RESEARCH ARTICLE

The effect of applying Ramadan education and awareness program on clinical outcomes among Type 2 diabetes mellitus patients who fast during Ramadan

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ABSTRACT

Fasting during Ramadan is a spiritual and religious practice. Fasting increases the risk of complications in people with diabetes, including hypoglycaemia and hyperglycaemia. There is a lack of evidence-based medicine in managing diabetes during Ramadan. Various recommendations are based more on expert opinion than clinical evidence.

Objectives: To evaluate the effectiveness of applying Ramadan education and awareness programs on blood glucose profile among Type 2 Diabetes Mellitus patients who fast during Ramadan.

Methods: This quantitative design of a quasi-experimental study involving 84 type 2 diabetic patients recruited one week before Ramadan at the Diabetes and Endocrine Center in Sulaimani city. The Enrolled patients were divided into two groups. Forty-three patients were in the first group, Group A, who participated in a 1-hour education program with repeated follow-up throughout the month of investigation. The control group, Group B, comprised 41 patients who were invited but did not enter the program.

Results: After Ramadan, the intervention group had a mean weight reduction of 0.9 kg. A considerable improvement was observed in the Mean of blood glucose among the intervention group, which declined from (182.3 mg/dl) to (171.3 mg/dl). In the intervention group (74.4%) of patients reported not experiencing any symptoms. Whereas in the control group, this proportion is (53.7%).

Conclusions: This Ramadan-focused educational program supported type 2 diabetic patients in weight loss, improved glucose control, and safer fasting during Ramadan.

Keywords: type 2 diabetes, Ramadan education, Fasting

INTRODUCTION

Fasting during Ramadan is spiritual and religious (Shiju et al., 2022). Every healthy adult Muslim must practice it (Sahin et al., 2013). Even though the Quran exempts those diagnosed with illness from fasting, most Muslim practitioners with diabetes do not see themselves as sick and continue to fast(Lee et al., 2017). Fasting increases the risk of complications in people with diabetes, including hypoglycaemia, hyperglycaemia, and ketoacidosis, because it alters physiological factors like eating habits and circadian rhythms (Hanif et al., 2020). The International Diabetes Federation has recommended structured education programs as important for enabling patients to manage their diabetes better (International Diabetes Federation, 2021). Diabetes education with a Ramadan focus can be a beneficial tool to improve health care for people with diabetes during Ramadan since it will allow patients to fast safely.(Muhammad Yakoob Ahmedani et al., 2016) Medical practitioners should be aware of dietary and physical activity. Medication-taking changes come with fasting during Ramadan, as well as the risks (primarily hypoglycaemia and hyperglycaemia) and methods for dealing with those changes and reducing those risks(McEwen et al., 2015). Recommendations have been made to prevent or lower the risk of problems in diabetic patients who fast. Therapeutic education focused on Ramadan, including dietary modifications and glycaemic self-monitoring, is essential (Jamoussi et al., 2017). This study's primary goal is to evaluate the effectiveness of applying Ramadan education and awareness programs on blood glucose profile among Type 2 Diabetes Mellitus patients who fast during Ramadan.

METHOD

This quantitative design of a quasi-experimental study involved 84 type 2 diabetic patients recruited one week before Ramadan at the Diabetes and Endocrine Center in Sulaimani city. Muslim patients with Type 2 DM who insisted on fasting and attending the Diabetes and Endocrine Center in Sulaimani City were enrolled; type 2 DM patients on lifestyle measures, oral medications and injection therapies; type 2 DM Patients with ≥18 years of age, Both genders, those who had been receiving diabetes-related treatment for at least 1 year prior to the study and who consented to the study were included. We excluded type 2 DM patients with the following complications or comorbidities: chronic liver disease, chronic renal diseases, diabetic retinopathy, severe anaemia and those patients on medications known to cause hyperglycemia like corticosteroids... The recruited patients were divided into two groups: 43 patients were in the first group, Group A, who participated in a 1-hour education program with repeated follow-up

throughout the month of investigation. The control group, Group B, comprised 41 patients who were included but did not participate in the program. This education programme aimed to help patients develop the knowledge and self-care abilities necessary to manage their disease more effectively during Ramadan. Objectives of the programme:

- He balanced dietary intake regarding quality and quantity (limiting fatty and fried foods and products with high glycemic index.
- During non-fasting periods, avoid dehydration by consuming enough liquids.
- They identify the clinical signs of hypoglycemia and hyperglycemia and what to do if they occur.
- Proper therapeutic compliance through adherence to doctor-recommended therapy changes.
- Please focus on the importance of SMBG for detecting hypoglycemia (<70 mg/dl) and hyperglycemia (>300 mg/dl), which are signs that it is time to break the fast.

Our education programme followed all the principles of structured education outlined in the International Diabetes Federation (IDF, 2021).

Body mass index, weight, Waist circumference, fasting blood sugar (FBS), and HbA1c were measured. Also, self-awareness was assessed by 11 questions after Ramadan fasting.

