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Ramadan and Diabetes : A mini-review

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Abstract
Many of the 80 million Muslim diabetics choose to fast during Ramadan, despite recommendations advising them to abstain. The unprepared fast exposes the diabetic subject to multiple complications of varying severity including hypoglycemia and ketoacidosis. Before Ramadan, the fasting of diabetic patients should be discussed and planned taking into consideration the patient's desire to fast, a risk assessment and above all a specific education including an adaptation of the treatment with the objective of eliminating the occurrence of complications.
Keywords: *Ramadan- Diabetes- Education - Hypoglycemia -Ketoacidosis*

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I. Introduction :

Of the 1.6 billion Muslims in the world, diabetes affects about 5%, or approximately 80 million of them. Diabetes represents a real public health problem in our society (10% of Moroccans are diabetic [1]) and the royal Moroccan armed forces are not spared. Type 1 diabetes mainly affects young people, so it can occur suddenly and unpredictable in young militaries without a predisposing risk factor. Type 2 diabetes, strongly correlated with the obesity epidemic that is also affecting armies, occurs in older people.

By extrapolating the results of the EPIdemiology of DIAbetes and Ramadan (EPIDIAR) study [2] and considering that 70 to 80% of diabetic Muslims practice religious fasting, more than 50 million people with diabetes [3] are brought , every year and over a month, to modify their lifestyle and adapt their diabetes treatments to these changes.

II. Lessons provided by epidemiological and observational studies on diabetes and Ramadan :

In certain chronic conditions such as diabetes where it is recommended that food be taken at regular intervals with a relatively stable carbohydrate load [4], breaking this regularity risks having deleterious consequences on glycemic balance, in particular when patients are on insulin therapy.

Considering all these elements, the question that arises is whether Ramadan fasting should be discouraged in diabetic patients. In any case, permission or exemption from practicing Ramadan in a diabetic patient should be argued from the individual context although general recommendations can be made.

In 1995, a first conference, bringing together doctors and researchers, was held in Casablanca to make recommendations on the psychological and physiological aspects of Ramadan [5]. Other organizations like the International Diabetes Federation (IDF), in collaboration with the International Diabetes and Ramadan Alliance, have also attempted to establish recommendations.

The conclusions were in all cases relatively evasive and led the experts to state that a patient with stable type 2 diabetes, without associated progressive comorbidity and on treatment with oral antidiabetics, can safely follow Ramadan. On the other hand, the other cases remained open to discussion and the decision is often made on a case-by-case basis according to the patient's wishes **(Table I).**

Category 1: Very high risk
Patients with 1 or more of the following criteria:

- severe hypoglycemia in the 3 months before Ramadan
- unexplained diabetic ketoacidosis in the 3 months before Ramadan
- hyperglycaemic hyperosmolar coma within 3 months before Ramadan
- history of recurrent hypoglycaemia
- history of hypoglycemia not felt
- poorly controlled type 1 diabetes
- acute illness
- pregnant diabetic patient or gestational diabetes treated with insulin

- chronic dialysis or chronic renal failure stages 4-5 - advanced macrovascular complications - elderly patient with deterioration of the general condition
Category 2: High Risk **Patients with 1 or more of the following criteria:**
- type 2 diabetes with prolonged poor glycemic control - well-controlled type 1 diabetes - type 2 diabetes well controlled with multiple injections of insulin or mixed insulin - pregnant type 2 diabetic or gestational diabetes controlled by diet alone - stage 3 chronic renal failure - stable macrovascular complications - patient with co-morbidities who present additional risk factors - patient with diabetes providing intensive physical labor - treatment with medication that may affect cognitive function
Category 3: Medium and Low Risk **Well-controlled type 2 diabetic patients treated with 1 or more of the following criteria:**
- hygienodietetic measures - metformin - acarbose - thiazolidinediones - second generation of SU - dipeptidyl peptidase-4 (DPP4i) inhibitors or glucagon-like peptide-1 (GLP-1 RA) receptor agonists - sodium-glucose cotransporter-2 inhibitors, (SGLT2i) - basal insulin

Table I. Risk categories according to the Criteria defined by IFF-dar [6]

III. Risks associated with Ramadan :

Fasting in diabetics has been consistently discouraged. Studies have shown an increased risk of acute complications during Ramadan [2,7].

