

## Glycaemic Trend During Ramadan in Fasting Diabetic Subjects: A Study from Pakistan

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**Abstract:** The aim of this questionnaire based survey was to assess the glycaemic control care and management of our fasting diabetic subjects. This retrospective study was carried out at Baqai Institute of Diabetology and Endocrinology, its affiliated centers and Memon Diabetic Centre of Karachi. Data was collected by a questionnaire including socio-demographic data, duration of diabetes, life style, diet and treatment during and preceding Ramadan of year 2004. All Known diabetic Muslim subjects except children below 10 years were included. The subjects were asked if they had observed any of the hypoglycemic or hyperglycemic symptoms. The major severity of the symptoms was assessed depending upon the assistance needed. The plasma glucose level during these episodes was recorded where it was available. During the month of Ramadan 327 out of 453 subjects (72.5%) fasted. Mean age of subjects was 50.3±12.6 years. Average duration of diabetes was 9.3±7.3 years. Majority of the subjects (96.3%) fasted with type 2 diabetes while only 3.7% fasted with type 1 diabetes. Subjects fasted for an average of 25 days. Overall prevalence of hypoglycemia and hyperglycemia was 21.7 and 19.8%, respectively. Only 4.0% had major hypoglycemic episodes, while 8% had major hyperglycemic episodes. The present study suggests that all diabetic subjects who intend to fast should be counseled before Ramadan about change in medication timings and dose, dietary changes and pattern of physical activity and about role of self-monitoring of blood glucose especially during acute symptoms.

**Key words:** Diabetes, fasting, glycaemic control, Ramadan

### INTRODUCTION

Fasting is one of the five pillars of Islam. There are more than one billion Muslims in the world and it is obligatory for all adult healthy Muslims to abstain from food, drink and smoking each day from dawn to sunset, for 1 lunar month in a year [i.e., The Holy month of Ramadan] (Sarraf-Zadegan *et al.*, 2000) (Diabetes and Ramadan Advisory Board, 2004). As the lunar year rotates from season to season therefore the month of Ramadan can occur in any of the four seasons and the hours spent in fasting varies from 11 to 18 h day<sup>-1</sup> (Aadil *et al.*, 2004).

World wide, healthy Muslim adults fast religiously in the month of Ramadan. Although diabetics may be exempted from fasting but many of them prefer not to accept this exemption (Mohamed *et al.*, 2002). Number of studies has shown that fasting in Ramadan is safe for the majority of diabetic patients with proper guidance, education and diabetic management (Azizi and Siahkaloh, 2003).

The eating pattern during daytime of Ramadan, as well as the composition of food, varies from balance diet to high carbohydrate and fat diet, mainly in the form of two large meals at dawn and sunset (Sarraf-Zadegan *et al.*, 2000).

Ramadan fasting is different from starvation because of its regular pattern of fasting and eating. It can affect the control of diabetes because of changes in meal timings and frequency, types of food, use of medication and daily life style (Yarahmadi *et al.*, 2003).

Many of the diabetic patients who fast in this month without any medical guidance often end up developing acute complications (Mohamed *et al.*, 2002). Medicine dosage schedule have to be altered during Ramadan. In fact the drugs can be taken only between sunset and dawn and the time span between two doses is sometimes shorter than usual non-Ramadan days (Aadil *et al.*, 2004).

Studies have shown that through proper diet changes, self glucose monitoring, daily physical

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activity and proper changes in oral hypoglycemic agents timing and dosing safe fasting is possible (Mohamed *et al.*, 2002).

The aim of the study was to assess symptomatically the glycaemic trend of diabetic subjects before and during Ramadan.

## MATERIALS AND METHODS

This study was carried out at Baqai Institute of Diabetology and Endocrinology (BIDE). To cover a large population of diabetic subjects the sample data was also collected from the affiliated centers of BIDE namely Fehmi Health Care Center, Sina Health Care Center and Diabetes clinic at Ghara, as well as from Memon Diabetic and Diagnostic Centre of Karachi.

It was a retrospective study in which data was collected by a structured, self administered questionnaire developed by the department of diet and education of BIDE. The questionnaire included the information regarding socio-demographic status, duration of diabetes, life style, diet and treatment during and preceding Ramadan. Patients were also, asked about diabetes related complications.

