

# The Impact Of Pre-Ramadan Therapeutic Education On Changing The Decision To Fast ( About 116 Cases)

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## Abstract

### Introduction

Fasting during the month of Ramadan constitutes a real challenge for diabetic patients because of the complexity of managing diabetes during this period. The aim of our study was to evaluate the effect of pre-Ramadan therapeutic education on the decision to fast and on the glycaemic control of diabetic patients, based on the criteria defined by the "Practical guidelines DAR 2021".

### Materials and Methods:

This is a 3-month prospective and descriptive study, including type 2 diabetic patients, carried out in the Endocrinology, Diabetology and Metabolic Diseases Department of the Avicenne Marrakech Military Hospital, involving 116 patients and planned in three visits. A "pre-Ramadan visit" (2 to 4 weeks before), a "during Ramadan" visit (third week of Ramadan) and a "post-Ramadan" visit.

### Results

The study involved 116 patients, with a slight female predominance: 59 women and 57 men (sex ratio F/M: 1). The mean age of the patients was  $60.5 \pm 8.15$  years. The diabetes had been present for  $> 10$  years in 69.6% of patients. Hypoglycaemia occurred in 43.2% of patients. Self-monitoring of blood glucose was optimal in only 21.6% of patients, 35.3% of whom had an HbA1c  $> 9\%$ . Different treatment strategies were adopted, including 13 patients on a regimen of 2 premixed insulins and 13 patients on a basal-bolus plan.

After therapeutic education, 39 patients changed their decision to fast ( $P < 0.001$ ) and only 25 patients maintained their decision.

During Ramadan, 35 patients out of 91 were unable to continue fasting ( $p = 0.017$ ), the cause of which was hypoglycaemia in 24 cases ( $p < 0.001$ ).

After the month of Ramadan, 58 patients in the fasting group had an unbalanced diabetes with a HbA1c  $\geq 9\%$  compared with 28 patients who were unbalanced before the fast, whereas only 5 patients in the non-fasting group remained unbalanced with a HbA1c  $\geq 9\%$  compared with 13 patients before the fast ( $p < 0.001$ ).

### Conclusion

Our study demonstrated the importance of risk assessment, and showing it to patients changed their decision and prevented complications.

**Keywords:** Fasting, Ramadan, Muslim diabetic type 2, High risk, therapeutic education, Complications, Glycaemic disorders

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## I. Introduction

The fasting of a Muslim diabetic patient is an annual challenge in the run-up to the month of Ramadan, and remains a very difficult decision for both the doctor and the patient. Ramadan is one of the most sacred rites in the Muslim world, forming one of the five pillars of Islam. It is characterised by a prohibition on eating, drinking and smoking from dawn to sunset throughout this sacred month. This can expose well-controlled diabetic patients to an imbalance in their diabetes and poorly controlled patients to acute, sometimes fatal, complications [1]. However, despite clear religious texts and medical recommendations, the vast majority of Muslim diabetics observe the fasting rite during this month. This situation is often resented, particularly by aged subjects and those who are poorly balanced, and only therapeutic patient education (TPE) remains the decisive factor in allowing or

not allowing fasting [2]. The aim of our study was to evaluate the effect of pre-Ramadan TPE on the decision to fast and on glycaemic control in diabetic patients.

## II. Materials and Methods

This is a prospective and descriptive study of 3 months, having started 4 weeks before the month of Ramadan of 2023 and ended one month after, including type 2 diabetic patients, carried out in the department of Endocrinology, Diabetology and Metabolic Diseases and Nutrition of the Military Hospital Avicenne Marrakech.

Patients were selected by random method as study subjects, out of which 4 patients were excluded from the study for personal reasons.

**Inclusion criteria:** All type 2 diabetic patients who had decided to fast during Ramadan.

**Exclusion criteria:** Type 1 diabetic patients

Type 2 diabetic patients who did not fast

Pregnant women with diabetes

The complete study was planned in three visits. A "pre-Ramadan visit" (2 to 4 weeks before), a "during Ramadan visit" (third week of Ramadan) and a "post-Ramadan visit".

During the first visit, patients received a clinical and biochemical assessment as a standard routine. The data were collected during the consultation using a structured data collection form (table I) including identity, previous fasting, desire to fast, detailed history of previous hospitalisations, concomitant illnesses, treatment used, self-monitoring of blood glucose and level of physical activity.

The elements used in the calculation of the suggested risk score for diabetic patients wishing to fast during Ramadan are presented in (Table I and Figure N1).

