Original Article

Assessment of Ramadan Education and Knowledge among Diabetic Patients in Taif City

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Abstract

Introduction: Understanding diabetes management during Ramadan is crucial for diabetic patients for effective interventions. This study aimed to assess Ramadan education and knowledge among diabetic patients in Taif City

Methodology: a cross-sectional study was done on 389 diabetic patients using an online questionnaire. Data about patients' demographics, dietary habits, physical activity, type and duration and DM treatment, comorbidities, changes in time and dose of drug administration, experience of hypoglycemia and hyperglycemia and their management during fasting were collected.

Results: 27.2% had an age >50 years, 63% were females, 87.1% had comorbidity, 54.5% had DM type 1, 36.8% had DM duration of 1-5 years and 87.7% were fasting during Ramadan. During Ramadan, 32.1% were not eating sweets, 37.3% were not taking their Suhoor late and 84.6% and 82.8% were aware of the symptoms of hyper and hypoglycemia respectively. Most of them (73.8%) received instructions and knowledge about DM during Ramadan and 67.9% were willing to know more. Of them, 60.2% had a good overall awareness level about Ramadan education and knowledge and good overall awareness was significantly higher among those not having comorbidity, or heart diseases, with type 1 DM, on insulin, who maintain control of glucose levels during Ramadan, who experience the symptoms of hypo or hyperglycemia and check blood glucose levels if symptoms of hypo or hyperglycemia develop.

Conclusion: despite the adequate overall awareness, the results highlight the need to raise diabetics awareness of diabetes and diabetic self-care techniques in Ramadan.

Keywords: *assessment, Ramadan, education, knowledge, diabetic, Taif*

Introduction

Diabetes is a chronic illness that is highly prevalent globally. typified by elevated blood glucose (blood sugar) levels, which over time can seriously harm a number of organs. The Kingdom of Saudi Arabia is now seeing a significant increase in the number of patients with diabetes. Furthermore, 20% of Saudi Arabia's population has diabetes, making it the country with the seventh-highest prevalence in the world (1).

Numerous dietary, lifestyle, and socioeconomic factors have been identified as risk factors for diabetes mellitus (DM) in Saudi Arabia and have been connected to the disease (2). Ramadan fasting is the fourth of Islam's five pillars. Most Muslims with type 1 or type 2 diabetes fast once a year during the Islamic lunar month. During this period, all Muslims who are in good health are required to fast (2). Nonetheless, Muslims who are really sick or have chronic conditions like diabetes mellitus are exempt from fasting. Importantly, some people with diabetes insist on fasting and refuse to abide by their doctors' advice (3).

During the month of Ramadan, the Epidemiology of Diabetes and Ramadan (EPIDIAR) study looked at the characteristics of 12,243 diabetics. The results showed that 43% of patients with type 1 diabetes and 79% of patients with type 2 diabetes were able to maintain a fast-during Ramadan (4). Hypoglycemia is one of the potential problems that many diabetics who fast throughout Ramadan may not fully understand. Because of this ignorance, they may not receive enough attention for their condition during fasting, which could endanger their health (3).

To find any gaps and create suitable solutions to reduce difficulties, it's critical to comprehend the diabetic patients' level of education and awareness regarding the Ramadan fast. Fasting during Ramadan can have serious consequences for diabetic patients, such as adjustments to their weight, lipid profile, and glycemic management (5).

The safety of diabetic patients throughout the fasting period of Ramadan is of utmost importance.

Healthcare professionals can better adapt their teaching and assistance to patients' requirements and lower the risk of acute complications by knowing about their awareness and understanding of controlling their diabetes while fasting (3). For diabetic patients who fast during Ramadan, adjustments to insulin dosages, timing, and oral hypoglycemic medications may be required. Measuring the patients' awareness and comprehension of these modifications can help medical professionals make sure that patients are properly managing their condition during fasting (5).

Diabetes-specific Ramadan health education can significantly support healthy lifestyle changes throughout the holy month of Ramadan. Examining diabetes patients' evaluations of their education and knowledge of Ramadan may provide valuable insights into the effectiveness of current educational programs and highlight areas that require improvement (3).