The major complications are as follows:

-Hypoglycemia: Venous glycemia <0.6g / l. The cause of hypoglycaemia is mainly the decrease in food intake. The EPIDIAR study shows that fasting increases the risk of severe hypoglycaemia 4.7 times in patients with type 1 diabetes and 7.5 times in patients with type 2 diabetes.

-Hyperglycemia:

In diabetics, the risk of micro and macro-vascular complications increases with the existence of hyperglycemia. The EPIDIAR study has shown that the incidence of hyperglycaemia increases 5 times in type 2 diabetics during fasting, and 3 times in type 1 diabetics. These results have been attributed to excessive reduction in drug dosages. antihyperglycaemic agents (in order to prevent hypoglycaemia) and food intake loaded with sugars.

-Diabetic ketoacidosis:

Acute and serious complication due to a major glycemic imbalance occurring mainly in type I diabetics, but sometimes present in type 2 when there is no insulin production.

-Dehydration and Thrombosis:

Dehydration is a phenomenon caused by:

- A decrease in the fluids ingested during the prolonged fast.
- Excessive sweating, due to heat and intense physical activity.

-Consequences of the combination of dehydration and hyperglycemia:

- Hypotension
- Hypovolemia: syncope, falls and fractures
- Blood hypercoagulability: risk of thrombosis (AVC-IDM)
- Hyperosmolar coma: is an extremely serious and fatal acute complication if it is not supported.

IV. So 10 basic rules to best manage Ramadan for diabetic patients were proposed : [7]

1. Prepare for the fast a month or two in advance with the patient.
2. Educational reminders on hypoglycemia, hyperglycemia, ketosis.
3. Individualize therapeutic management.
4. Give personalized nutritional advice for a balanced diet.
5. Make sure you hydrate well outside of fasting hours.
6. Adapt the drug treatment **(Table II).**

7. Promote physical exercise by avoiding excess.
8. Advise regular monitoring of capillary blood glucose (authorized).
9. Know the situations requiring a punctual or lasting break in the fast.
10. Involve the family and / or a resource person

Antidiabetic	Risk	In practice
Metformin	No	Doses unchanged and insist on taking postprandial
DPP-4 inhibitors ++++	No	Doses unchanged
GLP-1 receptor agonists	No	Doses unchanged, very promising results
Alpha-glucosidase inhibitors	No	Unchanged doses
SGLT2 inhibitors	Dehydration	Do not prescribe or stop especially in immediate pre Ramadan (<3 months)
Hypoglycaemic sulfonylureas	Hypoglycaemia ++++	Lower the dose by titrating on the lowest blood sugar level (that of the end of the afternoon)
Glinides	Hypoglycaemia ++	Lower the dose and start again at night
DPP-4: dipeptidylpeptidase IV; GLP-1: Glucagon-like peptide; SGLT 2: sodium-glucose co-transporter type 2.		

Table II. Use of non-insulin antidiabetics during Ramadan in the endocrinology-diabetology department of the Mohammed V Rabat military hospital, risks and practical recommendations [8].

V. Conclusion :

At the end of this chapter, which is far from being exhaustive but it is impossible to be so because of the heterogeneity of the eating practices of Ramadan, it appears that, in the diabetics, particular attention should be given to dietary recommendations, with particular vigilance on calorie and carbohydrate intakes. Dietary measures seem as important as those relating to pharmacological treatment.