For patients who did not change their mind about fasting, we provided standard suggestions on medication modifications. They were reminded to avoid high-calorie and highly refined foods prepared during this holy month, and light to moderate exercise was allowed. Symptoms of hypoglycaemia and instructions to break the fast as soon as they appeared were highlighted.

The aim of the second visit, carried out "during Ramadan", was to verify that the decision taken at the first visit had been maintained, and to assess compliance with treatment and self-monitoring of blood glucose levels in patients who had decided to fast, as well as the cause of interrupted fasting in certain others.

The aim of the third visit, which took place the month after Ramadan, was to re-evaluate their level of consciousness after Ramadan, to repeat the clinical examination and biochemical analyses, and to restore therapeutic schemas to their previous levels.

**Table I: Elements for calculating the suggested risk score for diabetic patients wishing to fast during Ramadan (from Pratical guidelines DAR 2021[2]).**

Risk Factor	Score	Risk Factor	Score
<b>1- Type and duration of diabetes</b>		<b>7- Pregnancy <sup>a</sup></b>	
Type 1 diabetes	1	Pregnant outside your objectives	4
Type 2 diabetes	0	Pregnant with objectives met	2
Duration ≥ 10 years	1	Not pregnant	0
Duration ≤ 10 years	0		
<b>2- Presence of hypoglycaemia</b>		<b>8- Fragility and cognitive function</b>	
Hypoglycaemia not sensed	5	Altered cognitive function	
Severe/recurrent hypoglycaemia	4	Fragile	4
Daily mild hypoglycaemia	3	70 years old without home support	3
Hypoglycaemia 1-6 times/week	2	No frailty or loss of cognitive function	1
Hypoglycaemia less than 1x/week	1		
No hypoglycaemia	0		0
<b>3- Characteristics of glycaemic control</b>		<b>9- Physical activity</b>	
Level of HbA1c > 9%		Intense physical activity	1
Level of HbA1c 7,5- 9%	2	No intense physical activity	0
Level of HbA1c < 7,5%	1		
	0		
<b>4- Self-monitoring of blood glucose</b>		<b>10- Previous experience of Ramadan</b>	
Prescribed but not performed	2	Overall negative experience	
Prescribed but sub-optimal	1	No negative or positive experience	1
Followed as prescribed	0		0
<b>5- acute Complications</b>		<b>11- hours of fasting (location)</b>	
DKA/HYPEROS in the last 3 months	3	≥ 16 hours	1
DKA/HYPEROS in the last 6 months	2	< 16 hours	0
DKA/HYPEROS in the last 12 months	1		
NO DKA or HYPEROS	0		
<b>6- Chronic complications/ co-morbidities</b>		<b>12- Treatment of diabetes</b>	

Unstable angina/ heart failure / GFR < 30 ml/min	6	Multiple daily injections of mixed insulin	3
GFR 30 – 45 ml/min		Basal-bolus/insulin pump	2,5
CVD stable / GFR 45 – 60 ml/ min	4	Mixed insulin once a day	2
No CVD et GFR normal		Basal insulin	1,5
	2	Glibenclamide	1
	0	Gliclazide/glimépiride or répaglinide	0,5
		Other therapies (SU or insuline not included)	0

DKA: Diabetic ketoacidosis; HYPEROS: Hyperglycaemic non-ketotic hyperosmolar coma; GFR: Glomerular filtration rate; CVD: Cardiovascular disease; HbA1c-: Glycaemic haemoglobin.

a. Pregnant and breast-feeding women have the right not to fast, whether or not they have diabetes.



Figure N1 : Risk scores and risk categories (based on International Diabetes Federation, 2021)

### STATISTICAL METHODS

The descriptive analysis consisted of calculating the numbers (percentage) for the qualitative variables, the mean±standard deviation for the quantitative variables with a normal distribution and the median (interquartile ranges) for the quantitative variables with an abnormal distribution. The normality of the distribution of the variables was studied using the Shapiro-Wilk test. P<0.05 was considered statistically significant. Correlation was tested using the Chi-2 test. Statistical analysis was performed using Jamovi software version 2.3.28.

### III. Results

#### Description of the study population: Table II

The study involved 116 type 2 diabetic patients, with a slight female predominance: 59 women and 57 men (sex ratio F/M: 1). The mean age of the patients was 60.5 ± 8.15 years. The average age of diabetes was <10 years in 30.4% of patients and >10 years in 69.6%. Hypoglycaemia occurred in 43.2% of patients. Self-monitoring of blood glucose was optimal in 21.6%, sub-optimal in 43.1% and 35.3% did not monitor their diabetes. Regarding glycaemic control: 38.8% of our sample had HbA1c < 7.5%, 25.9% had HbA1c between 7.5% and 9% and 35.3% had HbA1c > 9%. In terms of treatment, 19 patients (16%) were on a combination of metformin + dipeptidyl peptidase 4 inhibitor, 32 patients (27.6%) were on metformin + hypoglycaemic sulphonamide, 9 patients (6.9%) were on metformin + sulphonamide + insulin bed time, 17 patients (14.6%) were on metformin + insulin bed time, 11 patients (9.5%) were on metformin alone, 13 patients (11.2%) were on a schema of 2 premixed insulins and 13 patients (11.2%) were on a basal-bolus schema.

