects of religiously motivated fasts. The fact that fasting is a common religious practice observed not only among Muslims, but among many other religious communities as well underlie a long felt need for drafting recommendations on fasting in diabetic patients as there are no substantial guidelines for the same. An extensive review of the work involving studies across populations in India and other nations across the world was conducted, with the aim to arrive at some broad consensus highlighting on the need for developing strict guidelines for patients with diabetes during fasting, before fasting and afterwards.

**Key words:** Diabetes, fasting, guidelines, Ramadan, religious, review, risk approach strategy

## INTRODUCTION

### Background

The number of people with diabetes is increasing due to population growth, aging, urbanization and increasing prevalence of obesity and physical inactivity. According to fact sheet of World Health Organization updated on October 2013, 347 million people worldwide have diabetes, and an estimated 3.4 million people died from consequences of high fasting blood sugar in 2004 and that diabetes will be the 7<sup>th</sup> leading cause of death in 2030.<sup>[1]</sup> India leads the world with the largest number of diabetic subjects earning the dubious distinction of being termed the “diabetes capital of the world.” Fasting is an important spiritual aspect of many religions such as Islam, Hinduism,

Christianity and Judaism. It is a time of abstinence from food and is usually considered as a time of prayer, reflection, purification and learning self-control by making changes to the diet.<sup>[2]</sup> This narrative review was conducted with the intention to provide an overview of risk approach strategy in diabetics on fasting with a special focus on Ramadan fasting.

### Practices

Different cultures approach fasting in different manners. For Jews and Muslims, pork is always forbidden being unclean. For Catholics, traditionally meat could not be eaten on Friday or various other specified day because it is a luxury, and it’s advised to eat a little more modestly. Other people for either medical or spiritual reasons abstain from eating many foods over several days to cleanse the body, and only a variety of drinks are allowed in order to flush the body out. Baha’i during Ala and Muslims during Ramadan fast during the day, but are allowed to eat and drink at night.<sup>[3]</sup> Alternate day fasting (ADF) consists of alternating 24-h periods: During the “feast period,” fasters may consume food *ad libitum*; during the “fast period,” food consumption is restricted or halted altogether. Water is allowed *ad libitum* during all

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times.<sup>[4]</sup> Even mealtimes may differ between south Asian and western societies. For example, the main evening meal may be as late as 11 pm or midnight in some families or groups. Meal timings and patterns will also change during times of fasting, such as Ramadan, when there are two a day meals: Sehri (pre-dawn) and Iftar (after sunset). This has implications for the advice given regarding timing and dosing of blood glucose-lowering therapies and possibly also self-monitoring of blood glucose.<sup>[5]</sup>

### Timing

For the Baha'i and Muslims, fasting is associated with a particular span of time in the year. In eastern religions, the time of the full moon is often a time of fasting. For others, fasting is tied to specific holidays. Catholics and some other Christians fast during Lent, the 40 days before Easter, for example. Jews fast on various holidays, most prominently Yom Kippur. Some fast before embarking on particular actions. Purification rites are a part of many ordination rituals, and fasting might be included in it.<sup>[3]</sup>

### Situation analysis

In 1995, an international consensus meeting of physicians and researchers was held in Morocco to establish the Casablanca guidelines, which was the first international attempt to provide a consensus on the psychological and physiological aspects of Ramadan. It was a guide for both patients and physicians on fasting during Ramadan, which suggested that patients with stable type 2 diabetes without progressive comorbid pathology, under treatment with oral hypoglycemic agents could safely undertake the fast.<sup>[6]</sup> The guidelines went a long way in opening discussions in the academic circles on fasting and diabetes mellitus.

