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Effects of pre-Ramadan education on safe Ramadan fasting of people with type 2 diabetes

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Abstract

Background: Most of the people with uncomplicated type 2 diabetes mellitus (T2DM) fast during the holy month of Ramadan in Bangladesh. Safe Ramadan fasting is a great challenge for both physician and people with diabetes.

Objectives: This study was conducted to observe the effects of Ramadan-focused structured education programs on weight, hemoglobin A1c (HbA1c), biochemical parameters and hypoglycemic episodes during Ramadan in Bangladeshi adult people with T2DM who intend to fast.

Methods: This prospective study recruited 615 participants with T2DM two months before the month of Ramadan in 2014 at the Endocrinology department of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. A 2-hour structured education program was provided to 286 participants (group A) and 329 participants received the usual education provided by the treating physician (group B). All participants were followed up during and upto 1 month after Ramadan.

Results: A significant reduction in the HbA1c level from pre-Ramadan to post-Ramadan was seen in both the groups (group A: 8.3±1.7%vs7.6±1.3,p<0.001; group B 8.2±1.6vs 7.7±1.4,p<0.001; mean±SD). But there were no difference of HbA1c, serum creatinine, SGPT or body weight from pre-Ramadan to post-Ramadan in either of the groups (p=ns for all). Similarly, there was no significant difference between group-A and group-B in respect of pre-Ramadan or post-Ramadan HbA1c, serum creatinine, SGPT or body weight (p=ns for all). Pre-Ramadan hypoglycemia frequency was higher in group A (51/286, 17.8%) than group B (12/329, 3.6%; p<0.001); but statistically similar hypoglycemia frequency during Ramadan was observed in both the groups (group A vs. group B: 0.3% vs. 1.8%, p=0.129). Both group A and group B participants had reduced frequency of hypoglycemia during Ramadan in comparison to those experienced 3-months prior Ramadan (p<0.001 and p=0.031 respectively) but the reduction is more marked in group A.

Conclusions: Pre-Ramadan education especially when structured has significant beneficial effects on safe Ramadan fasting reflected by reduced HbA1c and hypoglycemia frequency. *[J Assoc Clin Endocrinol Diabetol Bangladesh, January 2022; 1 (1): 09-14]*

Keywords: Bangladesh; Diabetes; Fasting; Ramadan; T2 Diabetes

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Introduction

Fasting during Ramadan is one of the five pillars of Islam and occurs yearly during the time when the holy Quran was revealed to prophet. The month-long (29-30 day) fast is obligatory for all the healthy Muslims who have reached puberty, and is a time for spiritual contemplation and seeking nearness to Allah. Followers must refrain from eating and drinking between dawn and sunset, and must also abstain from using oral medications, sexual activity and smoking. It is believed that spiritual rewards for good deeds are multiplied during Ramadan, and there is an intense desire to participate in fasting, even among those who could seek exemption. However, if an individual's health may be significantly affected by fasting or when one is sick, the Quran exempts him or her from fasting.[1] The population-based epidemiological study, Epidemiology of Diabetes and Ramadan (EPIDIAR), showed that 43% of patients with Type 1 diabetes (T1DM) and 79% of patients with Type 2 diabetes (T2DM) reported fasting in 13 Islamic countries including Bangladesh during Ramadan.[2] The EPIDIAR study conducted on 12243 Muslims showed that fasting during Ramadan increased the risk of severe hypoglycemia by 4.7-fold in patients with T1DM and by 7.5-fold in patients with T2DM.[2] Some other important potential complications of fasting for the patients are hyperglycemia, diabetic ketoacidosis, dehydration, and thrombosis. As a result of the above sufferings, it is now common for health workers to face some common questions by their patients during Ramadan, such as, can a diabetic patient fast?; what are the risks & benefits associated with fasting?; what about diet and exercise?; how to adjust drugs?; can a patient monitor blood sugar while fasting? All these questions may be answered if health workers are ready to provide a well-designed education to the patients prior to Ramadan. However, currently, patients with well-controlled T2DM are allowed to do fast during Ramadan by their health workers.[3-4] Ramadan-focused education was shown to be beneficial in empowering those living with diabetes to change their lifestyles during Ramadan.[5] Counseling before the start of Ramadan may increase awareness of adverse effects and proper management of diabetes. Citizens of the United Kingdom with T2DM who fasted during Ramadan and participated in a Ramadan education program were more likely to make healthy lifestyle choices and to minimize the risk of hypoglycemic events and weight gain.[6] In a prospective study, an improvement was shown in the number of acute diabetes complications with active glucose monitoring, alteration of drug dosage and timing, dietary counseling, and patient education.[7] For a safe fasting experience during Ramadan, patients needed pre-Ramadan assessment (such as glycemic status, complications & co-morbid conditions of patients and patient's ability to do fast); Ramadan focused structured education and motivation; and patient-centered individualized management plan.[8-10] We designed a Ramadan-focused, education program (both structured and unstructured) and aimed to assess the impact of the program on weight, biochemical parameters, and hypoglycemic episodes during Ramadan in Bangladeshi people with T2DM who intend to fast.