After assessment of the risk score: 29.3% were classified as low risk, 26.7% as intermediate risk and 44% as high risk.

**For patients classified as high risk:** after the first session of TPE, 70% (35 patients) decided not to fast, while 30% (15 patients) maintained their decision despite the high risk. During the month of Ramadan 62.9% (22 patients) observed their decision and 37.1% (13 patients) did not. Thus a total of 28 out of 51 patients fasted during Ramadan. Of these, only 9 patients were able to continue fasting and 19 patients broke their fast. The cause of breaking the fast was hypoglycaemia in 78.9% of cases, major hyperglycaemia in 15.8% of cases and only one patient ad been diagnosed with a myocardial infarction.

**For patients classified as intermediate risk:** after the first TPE session, 12.9% (4 patients) decided not to fast while 87.1% (27 patients) maintained their decision to fast. During the month of Ramadan, two patients complied with their decision not to fast, while two patients did not. Therefore, a total of 29 out of 31 patients fasted during the month of Ramadan. Of these, 21 patients (70%) were able to continue fasting and 8 patients (30%) broke their fast. The cause of breaking the fast was hypoglycaemia in 66.3% of cases and major hyperglycaemia in 33.3% of cases.

**For patients classified as low risk:** after the first TPE session, 100% (34 patients) decided to fast. During the month of Ramadan, 28 patients were able to continue fasting and 6 patients were unable to do so. The reason for breaking the fast was hypoglycaemia in 90% of cases and major hyperglycaemia in 10%.

After therapeutic education, 39 patients changed their decision to fast (P<0.001), with only 25 of them sticking to their decision.

During Ramadan, 35 patients out of 91 were unable to continue fasting ( $p=0.017$ ), the cause of which was hypoglycaemia in 24 cases ( $p<0.001$ ).

After the month of Ramadan, 58 patients in the fasting group had an unbalanced diabetes with a HbA1c  $> 9\%$  compared with 28 patients who were unbalanced before fasting, whereas only 5 patients in the non-fasting group remained unbalanced with a HbA1c  $> 9\%$  compared with 13 patients before fasting ( $p<0.001$ ).

**Table II: Characteristics of type 2 diabetes patients included in our study**

Variable	n = 116
Age <sup>a</sup>	60,5 ± 8,16 ans
Sexe <sup>b</sup>	
Female	50,9% (59)
Male	49,1% (57)
Years of diabetes <sup>b</sup>	
< 10 ans	30,4%
>10 ans	69,6%
History of hypoglycaemia <sup>b</sup>	43,1%
Self-monitoring of blood glucose <sup>b</sup>	
Optimal	21,6%
Sub-optimal	43,1%
None	35,3%
HbA1c before Ramadan <sup>b</sup>	
<7,5%	38,3%
Between 7,5% and 9%	25,9%
>9%	35,3%
Traitement <sup>b</sup>	
MTF alone	9,5% (11)
MTF + SU	27,6% (32)
MTF + IDPP4	16% (19)
MTF + bed Time	14,6% (17)
MTF + SU + Bed Time	6,9% (9)
2 prémixés	11,2% (13)
Basal-bolus	11,2% (13)
Score <sup>b</sup>	
High risk	44% (51)
Intermediate risk	26,7% (31)
Low risk	29,3% (34)
HbA1c after Ramadan <sup>b</sup>	
<7,5%	12,1% (14)
between 7,5% and 9%	33,6% (39)
>9%	54,3% (63)

MTF : metformin ; SU: sulphonamides ; iDPP4: inhibitors of dipeptidyl peptidase 4; HbA1c: glycated haemoglobin;

Expressed as mean standard deviation. a

Expressed as headcount (percentage). b

**Table III: Correlation table**

Variable	Fasting	Not fasting	P value
Change in decision to fast after therapeutic education	91 patients	25 patients	<0,001
Breaking the fast		35 patients	=0,017
Hypoglycaemia		24 patients	<0,001
Glycaemic disorders after Ramadan	58 patients (vs 28 patients)	5 patients (vs 13 patients)	<0,001