Research has shown that fasting during Ramadan increases the risk of severe hypoglycemia in people with type 1 and type 2 diabetes (6). It may be challenging for diabetes patients to adhere to their regimens when fasting because they have to take their prescriptions after meals and fast until the evening (7). Patients must be trained to identify and respond to hypoglycemia symptoms to prevent complications (7). To maintain stable blood glucose levels and overall health, it is essential to promote a balanced diet during non-fasting hours (7).

This study aimed to assess Ramadan education and knowledge among diabetic patients in Taif City, Saudi Arabia.

Subjects and Methods

Research design, setting and time frame: a cross-sectional study was conducted in Taif City, Saudi Arabia from March to May 2024.

Study participants: the inclusion criteria were diabetic patients with type 1 or type 2 diabetes above 12 years receiving diabetes-related treatment for at least one year before the study. Patients with serious complications such as uncontrolled

hypertension, those with unstable angina, and pregnant women were excluded.

Sample size: the pooled prevalence of DM in Saudi Arabia in a recent systematic review and meta-analysis dome in 2023 was 16.4% (8). Using the Raosot online calculator and based on the Saudi total population, using a margin of error of 5% and a confidence interval of 95%, a minimum sample of 211 was calculated.

Data collection tool: A questionnaire was distributed as an online survey, where participants were made aware of the purpose of the study and only those who consented to the use of their data in the analysis were included. The following variables were obtained: demographic characteristics, dietary habits, and physical activity by recording data from patient files to extract information as well as by conducting individual interviews. Other information obtained included the type and duration of diabetes, and any medications patients were taking, and associated comorbidities such as dyslipidemia, high blood pressure, and the presence of heart disease. Changes in the time and dose of drug administration and evidence of hypoglycemia and hyperglycemia were also recorded, in addition to how these conditions were managed during fasting. The type of diabetes was identified based on the original reported diagnosis.

A total of fifteen questions assessed the participants Ramadan education and knowledge. For every correct answer a sore of "1" was given, and for every wrong or "I don't know" answer a score of "0" was given leaving a total score of 15. If a participant's score was less than 60% of the total, the overall awareness score was classified as bad, and if the participant's score was 60% or higher, the overall awareness score was considered good (9).

Ethical considerations: an ethical approval for the study was obtained from the Research Ethics Committee of Al-Hada Research Center, Taif, Saudi Arabia.

Data analysis: data was analyzed using SPSS application version 26. To examine the relationship between the variables, the Chi-squared test ($\chi2$) was used for qualitative data presented as numbers and percentages. Mean and standard deviation (Mean ± SD) were used for quantitative variables. Correlation analysis was carried out using Spearman's test, with statistical significance defined as a p-value of less than 0.05.

Results

Of the 389 diabetic patients studied, 22.1% had an age ranging from 21-30 years and 27.2% had an age more than 50 years. The majority (63%) were females, and 87.1% had comorbidity with Dyslipidemia (42.9%) the most common **(Table 1)**.

Table 1. Distribution of patients studied according to their demographic data and presence of comorbidity (No.: 389)	
Variable	**No. (%)**
Age (years)	
12-20	79 (20.3)
21-30	86 (22.1)
31-40	57 (14.7)
41-50	61 (15.7)
>50	106 (27.2)
Gender	
Female	245 (63)
Male	144 (37)
Comorbidity	
No	50 (12.9)
Yes	339 (87.1)
If yes, specify: (No.: 339)	
HTN	143 (36.8)
Dyslipidemia	167 (42.9)
Heart diseases	65 (16.7)

(Table 2) shows that 54.5% of patients had DM type 1, 36.8% had DM duration of 1-5 years and 38.3% were on oral glucose lowering agent for DM management. The majority (87.7%) reported that they fast during Ramadan.