Methods

Study design and subjects:

This prospective study was conducted at the Endocrinology department of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. People with T2DM who gave a history of fasting in the previous year and who showed intention to fast for at least 15 days in the coming Ramadan were recruited (n=615) for the Ramadan Education program. Group A included 286 patients, who attended a 2-hour structured education program [Table-I]. Group B consisted of 329 patients, who did not attend the program but received usual education provided by the treating physician. Patients with uncontrolled hypertension, severe liver or renal disease, pregnant women, hospitalized individuals and patients with hypoglycemia unawareness were excluded from the study.

Study procedure:

Entry of patients was completed 8 weeks before Ramadan in the year 2014 according to inclusion criteria. After recruitment clinical and demographic data were recorded in a structured questionnaire. Pre-Ramadan follow-up was done after 4 weeks of entry and weight, blood glucose profiles, HbA1c, serum creatinine and Serum glutamic pyruvic transaminase (SGPT) were recorded. During Ramadan, patients were asked to record their blood sugar using a glucometer before and after Iftar on a weekly basis, and also record any adverse events, especially hypoglycemia in the record sheet. Their treating physicians followed them up as routine practice of care. Every week they contact with the patients to know hypoglycemic events. Post Ramadan follow-up was done within 4 weeks after Ramadan and included a history of hypoglycemia, anthropometric

measurements, HbAlC, serum creatinine, SGPT and any other adverse events. Hypoglycemia was defined as a blood glucose of less than 3.9 mmol/L.

Ethical aspects:

Ethical approval for the study was obtained from the departmental ethical committee. After obtaining informed signed consent, recruitment of patients for the study commenced 8 weeks before Ramadan of 2014.

Statistical analysis:

Statistical tests were considered significant at p values of <0.05. Results were expressed as mean ± standard deviation (SD) and analyzed by paired and unpaired t-test. Qualitative variables were compared using $\chi 2$ and McNemar test as applicable. The SPSS software (Windows version 17.0) was used for the analysis and interpretation of data.

Results

Table-II shows the characteristics of the studied participants of group A and group B. Mean (±SD) age of the patients of group A was 50.73 (±11.44) years. More than half of the patients (55%) were female in this group. Before Ramadan, the mean (±SD) weight of the patients was 65.26 (±9.35) kg, the mean (±SD) HbA1c level was 8.25 (±1.69)%, the mean (±SD) serum creatinine level was 0.96 (±0.33) mg/dL and the mean (±SD) SGPT level was 35.45 (±14.63) U/L in group A. The mean (±SD) age of the patients of group B was 51.78 (±11.49) years. Around 56.5% of the

Table II: The characteristics of the study participants

Variables	Group A	Group B
n	286	329
Age (years, mean ± SD)	50.73 ± 11.44	51.78 ± 11.49
Female (%)	157 (54.9%)	186 (56.5%)
Weight before Ramadan (kg, mean ± SD)	65.26 ± 9.35	63.58 ± 13.27
HbA1c before Ramadan (%,mean ± SD)	8.25 ± 1.69	8.18 ± 1.55
Serum Creatinine before Ramadan (mg/dL, mean ± SD)	0.96 ± 0.33	1.01 ± 0.22
SGPT before Ramadan (U/L, mean ± SD)	35.45 ± 14.63	32.24 ± 12.81