#### IV. Discussion

Fasting during the month of Ramadan is a sacred religious rite. It is an obligation for all healthy adult Muslims. It takes place during the ninth month of the Hegira calendar. Its duration varies, between 29 and 30 days, and the daily hours of fasting range from 12 to 20 hours depending on the season and geographical location [3]. Fasting exposes diabetic patients to a deterioration in metabolic control and acute complications: hypoglycaemia, hyperglycaemia and diabetic ketoacidosis, as well as an increased risk of thromboembolism [4]. This may be due to the alternation of daytime fasting and festive overeating during the night, as well as to the changes in eating behaviour and lifestyle observed during this month [5]. However, despite the tolerance of religious texts, a large number of diabetics strongly desire to fast even though their risk level is high and sometimes without therapeutic adjustment [6].

Many published studies have discussed the subject of fasting during the month of Ramadan, but most have assessed the relationship between Ramadan fasting and diabetes on the basis of the anthropometric and

biological consequences of fasting and the possibility of therapeutic adaptation [7, 8, 9, 10, 11]. However, few have demonstrated the place of TPE in changing the decision to fast regardless of beliefs and social influence [12, 13]. In fact, the interest of our work was personalised TPE before the holy month based on parameters determined by the "Practical guidelines DAR 2021" (table I), which made it possible to classify patients according to their level of risk, to dissuade them from not fasting and to facilitate monitoring during the fast for some.

Following our study, 39 patients changed their initial decision to fast and only 25 patients maintained their decision. This is in agreement with the study of the University Hospital of Fes involving 88 type 2 diabetic patients, 41 of whom intended to fast before the therapeutic intervention and only 12 of whom did so after this educational session ( $p < 0.0001$ ) [14]. In the study by Gaborit et al [15], including 81 DT2, 52% of patients fasted despite the interdiction of fasting at home, while in the study by Nasri et al [16], an Algerian study carried out on 87 diabetics to evaluate the value of the imam in therapeutic education, 28% of patients unable to fast fasted throughout the month of Ramadan, mainly for religious reasons. This shows the value of risk stratification combined with a structured TPE programme before Ramadan, based on dietary advice and recommendations for managing complications during fasting, without forgetting the religious dimension, while justifying the reasons for exemption from fasting detailed in the Koran and the Sunnah, such as illness: "Whoever among you who is ill or travelling and is prevented from fasting (the Ramadan fast) must fast later a number of days equal to the number of days not fasted. In this way, Allah wishes to make it easier for you to fulfil your religious duties and not to make them difficult for you" [17].

Furthermore, the main risk during prolonged fasting is hypoglycaemia, which is an acute complication of type 2 diabetes [18]. This complication is favoured by physical effort during a day without food intake, failure to comply with dietary hygiene rules and, above all, poor therapeutic adaptation [17,18]. However, the EPIDIAR study [8], a study of 12,914 Muslim diabetic patients from 13 countries including Morocco, 78% of whom were type 2 diabetics (non-insulin-dependent), showed that fasting increased the risk of severe hypoglycaemia by 4.7 times in type 1 diabetic patients and by 7.5 times in type 2 diabetic patients, so the increase in hypoglycaemia seems to be linked to various non-exclusive factors: reduced food intake during fasting hours, unchanged daily physical exercise and failure to adapt treatments[2,8]. The study also reported 5 times more severe episodes of hyperglycaemia during Ramadan, with or without ketoacidosis, but with hospitalisation in type 2 diabetes and 3 times more in type 1. This was confirmed by our study, which found that during Ramadan, 35 out of 91 patients were unable to continue fasting ( $p=0.017$ ), the cause of which was hypoglycaemia in 24 cases ( $p<0.001$ ).

Regarding glycaemic control, fasting induces multiple metabolic alterations in the human organism. In our series, 87.9% (102 patients) of cases increased their HbA1c, which is in agreement with the series by Uysal et al [19] and Lee et al [20] who reported a significant increase in HbA1c after Ramadan (by 0.1% and 0.2% respectively). On the other hand, in the studies by Maislos et al [21] and Khatib et al [22], patients improved their HbA1c during the month of Ramadan, with the mean level falling from  $7.08 \pm 1.38\%$  before Ramadan to  $6 \pm 1.27\%$  after Ramadan.

## V. Conclusion

Fasting during Ramadan still poses a real dilemma for diabetic Muslims in view of the potentially serious risks it may engender against their religious obligations and the social relationships that tell them to fast. However, despite the guidelines, the majority of type 2 diabetic patients insist on fasting, which explains the need for personalised therapeutic education that, in our case, showed the various risks incurred during fasting in terms of acute complications and glycaemic disorders after fasting.

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