

Perception and practice of Ramadan fasting among patients with type I diabetes mellitus in the view of the practical guidelines

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ABSTRACT

Many type 1 diabetes patients (T1DM) choose to fast during Ramadan despite having an increased risk according to guidelines. Their fasting perception and practice need to be explored. The objective of this study is to examine the fasting perception and practice among T1DM patients in relation to their risk categories, metabolic conditions and in the view of practical guidelines. This cross sectional study included 113 adolescent and young Saudis with T1DM on basal bolus regimen from the diabetic center in Madinah. Data on fasting perception and practice were collected from patients 2 weeks after the end of Ramadan 2017 together with reviewing medical records. Risk categorization was performed according to Diabetes and Ramadan (DAR) 2016. The very high risk group included 78.8%. Fasting was safe by 85.5%, obligatory by 67.8%, exempted by 2.5%, and not indicated for pregnant by 6.8%. Compensation for non-fasting days was obligatory by 81.4% with 16.8% used to fast extra days outside Ramadan. Among the 113 patients, 86.7% experienced fasting (70.8% full fasters) with no significant difference in risk categories. Some patients followed the recommendations during fasting (proper meals in 26.5% at sunset, 73.5% at pre-dawn, 72.4% decreased activity, 60.1% increased fluid intake, 75.5% had inverted sleep pattern, 37.8% decreased insulin doses, 75.5% performed regular SMBG and 5.1% had professional supervision). Severe complications were 5.1% DKA and 1% severe hypoglycemia. Significant predictors for non-fasting were adolescence ($p=0.036$), recurrent hypoglycemia ($p=0.013$), harm perception ($p=0.006$), non-compensation ($p=0.000$) and comorbidities ($p=0.039$). In conclusion, most T1DM patients chose to fast during Ramadan without adequate support or following strict guidelines. Most of them do not experience any adversities and if they break fasting (mostly due to hypoglycemia), they are able to compensate later. Adolescent patients with harm perception, recurrent hypoglycemia, and no tendency to compensate for non-fasting showed less positive attitude towards fasting. More specific guidelines, education, and professional supervision are needed for these patients during Ramadan.

Keywords: Perception, practice, type 1 diabetes, Ramadan fasting, compensation.

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INTRODUCTION

The practice of fasting during the month of Ramadan is a fundamental obligation in Islam but not for all Muslims. According to the Islamic law, many are exempted from fasting including pre-pubertal children and diseased patients who cannot comply with daily prolonged fasting

from sunrise to sunset for a lunar month (Al-Arouj et al., 2005). Both the Islamic Organization for Medical Sciences and the International Islamic Fiqh Academy (Beshyah, 2009) and the American Diabetes Association (Al-Arouj et al., 2010) agreed to categorize all type 1

diabetes (T1DM) patients into very high risk group and recommended against fasting based on the possible risks of severe complications. Despite all recommendations, many T1DM patients insist on fasting (Salti et al., 2004) and surprisingly studies showed that for stable T1DM with good hypoglycaemic awareness, fasting could be possible and probably safe (Kadiri et al., 2001; Benaji et al., 2006; Kobeissy et al., 2008; Beshyah et al., 2007; Kassem et al., 2005; Zabeen et al., 2014; Azad et al., 2012). Still they need pre-Ramadan medical assessment, Ramadan-focused medical education, individualized management plan, and strict medical supervision to ensure their safety (Mohsin et al., 2015; International Diabetes Federation and the DAR International Alliance, 2016). For safe fasting, the pre-approach management strategy for fasting recommended 3Rs: presentation, risk stratification, and education (Hassan et al., 2014), while others recommended 5 R's: respect, risk stratification, revision of therapy, regular follow-up, and reappraisal of strategy (Jawad and Kalra, 2015). Therefore, the International Diabetes Federation (IDF), in collaboration with the Diabetes and Ramadan (DAR) International Alliance in April 2016 (IDF/DAR) stratified poorly controlled T1DM patients into the very high risk group and the well-controlled patients into the high risk group (International Diabetes Federation and the DAR International Alliance, 2016) and recommended against fasting in both risk groups. So, all patients with T1DM should be advised not to fast and if they have personal decisions to fast they should receive structured education, be followed by a qualified diabetes team, self-monitor blood glucose regularly (SMBG), adjust medication doses as per recommendations, be prepared to break the fast in case of hypo- or hyperglycaemia, be prepared to stop the fasting in case of frequent hypo- or hyperglycaemia or worsening consequences of other related medical conditions (International Diabetes Federation and the DAR International Alliance, 2016).