Table 2. DM clinical data and fasting during Ramadan among studied patients (No.: 389)	
Variable	**No. (%)**
DM type	
Type 1	212 (54.5)
Type 2	177 (45.5)
DM duration (years)	
1-5	143 (36.8)

6-10	105 (27)
11-15	66 (17)
>15	75 (19.3)
Type of DM treatment	
Insulin	113 (29)
Oral glucose lowering agent + insulin	72 (18.5)
Oral glucose lowering agent	149 (38.3)
Diet	55 (14.1)
Do you fast during Ramadan?	
No	48 (12.3)
Yes	341 (87.7)

(Table 3) demonstrates that 32.1% of patients were not eating sweets during Ramadan, 37.3% were not taking their Suhoor late and 75.3% were not using an injection of glucagon while fasting. Of them, 82.3% were consuming enough fluids, 45.2% were exercising, and 73.3% change the time and dose of their medicine during Ramadan. The majority (84.6% and 82.8%) were aware of the symptoms of

hyper and hypoglycemia respectively. And 73.8% received instructions and knowledge about diabetes mellitus during Ramadan. About 64% (64.3%) were aware of their glucose levels during Ramadan and 76.1% agreed that fasting help to control blood glucose levels.

(Table 4) demonstrated that 33.9% of patients reported that they manage their hypoglycemia during fasting by consuming a lot of juice and fluid. And 39.6% reported that they monitor their blood glucose more than one time per day during Ramadan. More than half (58.9%) reported that if symptoms of hypoglycemia developed, they will stop fasting and only 19% reported that if symptoms of hyperglycemia developed, they will visit a doctor.

Table 3. Participants' responses to knowledge questions related to Ramadan education and DM care during Ramadan (No.: 389)		
Variable	**No (No. %)**	**Yes (No. %)**
Do you eat sweets during Ramadan?	125 (32.1) *	264 (67.9)
Do you consume enough fluids during Ramadan?	69 (17.7)	320 (82.3) *
Do you exercise during Ramadan?	213 (54.8)	176 (45.2) *
Do you take your Suhoor late?	145 (37.3) *	244 (62.7)
Do you change the time and dose of your medicine during Ramadan?	104 (26.7)	285 (73.3) *
Do you use an injection of glucagon while fasting?	293 (75.3) *	96 (24.7)
Are you aware of the symptoms of hyperglycemia?	60 (15.4)	329 (84.6) *
Are you aware of the symptoms of hypoglycemia?	67 (17.2)	322 (82.8) *
Did you receive instructions and knowledge about diabetes mellitus during Ramadan?	102 (26.2)	287 (73.8) *
Are you aware of your glucose levels during Ramadan?	139 (35.7)	250 (64.3) *
Does fasting help to control blood glucose levels?	93 (23.9)	296 (76.1) *

*N.B.: * = Correct answer*

Table 4. Knowledge questions related to monitoring blood glucose and management of hypo and hyperglycemia during Ramadan (No.: 389)	
Variable	**No. (%)**
How do you manage your hypoglycemia during fasting? *	
I eat small snacks	140 (36)
I stop taking my medication	27 (6.9)
I consume a lot of juice and fluid*	132 (33.9)
I do not do anything	90 (23.1)
How many times do you monitor your blood glucose during Ramadan? *	
Never	50 (12.9)

Once a day	120 (30.8)
More than one time per day*	154 (39.6)
Once a week	46 (11.8)
Monitor at clinic	
What did you do when symptoms of hypoglycemia developed? *	
Continued to fast	83 (21.3)
Stopped fasting*	229 (58.9)
Visited a doctor	69 (17.7)
Required hospitalization	8 (2.1)
What did you do when symptoms of hyperglycemia developed? *	
Continued to fast	137 (35.2)
Stopped fasting	159 (40.9)
Visit a doctor*	74 (19)
Required hospitalization	19 (4.9)

*N.B.: * = Correct answer*

As for participants attitude towards Ramadan education, 67.9% were willing to know more about fasting during Ramadan. And as for their practice, 71.7% were maintaining control of their glucose levels during Ramadan. Of them, 63.5% experienced symptoms of hypoglycemia, and 74.8% reported that they check their blood glucose levels when symptoms of hypoglycemia developed. As for hyperglycemia, 70.7% experienced symptoms of hyperglycemia and 81.7% reported that they check blood glucose levels if symptoms of hyperglycemia develop **(Table 5)**.