HbA1c: Hemoglobin A1c
SGPT: Serum glutamate pyruvate transaminase

Table III: Comparison between weight of group A and group B at baseline and post-Ramadan

Education group	Weight (Kg)		*p-value
	Baseline	Post-Ramadan	
GroupA	65.3 ± 9.4	65.5 ± 9.6	NS
GroupB	63.6 ± 13.3	64.6 ± 9.5	NS
****p-value**	NS	NS	

*by paired t-test
** by unpaired t-test
NS: not significant

Table I: Pre-Ramadan structured education program

Ramadan-focused	Diabetes-related
Meal planning and dietary advice:	**Blood glucose monitoring:**
The diet during Ramadan should not differ from a healthy balanced diet	To stress that blood glucose testing does not constitute breaking fast
To encourage slow energy-release food (such as wheat, semolina, beans, rice)	Patients who fast should know how to test their capillary blood glucose
To minimize food high in saturated fat (such as ghee, samosas and pakoras)	We encourage patients to test their blood glucose when symptomatic or unwell
Exercise:	**Recognizing and managing complications:**
To take light and moderate exercise on a regular basis	How to recognize major symptoms of hypoglycemia and hyperglycemia
To avoid vigorous exercise during evening times because of risk of hypoglycemia	How to manage hypoglycemia
	For patients' safety, to stress the need to break the fast when hypoglycemia occurs
Medical assessment:	To encourage patients to seek further medical help if complications occur
To encourage patients to seek medical advice from their general practitioners before Ramadan regarding any necessary medication change or dose adjustment	

Table IV: Comparison between biochemical parameters of group A and group B at baseline and post-Ramadan

Education group	HbAlc(%)		*p-value	S.Creatinine (mg/dL)		*p-value	SGPT(U/L)		*p-value
	Baseline	Post-Ramadan		Baseline	Post-Ramadan		Baseline	Post-Ramadan	
GroupA	8.3 ± 1.7	7.6 ± 1.3	<0.001	0.96 ± 0.33	0.95 ± 0.27	NS	39.6 ± 15.4	34.2 ± 13.7	NS
GroupB	8.2 ± 1.6	7.7 ± 1.4	<0.001	0.90 ± 0.20	1.01 ± 0.26	NS	32.1 ± 14.9	32.2 ± 13.2	NS
**p-value	NS			NS			NS		

*by paired t-test
** by unpaired t-test
HbA1c: Hemoglobin A1c SGPT: Serum glutamate pyruvate transaminase
NS: not-significant

patients were female in this group. Before Ramadan, the mean (±SD) weight of the patients was 63.58 (±13.27) kg, the mean (±SD) HbA1c level was 8.18 (±1.55) %, the mean (±SD) serum creatinine level was 1.01 (±0.22) mg/dL and the mean (±SD) serum SGPT level was 32.24 (±12.81) U/L in group B.

After Ramadan, weight, HbA1c, serum creatinine and SGPT are showed in Table-III and IV. A significant reduction in the HbA1c level from pre-Ramadan to post-Ramadan was seen in both the groups (group A: 8.3±1.7% vs 7.6±1.3, p<0.001; group B 8.2±1.6 vs 7.7±1.4, p<0.001; mean±SD). But there was no differences of HbA1c, serum creatinine, SGPT or body weight from pre-Ramadan to post-Ramadan in either of the groups (p=ns for all). Similarly, there was no significant difference between group-A and group-B in respect of pre-Ramadan or post-Ramadan HbA1c, serum creatinine, SGPT or body weight (p=ns for all).

A combination of oral antidiabetic drugs and insulin was the treatment regimen in 67 patients in group A, whereas 181 patients were taking oral antidiabetic drugs and 33 patients were on insulin in the same group and only 5 patients were advised for only lifestyle intervention. In group B, 57 patients were given a combination of oral antidiabetic drugs and insulin. Two hundred forty-three patients received oral antidiabetic drugs and 26 patients were on insulin and only 3 patients were advised for only lifestyle intervention [Table-V].