Data analysis was conducted on Statistical Package for Social Sciences (SPSS), version 22.0. All the continuous variables, i.e. age, duration of diabetes, waist circumference, body weight, body mass index (BMI), fasting blood sugar, HbA1c, were presented as Mean ± SD. Categorical variables, such as gender, education level, occupation, and types of management, were presented in the form of numbers and percentages. A paired t-test was utilized to find the difference in mean values, and chi-square was used for categorical variables. $P < 0.05$ was considered statistically significant.

RESULTS

A total of 84 patients with type 2 diabetes (37 males and 47 females) attended the pre-Ramadan recruitment interview. Participants were divided into 43 patients in the study group and 41 patients in the control group. Table 1 summarizes the demographic distribution of the enrolled patients in the study and has no role of statistical significance in demography.

Table 2 summarizes the Effects of a Ramadan education and awareness program on the clinical characteristics of the patients in the control and intervention groups. After Ramadan, the intervention group had a mean weight reduction of 0.9 kg compared with a 1.0 kg mean weight gain in the control group. The level of BMI among the studied group generally shows a considerable improvement in BMI among the

experimental group when comparing the results at baseline data in the same group. When results are compared to baseline data from the same group, the BMI level among the control group typically worsens. Among participants in the study group, waist circumference positive changes were observed; the mean difference in this group decreased from (97.7 cm) to (96.6 cm). In contrast, the mean difference in the control group increased from (100.8 cm) to (101.7 cm). Regarding the comparison of means for the blood glucose at baseline and after implementation of the program, there is a considerable improvement in the Mean of blood glucose among the experimental group, and it declined from (182.3 mg/dl) to (171.3 mg/dl).

In contrast, the mean for the blood glucose in the controlled group rose from (201.8 mg/dl) to (230.5 mg/dl). When comparing the HbA1c means at baseline and after the program's implementation, the experimental group's HbA1c mean improved; it declined from (8.33%) to (8.15%). At the same time, the control group's mean rose from (8.44%) to (8.84%). Table 3 summarizes the impact of RFEP on the frequency of hypoglycemic symptoms during Ramadan. The experimental group (74.4%) of patients reported not experiencing any symptoms. Whereas in the control group, this proportion is (53.7%). Furthermore, Only 2.3% of the patients in the study group experienced hypoglycemia once during Ramadan, compared to 9.7% of the patients in the control group. In addition, about 14.9% of the patients in the study group experienced hypoglycemia more than twice during Ramadan, compared to 34.1% of the patients in the control group.

Table 1. Demographic characteristics related to patients.

Variables	N=84				Total	
	N=43 Study group		N= 41 Control group			
	Frequency	%	Frequency	%	Frequency	%
Age						
< 50 years	11	25.6	10	24.4	21	25.0
50-59 years	11	25.6	16	39.0	27	32.1
≤ 60 years	21	48.8	15	36.6	36	42.9
Mean ± SD	57.6± 10.3		55.9± 10.4			
Gender						
Male	21	48.8	16	39.0	37	44.0
Female	22	51.2	25	61.0	47	56.0
Marital status						
Single	0	0	1	2.4	1	1.2
Married	43	100	40	97.6	43	98.8
Level of education						
Illiterate	16	37.2	11	26.8	27	32.1
Primary school graduated	8	18.6	16	39.0	24	28.6
Secondary school graduate	10	23.3	12	29.3	22	26.2
Institute, university and higher graduated	9	20.9	2	4.9	11	13.1
Residency						
Urban	34	79.1	37	90.2	71	84.5
Sub-urban	9	20.9	4	9.8	13	15.5
Occupation						
Employed	11	25.6	6	14.6	17	20.2
Self-employed	5	11.6	0	0	5	6.0
Housewife	18	41.9	23	56.1	41	48.8
Retired	8	18.6	7	17.1	15	17.9
Jobless	0	0	2	4.9	2	2.4
Other	1	2.3	3	7.3	4	4.8
Economic status						
Sufficient	20	46.5	18	43.9	38	45.2
Barely sufficient	19	44.2	19	46.3	38	45.2
Insufficient	4	9.3	4	9.8	8	9.5
Total	43	51.2	41	48.8	84	100

Table 2   Effects of a Ramadan-focused education program on the clinical characteristics of the patients in the control and intervention groups

		Study group G1 (n = 43)			Control group G2 (n = 41)			
		Before Ramadan	After Ramadan	Difference	Before Ramadan	After Ramadan	Difference	P.value
Weight (kg)		79.2± 13.2	78.3 ± 12.6	- 0.9	78.9 ± 13.8	79.9 ± 14.0	+ 1.0	NS
BMI (kg/m2)	< 25	68.7 ± 5.4	69.3 ± 8.4	+ 0.6	54.4	55	+ 0.6	NS
	25 – 30	78.5±9.5	77±10	- 1.24	74.8±6.4	74.99±6.6	+ 0.2	S
	> 30	86.88±9.9	84.82±10.2	- 1.05	90.25±13.4	91.39±13.3	+ 0.95	NS
Waist Circumference		97.7± 11.9	96.6± 11.2	- 1.11	100.8±12.9	101.7±12.9	+ 0.91	NS
FBG		182.3± 52.3	171.3± 49.9	- 11.0	201.8±53.2	230.5±83.0	+ 28.7	S
HbA1c		8.33 ± 1.43	8.15 ±1.28	-0.18	8.44 ± 1.38	8.84±1.17	+ 0.40	NS

Table 3 Effects of Ramadan education and awareness program on hypoglycaemias during Ramadan.