In the context of highly individualization of perception and practice of fasting, there is a need to study T1DM patients who prefer to fast during Ramadan. Therefore, this study examined the perception and practice of fasting among T1DM adolescents and young adults from Saudi Arabia in relation to their metabolic control, complications, and comorbid conditions and in comparison with the known recommendations.

SUBJECTS AND METHODS

A cross sectional study was conducted at the "Prince Abdul-Aziz Bin-Majed Diabetes Care Centre" (PAMDCC), in Madinah, Saudi Arabia. After ethical approval from the local authorities, a non-probability convenience sample of 113 Saudis with T1DM, aged 12-35 years, on basal bolus regimen was included in the study, 2 weeks after the end of Ramadan 2017. All patients (and their parents if attended the interview) gave informed consent to participate in this study. Exclusion criteria included the presence of

acute illness before Ramadan, pregnancy, chronic kidney disease stage 4 and 5, end stage renal failure on chronic dialysis and advanced macro-vascular complications.

Interview format

Face to face interview was conducted to collect demographic and metabolic data. Questions included history of severe hypoglycemia or DKA within the 3 months period prior to Ramadan, recurrent hypoglycemia, and hypoglycemia unawareness. Questions concerning fasting practice included number of fasting days, fasting extra days during the year, causes of breaking fast and compensation for non-fasted days. Questions also included the perceived harm from fasting and fasting complications (DKA, hyperglycemia and hypoglycemia). Severe hypoglycemia was defined by any event of loss of consciousness and/or convulsion which was associated with low blood glucose (<60 mg/dl), and/or responded to parenteral glucose or glucagon injection. Detailed food and fluid intake in sunset and predawn meals were recorded and revised by nutritionist to recognize both fat and carbohydrate contents and type (simple or complex) as well as food consumed between both main meals. Other lifestyle (activity and sleep pattern) and management changes (insulin doses and SMBG) during fasting were recorded.

Anthropometric measurements

Body weight was measured routinely in typical outdoor clothing without shoes using a standardized balance scale and height was measured using a stadiometer. Body mass index (BMI) was calculated as weight in kg divided by height squared meter. Subjects were divided into 3 groups: underweight (<18.5), lean (18.5 to 24.9) and overweight (≥ 25 to 29.9) and obese (≥ 30 kg/m²).

Review of medical records

The files of all patients were revised for the last biochemistry, HbA1c, presence or absence of any diabetic complications or other comorbid conditions including hypertension, thyroid disease, dyslipidemia or any other disease. Glycemic control was defined by HbA1c<7% and dyslipidemia was defined if the latest low density lipoprotein cholesterol level was ≥ 2.6 mmol/L.

Risk categorization

Risk categorization was performed according to the practical guidelines of the IDF-DAR in 2016 (International Diabetes Federation and the DAR International Alliance, 2016). The very high risk group included T1DM patients with any one or more of the following: severe hypoglycaemia within the 3 months period prior to Ramadan, DKA within the 3 months period prior to Ramadan, history of recurrent hypoglycemia, history of hypoglycemia unawareness, or poorly controlled. The high risk group included well controlled T1DM patients who did not have any criteria of the very high risk category.

Statistical analysis

Data analysis was performed by Statistical Package for the Social Sciences program version 20.0 Data with abnormal distribution were expressed in median. $P < 0.05$ was considered to be the cut-off value of significance. Statistical analysis was performed using

the non-parametric test for comparing the 3 fasting groups. Odd ratios were calculated through the multinomial logistic regression analysis.

RESULTS

A total of 113 Saudi patients aged 12 to 35 years were included in this study, 55.8% of them being females. Their average age was 19 years, 53.1% were adolescents, 46.9% were young adults, and 46.9% had diabetes for > 5 years. Only 11.5% of patients were employed, the remaining was either students (68.1%) or non-workers (20.4%). None of the employed patients was engaged in intense physical activity. Their average BMI was 23.26 kg/m² with 18.5% underweight, 66.2% lean, 6.2% overweight and 9.2% obese. Their average A1C was high (9.9%) with 83.3% of patients were uncontrolled. Among the patients 7.1% were smokers, 7.1% had hypertension, 16.8% had thyroid diseases, and 23.9% were dyslipidemic (Table 1).