Subjects were recruited just after Eid-ul-Fiter from 16th November 2004 to 15th January 2005 and include all known type 1 and type 2 diabetic Muslim subjects. Children below 10 years of age were excluded from the study. Symptoms of hypoglycemia and hyperglycemia were specifically asked and recorded.

The subjects were asked if they had observed any of the hypoglycemic symptoms such as shivering, cold sweating, excessive hunger and feeling of weakness, palpitation, drowsiness, visionary problem or unconsciousness. Whereas, the hyperglycemia symptoms mentioned in the questionnaire were frequent urination, polyphagia, polydipsia, drowsiness and unconsciousness. The severity of the symptoms was assessed depending upon the assistance needed. Whether the episode of hypoglycemia or hyperglycemia was relieved by self assistance and home treatment or whether the subject was assisted by his family member and was taken to a doctor. Statistical analysis was done using SPSS version 10.

## RESULTS

Three hundred and twenty seven out of 453 subjects (72.2%) fasted during the month of Ramadan, 163 (49.8%) were males and 164 (50.2%) were female. Mean age of subjects was  $50.3 \pm 12.6$  years, mean age of male was

$50.75 \pm 15.43$  and mean age of female was  $49.98 \pm 12.87$ . Average duration of diabetes of these subjects was  $9.3 \pm 7.3$  years. Majority of the subjects (96.3%) fasted with type 2 diabetes while only 3.7% fasted with type 1 diabetes. Subjects fasted for an average of 25 days (Table 1). Patients with any infection were excluded from the study.

Sixty percent of the patients reported diabetes and its related complications as the reason for not fasting. In type 2 diabetics, 6% were on diet alone, 56.7% were on oral hypoglycemic agents, 23.9% were on insulin and 13.7% were on insulin and Oral Hypoglycemic Agent (OHA) combination. Sulphonylurea was used by 67.6% and 75.5% of the patients were using metformin. All type 1 diabetics included in the study were only on insulin. Sixty nine percent had hypertension, 45% had neuropathy, 39% had dyslipidemia, 21.4% had past history of foot ulcer, 17% had angina, 13.6% had nephropathy and 8.8% had history of stroke. Thirty five percent of subjects reported change in their physical activity i.e Taraweeh (Prayers performed during Ramadan), walking and household chores during Ramadan.

Overall prevalence of hypoglycemia and hyperglycemia was 21.7% (71/327) and 19.8% (65/327), respectively. Only 4.0% had major hypoglycemic episodes, while 8% had major hyperglycemic episodes (Table 1). The major severity of the symptoms was assessed depending upon the assistance needed.

Out of 71 subjects who experienced hypoglycemia during fasting, 23 (32%) subjects checked plasma glucose level during hypoglycemia and the mean plasma glucose level noted was  $73 \text{ mg dL}^{-1}$ . During hyperglycemia episodes, 33 (51%) out of 65 subjects checked plasma glucose levels during hyperglycemic episodes and the mean plasma glucose level noted was  $277 \text{ mg dL}^{-1}$ . The study also showed no difference in the prevalence of hypoglycemia and hyperglycemia between type 1 and type 2 diabetic subjects during Ramadan.

**Table 1: General characteristics of the subjects**

Variables	Value
Fasting diabetic subject	72.2% (327/453)
Non fasting diabetic subject	27.8% (126/453)
Mean age (years)	$50.3 \pm 12.6$
Mean duration of diabetes (years)	$9.3 \pm 7.3$
<b>Type of diabetes in fasting subjects</b>	
Type 2 diabetes	95.6% (315/327)
Type 1 diabetes	4.4% (12/327)
<b>Gender distribution in fasting subjects</b>	
Male	49.8% (163/327)
Female	50.2% (164/327)
Prevalence of hypoglycemia	21.7% (71/327)
Prevalence of hyperglycemia	19.8% (65/327)
Prevalence of major hypoglycemia	4% (13/327)
Prevalence of major hyperglycemia	8% (26/327)

Table 2: Hypoglycemic episodes with change in medicine time, diet and physical activity

Variables	Hypoglycemia during Ramadan		p-value
	No N (%)	Yes N (%)	
<b>Medicine time</b>			
No	106 (76.3)	33 (23.7)	0.65
Yes	99 (73.9)	35 (26.1)	
<b>Diet</b>			
No	22 (64.7)	12 (35.3)	0.29
Yes	50 (74.6)	17 (25.4)	
<b>Physical activity</b>			
No	117 (76.5)	36 (23.5)	0.37
Yes	73 (71.6)	29 (28.4)	
<b>Gender</b>			
Male	108 (71.52)	43 (28.47)	0.091
Female	140 (79.54)	36 (20.45)	