The mean knowledge score was 8.78 ± 2.18, and **(Figure 1)** illustrates that 60.2% of studied participants had a good overall awareness level about Ramadan education and knowledge.

(Table 6) shows that the good overall awareness level about Ramadan education and knowledge was significantly higher among patients who don't have comorbidity and among those who don't have heart diseases ($p=<0.05$). Good overall awareness level was also significantly higher among patients with type 1 DM and who were on insulin for DM management ($p=<0.05$) **(Table 7)**.

Table 5. Participants' responses to attitude and practice questions related to Ramadan education and DM care during Ramadan (No.: 389)		
Variable	**No (No. %)**	**Yes (No. %)**
Attitude		
Do you want to know more about fasting during Ramadan?	125 (32.1)	264 (67.9)
Practice		
Do you maintain control of your glucose levels during Ramadan?	110 (28.3)	279 (71.7) *
Did you experience the symptoms of hypoglycemia?	142 (36.5)	247 (63.5)
Did you check your blood glucose levels if symptoms of hypoglycemia develop?	98 (25.2)	291 (74.8)

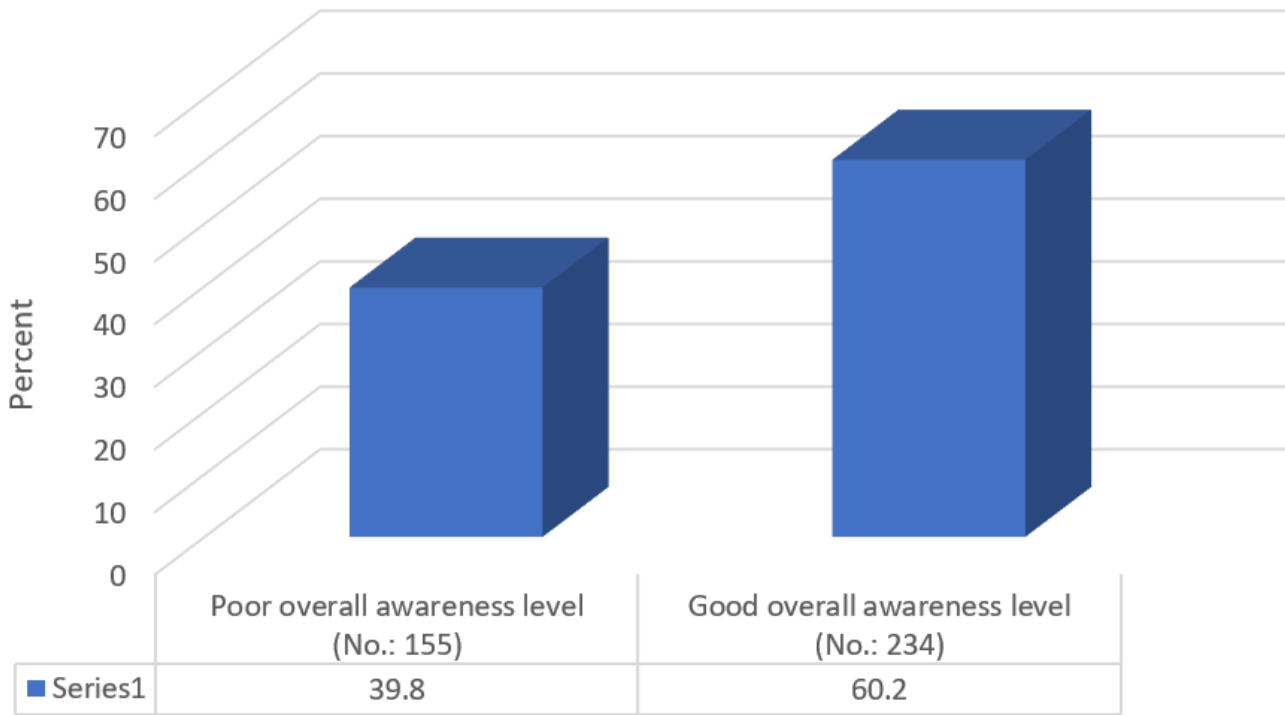|		
Did you experience the symptoms of hyperglycemia?	114 (29.3)	275 (70.7)
Did you check your blood glucose levels if symptoms of hyperglycemia develop?	71 (18.3)	318 (81.7)