Table V: Medication received by group A and group B during Ramadan

Modality	Group A	Group B
n	286	329
Lifestyle Intervention only	5 (1.7%)	3 (0.9%)
OADs	181 (63.3%)	243 (73.9%)
Insulin	33 (11.5%)	26 (7.9%)
OADs and insulin	67 (23.4%)	57 (17.3%)

OAD: oral anti-diabetic

Pre-Ramadan hypoglycemia frequency was higher in group A (51/286, 17.8%) than group B (12/329, 3.6%; p<0.001); but similar hypoglycemia frequency during Ramadan was observed in both the groups (group A vs. group B: 0.3% vs. 1.8%, p=0.129). Both group A and group B participants had statistically reduced frequency of hypoglycemia during Ramadan in comparison to those experienced 3-months prior Ramadan (p<0.001 and p=0.031 respectively; Table-VI). But the reduction of hypoglycemic episodes is more marked in group A (pre-Ramadan 17.8% to during Ramadan 0.3%).

Table VI: Hypoglycemia among participants of Group A and group B

Group	n	Hypoglycemia within 03 months before entry	Hypoglycemia during Ramadan	*p-value
A	286	51 (17.8%)	1 (0.3%)	<0.001
B	329	12 (3.6%)	6 (1.8%)	0.031
**p-value		<0.001	0.129	

*by McNemar test ** by $\chi 2$ test

Discussion

In this prospective study, it was found that pre-Ramadan education has a huge impact in reducing the chance of hypoglycemia. There is also a significant reduction of HbA1c after Ramadan which might also be attributable to the education provided. None of the patients with T2DM required hospitalization for any of their acute complications. The HbAlc (%) level was 8.3±l.7 and 8.2±1.6 respectively in the structured and non-structured groups, suggestive of poor glycemic control before Ramadan. The mean HbAlc level in this cohort was improved significantly (p<0.001) post-Ramadan to 7.6±1.3 in structured and to 7±1.4 in the non-structured group, showing the benefits of

education during Ramadan, similar to other studies.[11,12] Changes were also observed in other parameters such as serum creatinine and serum SGPT between these two groups at post-Ramadan but not significantly. No episode of severe hypoglycemia was found among the patients during Ramadan. The reduction in the frequency of hypoglycemia noted in the present study may be attributable to the combined or individual effect of patient education, active glucose monitoring, dietary counseling, and drug dosage and timing alteration, although, the individual role of each of these modifications was not assessed. The role of structured patient education in reducing the frequency of hypoglycemic episodes was shown in another study.[6] However, the individual role of active glucose monitoring, dietary counseling, drug dosage and timing alteration needs to be determined through further studies.

This study also included all the treatment regimens; i.e. patients on oral antidiabetic drugs, patients on insulin and patients on combination therapy (oral antidiabetic drugs with insulin) and patients on only lifestyle intervention. Islam allows people with diabetes to have regular blood tests while fasting. It was found that patients who attended the structured education program had a significant improvement in glycemic status and experienced fewer hypoglycemic events. The results of the educational intervention are both clinically and statistically significant.

One of the causative factors for the positive outcomes of our education program was the structured deliberation procedure with patients.The major strength of our study was that we tried to approach and fulfill the educational needs of a specific population and make it more accessible to the individuals who attended. In addition, the information and advice that the patients received in the program provided knowledge for the patients to continue their diabetes self-management and to take responsibility for their care beyond the month of Ramadan. The patients who participated in the program chose to do so and thus they may have been motivated to make their Ramadan fast safer. That motivation is very likely to have carried them through to the sustained results we obtained at post-Ramadan.Pre-Ramadan education and motivation are very important to prevent diabetic-related complications and Islam allows diabetics to have regular blood tests while fasting. Fasting along with regular prayer has proven to aid in better control of diabetes. An uncomplicated T2DM patient can fast during Ramadan safely.

Conclusion

Pre-Ramadan education especially when structured has significant beneficial effects on safe Ramadan fasting.

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Conflict Of Interest

The authors have no conflicts of interest to disclose

Financial Disclosure

The author(s) received no specific funding for this work.

Data Availability

Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

Ethical approval for the study was obtained from the Institutional Review Board. The written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.

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