Table 3: Hyperglycemic episodes with change in medicine time, diet and physical activity

Variables	Hyperglycemia during Ramadan		p-value
	No N (%)	Yes N (%)	
<b>Medicine time</b>			
No	97 (74.0)	34 (26.0)	0.37
Yes	100 (78.7)	27 (21.3)	
<b>Diet</b>			
No	25 (75.8)	8 (24.2)	0.73
Yes	52 (78.8)	14 (21.2)	
<b>Physical activity</b>			
No	112 (77.8)	32 (22.2)	0.44
Yes	72 (73.5)	26 (26.5)	

Change in medicine timing, diet and physical activity during Ramadan had no effect on the proportion of hypoglycemia and hyperglycemia during Ramadan (Table 2, 3).

Calorie calculation of one day diet during Ramadan with fasting (mean±SD =1818.20±650.08) and with out fasting (Mean±SD =1905.25±831.56) was done. There was no significant increase in the caloric intake of diet during Ramadan with fasting (p-value = 0.503) and without fasting (p-value = 0.309) compared with the diet before Ramadan.

### DISCUSSION

A large proportion of diabetic patients fast during Ramadan. In a recently published prevalence survey done in 13 Muslim countries (12,914 patients), about 42.8% of patients with type 1 diabetes and 78.7% of patients with type 2 diabetes reported fasting during Ramadan (EPIDIAR study, 2004).

To manage this group of patients is a challenging task for treating physicians. The most concerning point in the management of these patients are acute complications related to diabetes that is hypoglycemia and hyperglycemia. We designed this study to assess tendency of hypoglycemia and hyperglycemia in our fasting diabetic patients.

The prevalence of major hypoglycemia and hyperglycemia was not high as shown in many other studies (Laajam, 1990; Sulimani *et al.*, 1991). Several studies have shown similar results with no significant change in glycaemic control during Ramadan and in most of the cases acute complications were not frequently reported (Mafauzy *et al.*, 1990).

Change in medicine and its time had no significant impact upon prevalence of hypoglycemia and hyperglycemia. Similarly change in diet and physical activity during Ramadan did not increase the risk of hypoglycemia and hyperglycemia. Caloric calculation of one day diet preceding Ramadan and diet during Ramadan showed no significant increase in intake during Ramadan (Mafauzy *et al.*, 1990) in his study, on the other hand showed decreased caloric intake during Ramadan. Contrary to our study the EPIDIAR study has shown significant association of severe hypoglycemia with change of insulin as well as oral agents and with change in level of physical activity although one half of that study population did not change their life style during Ramadan including physical activity, food intake and sleep pattern (EPIDIAR Study, 2004). Regarding Self Monitoring Blood Glucose (SMBG) only 17% checked their blood glucose level even with hypoglycemic and hyperglycemic episodes. Similar findings have been reported in National Action Plans and Strategies for improvement of diabetes care in Malaysia (Malaysian Endocrine and Metabolic Society, 1998).

The study also showed no difference in the prevalence of hypoglycemia and hyperglycemia between type 1 and type 2 diabetes during Ramadan. There was no evidence of severe hypoglycemia in the study subjects, which was in agreement with other studies (Laajam, 1990; Yarahmadi *et al.*, 2003).

Being the subjective nature, this study has certain limitations. Patients were not able to remember their exact diet and physical activity pattern during Ramadan especially during episodes of hypoglycemia and hyperglycemia as this study was not planned prospectively. Documented evidence of self monitoring of blood glucose was not present in every case. Furthermore due to subjective nature of the study, the impact of change in diet, medication and physical activity on hypoglycemia and hyperglycemia can not be properly validated.

### CONCLUSION

In this retrospective study, symptoms based assessment of the glycaemic trend of fasting in diabetic patients was done. Our study suggests that all diabetic

patients who intend to fast should be counseled before Ramadan about change in medication timings and dose, dietary changes and pattern of physical activity and about role of self-monitoring of blood glucose especially during acute symptoms. As many of the patients did not come for consultation immediately before Ramadan it seems imperative to make every effort to bring them to clinic before commencement of fasting.

Because of the subjective nature of the study there are limitations, hence further prospective studies are required in future to assess the feasibility of safe fasting during Ramadan in our diabetic patients.

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