Figure 1: Percentage distribution of overall awareness level about Ramadan education and knowledge

As for the relationship between the overall awareness and participants' attitude and practice, it was found that the good awareness level was significantly higher among patients who maintain control of glucose levels during Ramadan, who experience the symptoms of hypo or hyperglycemia and check blood glucose levels if symptoms of hypo or hyperglycemia develop (p=<0.05) **(Table 8 and Figure 2)**.

Table 6. Relationship between the overall awareness level about Ramadan education and knowledge and participants demographics and comorbidity (No.: 389)				
Variable	**Overall awareness level**		**χ2**	**p-value**
	Poor No. (%)	**Good No. (%)**		
Age (years)				
12-20	25 (16.1)	54 (23.1)	9.01	0.061
21-30	38 (24.5)	48 (20.5)		
31-40	20 (12.9)	37 (15.8)		
41-50	33 (21.3)	28 (12)		

>50	39 (25.2)	67 (28.6)		
Gender				
Female	92 (59.4)	153 (65.4)	1.45	0.228
Male	63 (40.6)	81 (34.6)		
Comorbidity				
No	142 (91.6)	197 (84.2)	4.58	**0.032**
Yes	13 (8.4)	37 (15.8)		
If yes, specify: (No.: 339)				
HTN	55 (35.5)	88 (37.6)	0.18	0.671
Dyslipidemia	64 (41.3)	102 (43.6)	0.2	0.653
Heart diseases	36 (23.2)	29 (12.4)	7.86	**0.005**

Table 7. Relationship between the overall awareness level about Ramadan education and DM clinical data and fasting during Ramadan (No.: 389)				
Variable	**Overall awareness level**		χ^2	**p-value**
	Poor No. (%)	**Good No. (%)**		
DM type				
Type 1	72 (46.5)	140 (59.8)	6.72	0.009
Type 2	83 (53.5)	94 (40.2)		
DM duration (years)				
1-5	62 (40)	81 (34.6)	1.42	0.699
6-10	38 (24.5)	67 (28.6)		
11-15	25 (16.1)	41 (17.5)		
>15	30 (19.4)	45 (19.2)		
Type of DM treatment				
Insulin	30 (19.4)	83 (35.5)	17.24	0.001
Oral glucose lowering agent + insulin	25 (16.1)	47 (20.1)		
Oral glucose lowering agent	70 (45.2)	79 (33.8)		
Diet	30 (19.4)	25 (10.7)		
Do you fast during Ramadan?				
No	24 (15.5)	24 (10.3)	2.35	0.125
Yes	131 (84.5)	210 (89.7)		

Table 8. Relationship between the overall awareness level about Ramadan education and participants' attitude and practice (No.: 389)				
Variable	**Overall awareness level**		χ^2	**p-value**
	Poor No. (%)	**Good No. (%)**		
Attitude				
Do you want to know more about fasting during Ramadan?				
No	56 (36.1)	69 (29.5)	1.88	0.17
Yes	99 (63.9)	165 (70.5)		
Practice				
Do you maintain control of your glucose levels during Ramadan?				
No	67 (43.2)	43 (18.4)	28.38	<0.001

Yes	88 (56.8)	191 (81.6)		
Did you experience the symptoms of hypoglycemia?				
No	76 (49)	66 (28.2)	17.44	<0.001
Yes	79 (51)	168 (71.8)		
Did you check your blood glucose levels if symptoms of hypoglycemia developed?				
No	64 (41.3)	34 (14.5)	35.42	<0.001
Yes	91 (58.7)	200 (85.5)		
Did you experience the symptoms of hyperglycemia?				
No	64 (41.3)	50 (21.4)	17.86	<0.001
Yes	91 (58.7)	184 (78.6)		
Did you check your blood glucose levels if symptoms of hyperglycemia developed?				
No	51 (32.9)	20 (8.5)	37.07	<0.001
Yes	104 (67.1)	214 (91.5)		