Epidemiology of diabetes and Ramadan study until date forms the largest scientific database to evaluate the effects of fasting in people with diabetes in Ramadan or fasting in general. There is 7.5-fold (3-14/100 patient) greater risk of severe hypoglycemia in people with type 1 diabetes and 4.7-fold (0.4 to 3/100) greater risk in people with type 2 diabetes, according to this study. A risk factor generally overlooked, when dealing with fasting and diabetes is hyperglycemia. Hyperglycemia is associated with overeating after long periods of fasting which is said to be 5-fold greater in people with type 2 diabetes and 3-fold greater risk in people with type 1 diabetes. Further, there is a risk of diabetic ketoacidosis and dehydration in those who have poor glycemic control prior to fasting and long hours of fasting with minimal fluid intake with continued physical activity respectively.<sup>[7]</sup> Dehydration can further lead to orthostatic hypotension especially in patients with pre-existing

autonomic neuropathy, hypovolemia, and increased blood viscosity, which can raise the risk of thrombosis and stroke.<sup>[7]</sup> In addition, hyperglycemia can result in osmotic diuresis and contribute to volume and electrolyte depletion. Further, especially type 1 diabetics particularly if they are grossly hyperglycemic before Ramadan, are at increased risk for development of diabetic ketoacidosis. Its risk may be further increased as there is an assumption that if food intake is reduced during the month, insulin dosages should be reduced as well. Similar is the case of encountering hyperglycemia during fasting as patients reduce the dosage of medicines with a notion that it will prevent hypoglycemia.<sup>[8]</sup>

Although the Koran specifically exempts the sick from the duty of fasting (Holy Koran, Al-Bakarah, 183-185), especially if fasting might lead to harmful consequences for the individual,<sup>[9,10]</sup> but many Muslims with diabetes may not perceive themselves as sick and are keen to fast in spite of the fact that diabetes may place them at high risk for various complications if the pattern and amount of their meal and fluid intake is markedly altered.<sup>[8]</sup>

"Recommendations for management of diabetes during Ramadan," a study conducted by a group of physicians from Muslim and non-Muslim countries proposed a set of recommendations to answer some important medical questions regarding fasting during Ramadan.<sup>[8]</sup> The study further outlines that if blood glucose is <60 mg/dl or if it exceeds 300 mg/dl, the fast must be ended. This study also considered carrying out pre-Ramadan medical assessment of the patient along with their educational counseling regarding signs and symptoms of hyperglycaemia and hypoglycaemia, medication administration and management of acute complications along with guidelines for the management of patients with type 1 and type 2 diabetes. This study discouraged patients with type 1 diabetes from fasting.<sup>[8]</sup> These recommendations were endorsed by the American Diabetes Association (ADA) as an official ADA statement and were published in the society's journal (diabetes care) as an ADA working group report.<sup>[8]</sup> These ADA recommendations generally followed the Casablanca guidelines of 1995 but were more detailed and provided precise guidance on which groups are at a particularly high risk and which are at a lower risk, and can, therefore, fast safely.<sup>[11]</sup> The ADA recommendations for management of patients of diabetes during Ramadan are based primarily on consensus rather than clinical trials.

A study on attitudinal determinants of fasting in type 2 diabetes mellitus patients during Ramadan considered doing a comprehensive pre Ramadan education and

counseling conducting three house visits; "pre-Ramadan visit" (2-4 weeks before) a "during Ramadan," (3<sup>rd</sup> week of Ramadan) and a "post-Ramadan" visit (2-4 weeks post-Ramadan).<sup>[12]</sup>

Pre Ramadan enquiry about knowledge of diabetes, possible adverse events, if they had any adverse events during previous Ramadan, previous hospitalizations, whether they continued taking drugs or changed the dose during fast, usual dietary practices during Ramadan was noted and whether they were doing self-monitoring of blood glucose (SMBG) was recorded along with clinical and biochemical assessment.<sup>[12]</sup>

Several other studies too made an attempt towards fasting and feasted safely during Ramadan and regarding management of diabetes during Ramadan.<sup>[13,14]</sup> Ramadan represents more of a challenge than other spiritual fasts in diabetes as Muslims have to abstain from all food, drink, use of oral medications. Christians experience a less restrictive fast during the 40-day Lenten season as not all food is forbidden and daily medications can be continued.<sup>[15]</sup>