Table 1 shows also that many cases (74.3%) were poorly controlled. Within the 3 months period prior to Ramadan, 11 patients were reported to have DKA (9.7%) and 4 patients (3.5%) were reported to have severe hypoglycemia. Many patients (33.8%) had history of recurrent mild to moderate hypoglycemia but only 2 patients (1.8%) with hypoglycemia unawareness. However, none was reported to have non-compliance to insulin therapy, or recurrent hospitalizations. Other criteria for risk stratification of IDF/DAR were excluded on selection of cases. The very high risk group included 78.8% of all patients and the remaining 21.2% of the cases were in the high risk group. Most patients (85.5%) perceived no harm with fasting. Many T1D patients (67.8%) believed that they are not exempted from fasting and they should fast (obligation), while few believe that they are exempted (2.5%). Pregnancy was a cause for exemption by 6.8% of patients. Most of the patients admitted that they considered compensation for non-fasting days as obligatory (81.4%). Moreover, some (16.8%) used to fast extra-days outside Ramadan (Table 2).

The patients were divided into 3 groups according to their fasting practice during Ramadan 2017. Fasting was practiced by most patients (86.7%) and only 15 patients (13.3%) did not fast. Most of them (70.8%) fasted for >20 days. Concerning lifestyle changes, following dietary recommendation, 26.5% did not consume excess carbohydrate and fat at the sunset meal, 73.5% consumed complex carbohydrate at the pre-dawn meal, 72.4 % decreased their activity during fasting hours, many did not increase their carbohydrate amount (49%), sweets intake (59%) or food intake (70.4%) throughout the day, 60.1% increased their fluid intake and many patients (75.5%) had reversed sleep pattern. Concerning their management changes, 37.8% decreased their insulin dose, 75.5% performed regular

SMBG and 5.1% received professional supervision. Most of them (94.9 %) were reported to have usual diabetes care with no extra-appointments during Ramadan in clinics (Table 3).

Among fasting patients, many experienced no complications (53.1%), 19.4% hyperglycemia and 37.8% mild to moderate hypoglycemia. Severe complications were reported by 6 patients (5 (5.1%) with DKA and one with severe hypoglycemia (1%)). Hypoglycemia (14.4%); rather than hyperglycemia (1%) or fatigue and dizziness (1%), was the main cause of immediate breaking of fasting (Table 3).

Comparison between the 3 fasting groups showed that non-fasting group was significantly adolescents ($p = 0.002$), underbuilt/lean ($p = 0.029$), higher perception of harm ($p = 0.001$) and lower tendency to compensate for non-fasting days ($p = 0.000$) than the other 2 groups. There was no significant difference in the risk stratification among the 3 groups ($p = 0.603$), however, the non-fasting group had a higher history of recurrent hypoglycemia ($p = 0.006$). Concerning the lifestyle and management changes, there was no difference between the 2 fasting groups except for more compensation in the group of fasting >20 days (95.2%) than the other fasting group (66.7%) ($p = 0.000$). Full fasters showed more frequent inverted sleep rhythm ($p = 0.023$) and hyperglycemia ($p = 0.027$), but lower hypoglycemia ($p = 0.005$) than those who fasted less than 20 days (Table 4).

Significant predictors for non-fasting were adolescence ($p = 0.036$), recurrent hypoglycemia ($p = 0.013$), harm perception ($p = 0.006$), non-compensation ($p = 0.000$) and comorbidities ($p = 0.039$). Significant predictors for incomplete fasting were adolescence ($p = 0.04$) and non-compensation ($p = 0.015$) (Table 5).

DISCUSSION

It has been seen in this study that most of the included T1DM patients (78.7%) were in the category of the very high risk, who need to be exempted from fasting and should receive education and training with strict follow up in attempt of fasting during Ramadan (International Diabetes Federation and the DAR International Alliance, 2016). However, some might choose to fast (86.7%) and some (16.8%) practiced fasting of extra-days for other religious occasions. T1DM patients in this study considered Ramadan fasting as safe (85.5%) and obligatory (67.8%). Therefore, they believe that they should not terminate fasting for any cause and should compensate for non-fasting days (81.4%). The reported fasting complications in this study were mild (41.6%) with few DKA (4.4%) or severe hypoglycemia (0.9%) for circulation for more than 8 h (Karamat et al., 2010). Generally, lifestyle and management recommendations during Ramadan were not well applied by most of them

Table 1. Demographic and metabolic characteristics of type 1 diabetes patients (n = 113).