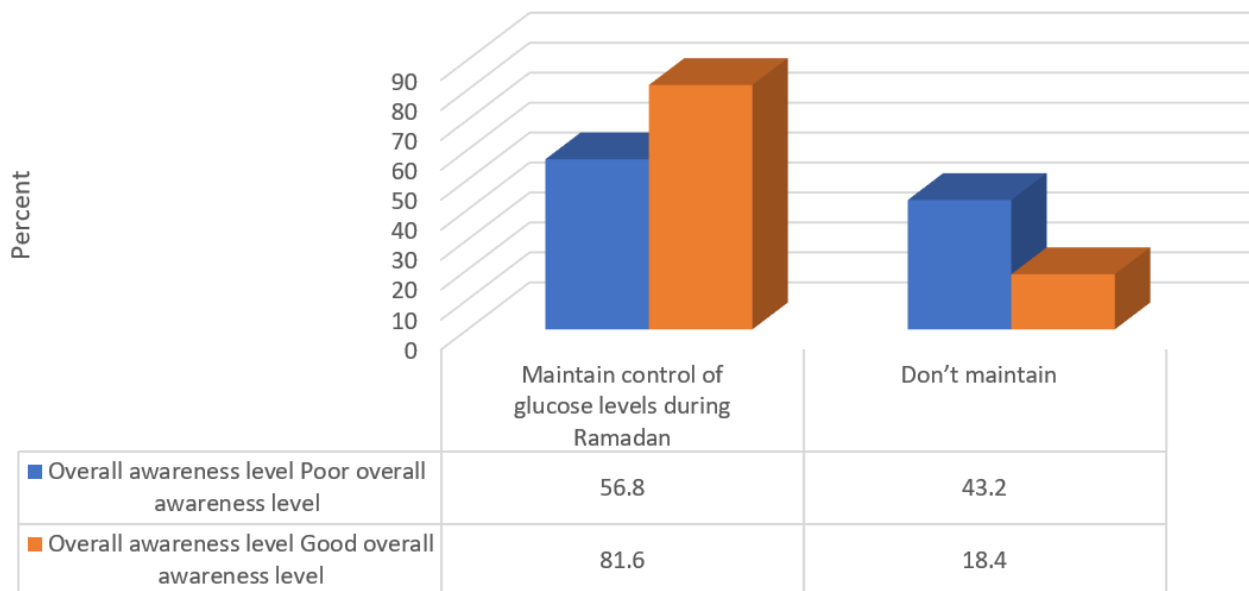|	Maintain control of glucose levels during Ramadan	Don't maintain
Overall awareness level Poor overall awareness level	56.8	43.2
Overall awareness level Good overall awareness level	81.6	18.4

Figure 2: Relationship between the overall awareness level about Ramadan education and participants' practice of maintaining control of glucose levels during Ramadan (No.: 389)

*N.B.: (χ2 =28.38, p-value =**<0.001**)*

Discussion

The current study aimed to assess the level of education and knowledge among diabetic patients in Taif, Saudi Arabia regarding fasting during Ramadan. Reference to Saudi Ministry of health recommendations, patients with diabetes should consult their doctor at least six to eight weeks prior to the commencement of fasting. During this visit, the doctor will assess the patient's health and recommend a modified diet plan that will improve blood glucose control during fasting and aid in weight loss for those who are obese during Ramadan

(10). The recommendations for management of diabetes in patients who elect to fast during Ramadan were proposed in 1995 at a conference in Casablanca (11).

The current study revealed that most diabetic cases were females with both type I and type II DM and complained of other co-morbidity. Also, one-third of the cases were recent cases (less than 5 years) and mainly on OHG drugs. The vast majority of diabetic cases reported they fast during Ramadan. This was in concordance with previous study by who documented that 43% of patients with type 1

diabetes and 79% of patients with type 2 diabetes were able to maintain a fast-during Ramadan (4).