The management of diabetes during Ramadan is not a simple problem, it is preferable that the doctor advises against the practice of religious fasting when he has the feeling that the patient does not control the nutritional “sprains” or “slippages”.

This is particularly evident in diabetics who are insufficiently balanced at baseline, "vulnerable", treated with drugs liable to cause hypoglycaemia and / or having significant variations in glycaemia. For others, religious fasting is still possible on condition that the subject agrees to attend educational sessions before the period of Ramadan. In “ **figure I**”, we suggest a decision pyramid to specify the factors to be taken into consideration before authorizing religious fasting in diabetic patients.

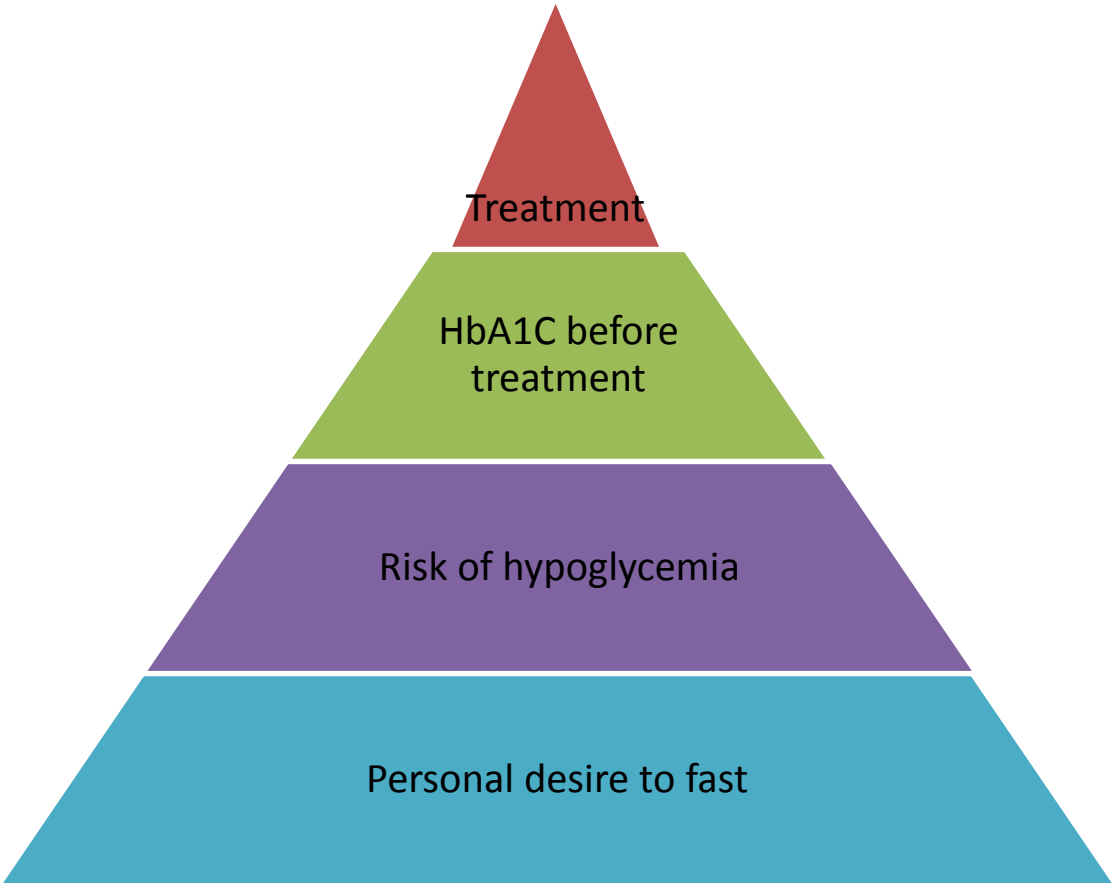

Figure I: Decision pyramid to know if the diabetic person can practice religious fasting or should be exempted during the period of Ramadan

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No conflicts of intersts

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