Variable		Frequency	
		N	%
Age groups	Adolescent	60	53.1
	Young adults	53	46.9
Duration of diabetes	≤ 5 years	60	53.1
	> 5 years	53	46.9
Gender	Female	63	55.8
	Male	50	44.2
Occupation	Students	77	68.1
	Not working	23	20.4
	Employed	13	11.5
Weight groups	Underweight	21	18.5
	Lean	75	66.2
	Overweight	7	6.2
	Obese	10	9.2
Micro-vascular complications	Neuropathy	23	20.4
	Nephropathy	5	4.4
	Retinopathy	10	8.8
Other comorbidities	Smoking	8	7.1
	Hypertension	8	7.1
	Thyroid disease	19	16.8
	Dyslipidemia	27	23.9
	Others	11	9.3
	Total comorbidities	41	36.3

Table 2. Perception of Ramadan fasting by type 1 diabetes patients (n = 113).

Variable		Frequency	
		N	%
Harm perception from fasting	No harm	97	85.5
	Harm	16	14.2
Causes of exemption from fasting	No exemption (fasting is an obligation)	80	67.8
	Type 1 patients	3	2.5
	Pregnancy	8	6.8
Compensation for non-fasting days	Not obligatory	21	18.6
	Obligatory	92	81.4
Fasting extra days outside Ramadan		19	16.8

and only 5.1% received professional observation while fasting.

These results were not in agreement with those of the

EPIDIAR study, where 43% used to fast with 4.7-fold increase in the risk of severe hypoglycemia (Salti et al., 2004). Moreover, one Saudi study (Salman et al., 1992)

Table 3. Complications during Ramadan fasting in type 1 diabetes patients (n = 98).

Variable		Frequency (%)
No complications		52 (53.1)
DKA		5 (5.1)
Hyperglycemia		19 (19.4)
Hypoglycemia	Mild – moderate hypoglycemia	37 (37.8)
	Severe hypoglycemia	1 (1.02)
Causes of immediate break fasting.	Hypoglycemia	14 (14.3)
	Hyperglycemia	1 (1)
	Fatigue, dizziness	1 (1)

Table 4. Significant differences between different fasting groups of type 1 diabetes (n = 113).

		Not fasting N=15 (13.3%)	Fasting <20 days N=18 (15.9%)	Fasting >20 days N= 80 (70.8%)	P
Characteristics					
Age groups	Adolescent	11 (73.3%)	15 (83.3%)	34 (42.5%)	0.002
	Young adults	4 (26.7%)	3 (16.7%)	46 (57.5%)	
Weight groups	Underbuilt	7 (46.7%)	7 (38.9%)	7 (8.75%)	0.029
	Lean	8 (53.3%)	9 (50.0%)	58 (72.5%)	
	Overweight	0 (0%)	0 (0%)	7 (8.75%)	
	Obese	(0%)	2 (11.1%)	8 (10%)	
Risk categorizations					
Risk category	Very high risk	11 (73.3%)	13 (72.2%)	65 (81.3%)	0.603
	High risk	4 (26.7%)	5 (27.8%)	15 (18.8%)	
	Recurrent hypoglycemia	9 (60.0%)	2 (11.1%)	16 (20%)	
Perception					
Harm perception		6 (40.0%)	2 (11.1%)	8 (10.0%)	0.001
Compensation for non-fasting		1 (6.7%)	14 (77.8%)	77 (96.3%)	0.000
Practice of fasting					
Lifestyle changes	Inverted sleep rhythm		6 (30%)	57 (71.25%)	0.023
Complications during fasting	Hypoglycemia*		11 (61.1%)	26 (32.5%)	0.005
	Hyperglycemia		1 (5.6%)	18 (22.5%)	0.027

*Mild to moderate.

Table 5. Significant predictors for non-fasting or incomplete fasting rather than full fasting among type 1 diabetic patients (n = 113).

Variable	Non-fasting Ramadan			Fasting <20 days				
	OR	95% CI	P	OR	95% CI	P		
Adolescence	3.72	1.09	12.69	0.036	6.77	1.813	25.23	0.004
Recurrent hypoglycemia	7.18	1.52	33.92	0.013	0.32	.096	1.04	0.059
Perception of harm	6.00	1.69	21.26	0.006	1.13	0.22	5.81	0.888
Non-compensation	359.3	34.83	3706.95	0.000	7.3	1.478	36.38	0.015
Comorbidities	3.30	1.06	10.28	0.039	1.40	0.486	4.04	0.533

Reference category: Fasting >20 days.
OR: odd ratio, CI: Confidence Interval.

from Riyadh reported three T1DM children with severe hypoglycemia within the 1st week of fasting. However, the reported incidence of hypoglycemia in our results (37.8%) was in agreement with another multi-centered prospective study from Pakistan (35.3%) (Ahmedani et al., 2014). One study involved 33 adolescent children with T1DM under strict training and follow up, found that 60.6% completed the fast with only five cases of mild hypo-glycaemia and no cases of DKA were reported (Azad et al., 2012). In our study, a much higher frequency (70.8%) had completed their fasting but without adequate fasting plans or supervision.