The current study found that less than two-thirds of diabetes patients had an overall good awareness level about their knowledge and awareness of fasting and diabetic treatment during Ramadan. More specifically, the majority of participants with diabetes reported changing the time and dosage of their medication during Ramadan, drinking adequate fluids, and being aware of hyper- and hypoglycemia symptoms during fasting. Additionally, the majority of them believe that fasting helps to regulate blood glucose levels because they were taught about diabetes mellitus during Ramadan. However, the majority of individuals had unhealthy habits of eating sweets during Ramadan and staying up late. Patients with additional co-morbidities, particularly those with heart conditions, were shown to be more cautious and to give their health more thought because they are more likely to experience consequences. Higher levels of awareness were also linked to type I diabetes and insulin use. These results were in line with those of Almalki MH et al. (12), who discovered that 76% of diabetics reported fasting and 58% said they checked their blood sugar levels during the day. This was similar to the current study reported rate where 87.1% of the cases monitor their blood glucose level daily during Ramadan.

According to a different study by Al-Amoudi et al. (13), only 30% of patients received advice and information about fasting during Ramadan. Blood glucose monitoring is essential for high-risk individuals who choose to fast throughout Ramadan because it will allow them to break the fast if their blood glucose levels are over 300 mg/dL (16.7 mmol/L) or less than 70 mg/dL (less than 3.9 mmol/L). found that while 75.9% of the Muslims with diabetes had general awareness and 58.8% had knowledge about fasting (which is comparable to the results of the current study), 71.4% of patients saw their doctors during the previous Ramadan, 72.7% tested their blood sugar, and 47.0% had episodes of hypoglycemia. In found that Only 49.1% of participants had consulted their doctors about their intentions to fast prior to the Ramadan,

and only 38.1% of participants monitored blood glucose levels throughout the month which much less than the reported rate in our study.

According to this study, very few diabetes individuals are aware of how to handle hypoglycemia or hyperglycemia while fasting. This is in line with a study by Wee et al. (14), which discovered that patients with poor hypoglycemia control were those who were not aware that controlling hypoglycemia medication was necessary. Avoiding repercussions like dehydration and hyperglycemia crises while out of work also requires knowing how to manage blood sugar levels.

Nearly two-thirds of diabetes cases exhibited hypoglycemia symptoms, according to the current study, whereas a slightly higher percentage reported hyperglycemia symptoms. Blood glucose levels were assessed in nearly three-fourths of the cases if symptoms of hypoglycemia appeared, and in more cases if symptoms of hyperglycemia appeared. Although only 10.1% of patients checked their blood glucose levels daily, the majority of patients (56.8%) did so before iftar, after hypoglycemia (30.2%), after iftar (29.4%), and occasionally in the afternoon (3.5%), according to research by Mansouri et al. (15).

Numerous studies have shown that people with diabetes who fast can do so safely and effectively as long as they receive the required instruction and training (16-19). An organized educational program that teaches people how to fast throughout Ramadan can prevent weight gain and reduce the likelihood of hypoglycemic episodes, according a recent study (20). Additionally, around two-thirds of the cases in the current study are interested in learning more about Ramadan fasting.

Limitations

A limitation of the study was the use of a self-administered questionnaire that could have a recall bias, anther limitation was the use of the cross-sectional study design that could reveal the association between variables but not casual relationships.

Conclusion

According to this study, diabetic patients did not know enough about or follow safe fasting procedures during the month of Ramadan. The incidence of problems connected to diabetes may be significantly impacted by the findings of this investigation. These results emphasize how vital it is to create and carry out public health initiatives that deal with diabetes control prior to Ramadan. These initiatives will reduce problems from diabetes and encourage healthy fasting behaviors. We think that healthcare professionals should receive the necessary education and training to offer suitable counselling in order to guarantee safe fasting practices during Ramadan.

Disclosure

Declaration

The authors declare no conflict of interest.

Funding

None.

Ethical Considerations

Ethical approval for the study was obtained from the Scientific Research Center of Health Services Department for Al-Hada Armed Forces, Taif, Saudi Arabia (No.: 2024-846), date: 18 March 2024.

Data Availability

All data related to this manuscript is available upon request from the corresponding author.

Author Contribution

Each author made an equal contribution to the paper's conception, data collecting, analysis, and writing.

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