## CAUSE FOR CONCERN

The holy month of Ramadan is one of five main pillars of being a Muslim. According to Harrison's principles of internal medicine, patients with type 1 diabetes or those with type 2 diabetes on multiple insulin injections should measure their plasma glucose three or more times a day and individuals with type 2 diabetes on insulin require more frequent monitoring than those on oral agents. It also states that most measurements in individuals with type 1 or type 2 diabetes should be performed prior to a meal supplemented with postprandial measurements.<sup>[16]</sup>

Most Muslims are passionate about fasting during this month. With the popular belief that pricking finger for SMBG breaks the fast,<sup>[17]</sup> many people skip SMBG during the day(s) of fast or alter their timing of measurement to match with their allowed food intake timings. For instance, Muslims who fast during Ramadan abstain from eating, drinking, taking oral medications, and smoking from early dawn (Sohur) until sunset (Iftar). The main meal, Iftar is taken at sunset and usually heavy meal with extra sweet foods and deeply fried food. Sohur is taken before sunrise with a lighter meal with complex carbohydrate.<sup>[18]</sup> Oral medications for diabetes if taken can be taken along with these meals only and if the SMBG too is done pre meals then in the morning it is scheduled to be around 4 am in the morning that is, before sunrise (Sohur). However, there

is a spontaneous progressive rise in blood glucose around 3-4 am in the morning in patients with both type 1 and type 2 diabetes known as dawn phenomenon, which is a consequence of the production of glucose by the liver at the end of the night together with a physiological increase in insulin-antagonistic hormones.<sup>[19]</sup> Dawn phenomenon start at the end of the overnight fast, that is, at pre-breakfast time, but has a prolonged deleterious effect on glucose concentrations over the entire post breakfast period. The combined effects of the dawn phenomenon and glucose derived from the intestinal hydrolysis of breakfast carbohydrates can result in an "extended dawn phenomenon" characterized by sustained blood glucose excursions during the morning period.<sup>[20]</sup> So taking the blood glucose levels at the time of pre-sohur (early dawn) will give falsely high level of blood glucose levels.

Although it is a common practice with many people that they consume a heavy Iftar which is followed 3 h later by a rich heavy dinner. The intervening 3 h are spent in prayers called "Taraweeh." In that case the blood glucose to rise throughout the night till Seher time.

Furthermore, it is known that post meal glucose excursions after breakfast, lunch, and dinner are not equally affected and may deteriorate at different rates over the time course of the disease, which may also differ across different population groups.<sup>[20]</sup>

Oral medications do not adequately control the dawn phenomenon, even when given in combination. In the contrary to that, the evening replacement of basal insulin, which abolishes the dawn phenomenon by restraining hepatic glucose production and lipolysis, is an effective treatment.<sup>[21]</sup>

Further, the frequency of hypoglycemia varies with different treatment modalities. Hypoglycemia with oral antidiabetic agents is predominantly associated with the insulin secretagogues. Hypoglycemia is not a common side effect of treatment with metformin, thiazolidinediones, or  $\alpha$ -glucosidase inhibitors. The risk of hypoglycemia is highest with long-acting sulfonylurea's such as chlorpropamide, glyburide, (glibenclamide), and long-acting glipizide.<sup>[22]</sup> Glyburide is associated with significantly more episodes of severe hypoglycemia than gliclazide.<sup>[23]</sup>

The oral glucose prandial regulators, repaglinide and nateglinide, are insulin secretagogues that have a rapid onset of action but do not stimulate insulin secretion in the fasting state and provoke less hypoglycemia than the sulfonylurea's.<sup>[24]</sup> In a systematic review of randomized controlled trials comparing insulin monotherapy and

combination therapy with oral agents, 13 of 14 studies did not show any significant difference in hypoglycemia rates between the different regimens.<sup>[25]</sup>