The low incidence of severe hypoglycemia in the present study could be explained by the patients' high HbA1c, increased sweet intake, decreased activity, decreased insulin dose and inverted sleep rhythm which made them more vulnerable to DKA rather than severe hypoglycemia, but did not protect them from exposing to mild hypoglycemia upon fasting. In support of our findings, Reiter et al. (2007) reported that 65% of their T1DM patients successfully fasted without harm which was probably because of their higher HbA1c levels, high adherence to the protocol, and reductions in insulin dosage. Another explanation given was that all patients were on basal bolus therapy using insulin analogous preparations which were presumed to have lower incidence of hypoglycemia than human soluble insulin that may remain in the circulation.

A substantial number of the patients included were under the very high risk group (78.8%) based on poor diabetes control (74.3%), history of preceding severe hypoglycemia (3.5%), or DKA (9.7%), recurrent hypoglycemia (33.8%) and hypoglycemia unawareness (1.8%). But, only the history of recurrent hypoglycemia showed influence on the decision not to fast ($p = 0.013$). Adolescence predicted both non-fasting ($p = 0.036$) and inability to complete fasting ($p = 0.004$). In accordance with the Islamic law where adolescents are obliged to fast, adolescents in this study were more likely than young adults to go for not fasting (OR 3.72) or fasting less than 20 days (OR 6.77) than full fasting. Previous studies documented the safety of fasting in children and adolescents with well-structured program of education for both children and their families prior to Ramadan together with close follow-up (Kadiri et al., 2001; Kobeissy et al., 2008; Kassem et al., 2005; Zabeen et al., 2014; Azad et al., 2012; Ahmedani et al., 2014; Reiter et al., 2007).

Other predictors of non-fasting included the belief of harm induced by fasting and the absence of an obligation to compensate for non-fasting by fasting equal number of days after Ramadan ($p = 0.015$) (Table 5). Our T1D patients who believed in necessary compensation (81.4%) may prefer to fast during Ramadan with their families rather than fasting alone later on. This is in contrast to the Islamic regulations, which entails no compensation for patients with chronic

illnesses. It is expected that T1D patients will not put themselves at risk and they will break their fasting easily for any danger, simply if they know and follow proper Islamic regulation.

In this study, a substantial number of patients followed guidelines as consuming complex carbohydrates at the pre-dawn meal, decreasing activity with inverted sleep cycle, increasing fluid intake, decreasing insulin dose, and performing SMBG. However, some weak points in the practice of fasting by those patients deserve attention. First; only 37.8% decreased their insulin doses during Ramadan fasting. Second; many (73.5%) used to ingest large amounts of foods rich in carbohydrates and fats at the sunset meal. Third; only 14.4% used to immediately end their fast if hypoglycemia occurs, and very few used to do so if blood glucose exceeds 300 mg/dl. Forth; very few patients received professional supervision while fasting and the majority of the patients did not receive any extra-care before or during fasting. All these defective points should be emphasized in the future management plans for better management of T1DM during fasting.

Limitations

The main limitation of this study was its cross sectional design which did not allow for extracting strong evidence about perception of fasting by T1DM patients. Moreover, all data were self-reported and documentation was lacking especially for fasting-related complications.

CONCLUSION AND RECOMMENDATIONS

Most patients with T1DM chose to fast during the month of Ramadan, and they do so without adequate support or following strict guidelines. Most of them do not experience any adversities during fasting and if they break fasting (mostly due to hypoglycemia), they are able to compensate later. Adolescent patients with harm perception, history of recurrent hypoglycemia, comorbidities, and who belief in non-compensation, showed less positive attitude towards fasting. Many of the perception and practice of these patients did not follow Islamic regulations. Therefore, there is an urgent need for better designed large clinical trials which could find evidence-based information concerned with safety and how best we should manage patients with T1DM fasting Ramadan. Such information is necessary for developing solid guidelines to assist patients who want to fast on any religious occasions. Meanwhile, health care professionals should ensure adequate education of their patients about their fasting rights in Islam. They should perform a systematic pre-Ramadan assessment with appropriate therapeutic adjustments and educational advice regarding healthy diet, exercise and

awareness of the risks of hypo- and hyper-glycemia. They should ensure regular follow-up in clinics and might involve parental supervision when appropriate.

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