How often did you have hypoglycemic symptoms during Ramadan?	Experimental group (N = 43)		Control group (N = 41)	
	N	Frequency	N	Frequency
Never	32	74.4	22	53.6
One	1	2.32	4	9.75
Two	4	9.3	1	2.43
More than two	6	13.9	14	34.1

DISCUSSION

The sample size for this study was eighty-four, and the mean age of participants was comparable between the two groups: 57.6 years in the study group and 55.9 years in the control group. The majority of patients (34.6%) had diabetes for more than ten years, (78.6%) of patients took oral anti-diabetic medications, while (19%) of participants took tablets and insulin. The majority of patients (84%) reported having co-morbidities. Regarding participant body weight, the current study found that after the program's implementation, patients in the study group experienced positive changes in their weight. The mean difference of patients body weight in the study group dropped from (79.2 kg) to (78.3 kg). An average weight loss of 0.7 kg was observed in the patient group that received an educational programme in the study READ (Ramadan Education and Awareness in Diabetes) (Bravis et al., 2010), which was carried out in England in 2010 with 111 type 2 diabetics treated with ADO. Also, According to a study by (McEwen et al., 2015), there was an average weight loss of 0.7 kg between the beginning and the end of Ramadan. A study in Singapore assessed Ramadan Fasting and Related Changes in Glycaemia, Caloric Intake, and Body Composition with Differences in Gender revealed a similar body weight in intervention group patients (Yeoh et al., 2015). These variations can be related to different Ramadan customs and food practices in various nations.

According to the current study findings, Ramadan-focused education programs had a significant association with patients' BMI. In this study, the BMI level was decreased by 0.20 among the study samples. Similar findings were presented in studies (Muhammad Y. Ahmedani et al., 2014) (El Toony et al., 2018)(Tourkmani et al., 2021).

In this study, glycemic control indicators also improved after program intervention. For instance, FBG was decreased by 21.5 mg/dl in an interventional group and HbA1c by 0.23% among the study samples. Similar findings were presented in a study by (2014) in Thailand, which observed the impact of Ramadan-focused education on Type 2 diabetic Muslims' awareness and glycemic control—in Ramadan, reported FBG decreased from 178.62 mg/dl to 160.13mg/dl and HbA1c by 0.23%. This is in addition to a former study at 2012 on 71 Diabetic patients to investigate the impact of Glycemic control and "Targeted Diabetes Education" during Ramadan fasting. The result of this study reported mean fasting blood glucose was reduced by 57 mg/dL, HbA1c by 1.5% in the intervention group (Mustafa et al., 2012).

The main issue for diabetic patients during Ramadan is the risk of hypoglycemia(Ahmad et al., 2012), in the present study more patients in the study group (74.4%) than in the control group

(53.7%%) reported not experiencing any symptoms. in addition, only 2.3% of patients in the study group experienced hypoglycemia symptoms more than twice during Ramadan, compared to 17.1% of patients in the control group. The risk of hypoglycemia seems to be decreased as a result of the Ramadan-focused educational program, This finding is in keeping with the a controlled intervention based study by (Tourkmani et al., 2021) on 262 type 2 diabetes patients reported that the Ramadan Focused Education Program had a positive effect and can be a helpful tool to get better results, like fewer cases of hypoglycemia and safe fasting for T2D patients during Ramadan. Additionally, a study in Egypt assessed the effect of structured diabetes education on diabetic patients' glycemic control while fasting during Ramadan revealed a 31% reduction in hypoglycemic events in intervention group patients (Nassar et al., 2021).

CONCLUSIONS

Participants in the Ramadan-focused educational program had improved overall BMI, weight, FBS, and HbA1c control during Ramadan and were less likely to develop hypoglycemia. This educational program on Ramadan helped type 2 diabetic patients fast more safely during the holy month.

Ethical Approval Statement

This research study, titled " **The effect of applying Ramadan education and awareness program on clinical outcomes among Type 2 diabetes mellitus patients who fast during Ramadan** " conducted by [**Hazhar Salih Mohammed** [1], **Dr.Dler Shamsulddin Hamid** [2]], has received ethical approval from the [The Ethics Committees of College of medicen] at [the University of Sulaimani].

AUTHOR'S CONTRIBUTIONS

All authors contributed equally to the conception and design of the study, data collection, and analysis, and drafted the initial manuscript. All authors critically reviewed and edited the manuscript. All authors approved the final version of the manuscript for submission.

DISCLOSURE STATEMENT:

The authors report no conflict of interest.

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