It occurs most frequently with insulin therapy, but sulfonylurea-induced hypoglycemia is also a significant problem. Hypoglycemia is less frequent with the second generation sulfonylureas. Glimepiride, modified release gliclazide, and the prandial glucose regulators may also limit hypoglycemia risk.<sup>[26]</sup>

### Situation interpretation

The majority of health-specific findings related to Ramadan fasting is heterogeneous as the amount of daily fasting time is different in different religions. Subjects have different preferences for timing of taking oral medications or not taking them at all during fasting and typical food choices and eating habits. There are several confounding variables that influence the effect of fasting on health e.g. variability in daily fasting time, smoking status, medication, diet, and cultural habits vary greatly between different cultures.<sup>[27-29]</sup> Comparisons between different studies of Ramadan fasting are difficult due to several confounding variables.

Collectively, these confounding variables likely explain the lack of consensus regarding the effects of Ramadan fasting in diabetics. There is huge scope for future work in this regard by minimizing the effect that these confounding variables have on findings.

The guiding principles on management of diabetes in fasting require a broader base of studies than currently available with us. However, this does not stop us from developing some basic understanding of the guidelines in this regard that may come out in the near future.

Oral medications and/or intravenous fluids are forbidden during the daylight hours of Ramadan; therefore, the subject population taking these could conceivably experience changes in health-related biomarkers simply by virtue of not taking medications.<sup>[27]</sup>

### AREA FOR ACTION

All the major religions in the world universally recommend one form of fasting or other and beliefs of people regarding fasting are beyond their health issues. Hence in order to avoid the practice of religious fasting as an embodiment of faith take toll on their health, action orientated recommendations are needed. The literature review as conducted above shows that medical professionals across the globe has voiced their concern on understanding implications of fasting on diabetes.

However as far as dealing with the health effects of fasting in diabetes is concerned, the generalizability of guidelines may not be the real approach. Moreover, the guidelines are focused on long duration fasting (Ramadan for example) and do not include once a week fasting on specific days observed in other religions, for example amongst Hinduism.

For a single day fasting or ADF, the pre Ramadan medical examination concept as adopted in the study for "Attitudinal determinants of fasting in type 2 diabetes mellitus patients during Ramadan" may not work fully. With the rising number of pre-diabetics in our general population, we have a job in our hand. Probably the answer lies in treating all diabetics with a willingness to fast as a risk group and planning accordingly. Once established, high risk strategy needs to be put in place while dealing with them.

Probably, one-way forward in this regard could be based on the high-risk strategy generally adopted in population/community medicine. The identification of fasting diabetics as a risk group shall be the basis for this strategy. The risk group can further be subdivided into high, medium and low risk groups based on absence or presence of following indicators:

#### High risk group

Fasting diabetics with any of the following:

1. With poor glycemic control.
2. Those with history of acute complications of diabetes like diabetic ketoacidosis or hyperglycemic hyperosmolar state.
3. Those with macro vascular or micro vascular complications like cerebrovascular disease, peripheral vascular disease, coronary artery disease, nephropathy, neuropathy and retinopathy.
4. Geriatric patient.
5. Pregnant females.
6. Long duration of fast.
7. Infections (pneumonia/urinary tract infection/gastroenteritis/sepsis).

#### Medium risk group

Fasting diabetics with good glycemic control and any of the following:

1. Short duration of fast.
2. Cultural heterogeneity.
3. Customs and beliefs favoring health access.
4. Living alone or difficulty in accessing health care.

#### Low risk group

Fasting diabetics with good glycemic control and any of the following:

1. Willingness to continue taking medicines during the fast.
2. Motivation for SMBG.
3. Good attitude regarding breaking the fast if symptoms of hypoglycemia or hyperglycemia or dehydration etc. set in.

## CONCLUSION

The risk group approach is a commonly practiced managerial tool in public health and population medicine. It has the advantage of being focused in approach and yet being general in outlook. Using this approach, the concerns regarding fasting in diabetes, which by all counts is a public health problem of concern in current medical practice, can be taken care of.

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