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Risk Assessment Among Diabetic Patients for Ramadan Fasting: A Multi-Center Study in Bangladesh

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ABSTRACT

Introduction: Ramadan fasting is observed by millions of Muslims worldwide and presents unique metabolic challenges for patients with diabetes mellitus. Altered meal timing, prolonged fasting hours, and medication adjustments may predispose individuals to complications such as hypoglycemia, hyperglycemia, dehydration, and diabetic ketoacidosis. Despite medical exemptions, many diabetic patients choose to fast during Ramadan. Therefore, structured pre-Ramadan risk assessment using standardized tools such as the International Diabetes Federation Diabetes and Ramadan (IDF–DAR 2026) risk score is essential to ensure safe fasting practices. **Aim of the Study:** To evaluate the fasting risk profile of diabetic patients using the IDF–DAR 2026 risk scoring system and to assess the effect of structured pre-Ramadan interventions on risk stratification. **Methods & Materials:** This multi-center hospital-based cross-sectional observational study was conducted among diabetic patients attending private outpatient chambers and outpatient departments of four government hospitals in Bangladesh. The hospital sites included Dhaka North City Corporation Hospital, Sathkhira Medical College, Narayanganj General Hospital and Chandpur General Hospital. Included 100 diabetic patients assessed before Ramadan. Risk stratification was performed using the IDF–DAR 2026 risk score, which evaluates multiple components, including type and duration of diabetes, treatment regimen, glycemic control, history of hypoglycemia, presence of complications, and lifestyle factors. Following the baseline risk assessment, structured pre-Ramadan interventions were implemented, including diabetes education, medication optimization, lifestyle counseling, and glucose monitoring guidance. Risk scores were reassessed after the intervention to evaluate changes in risk distribution. **Results:** Among the 100 participants, 72% were female and 98% had type 2 diabetes mellitus. The majority of patients (62%) had diabetes for 10–20 years. Suboptimal glycemic control was common, with 84% having HbA1c ≥7.5%. Before intervention, 42% of patients were categorized as high risk, 50% as moderate risk, and only 8% as low risk according to the IDF–DAR score 2026. Following a structured Ramadan intervention, the proportion of high-risk patients decreased to 20%, whereas the proportion of low-risk patients increased to 22%. The most common interventions included fasting-focused diabetes education (68%), medication adjustment (42%), insulin regimen optimization (30%), lifestyle modification (24%), and glucose monitoring promotion (24%). **Conclusion:** A substantial proportion of diabetic patients intending to fast during Ramadan fall into moderate-to-high risk categories. Structured Pre-Ramadan assessment and targeted interventions significantly improve risk stratification and may enhance fasting safety.

Keywords: *Ramadan fasting, Diabetes mellitus, IDF–DAR, Bangladesh*

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INTRODUCTION

Ramadan fasting is observed annually by Muslims worldwide and represents one of the five fundamental pillars of Islam. During this month, adult Muslims abstain from food, drink, and oral medications from dawn to sunset. Despite religious exemptions for individuals with chronic illnesses, a substantial proportion of patients with diabetes choose to fast. Globally, it is estimated that more than 148 million Muslims live with diabetes, and approximately 116 million participate in Ramadan fasting each year [1]. The Epidemiology of Diabetes and Ramadan (EPIDIAR) study demonstrated that 78.7% of patients with type 2 diabetes mellitus (T2DM) and 42.8% of those with type 1 diabetes mellitus (T1DM) fasted for at least 15 days during Ramadan [1,2]. These findings highlight the clinical importance of structured risk assessment and management strategies for diabetic patients intending to fast. Fasting during Ramadan introduces significant metabolic and physiological challenges for individuals with diabetes. Prolonged fasting hours, altered meal timing, and changes in medication schedules disrupt glucose homeostasis and increase the risk of acute metabolic complications. Hypoglycemia is the most frequently reported complication, particularly among insulin-treated patients and those with T1DM [3]. A systematic review reported approximately 50 hypoglycemic events per 100 patient-months among adolescents with T1DM during Ramadan [3]. In patients with T2DM, large observational studies have shown hypoglycemia in up to 15.5% and hyperglycemia in 14.9% of fasting individuals, with some requiring emergency medical care [4]. Additionally, patients with T1DM face increased risks of diabetic ketoacidosis, severe hypoglycemia, and glycemic variability due to insulin deficiency or inappropriate dose adjustments [2,5]. Other complications include dehydration, electrolyte imbalance, and postprandial hyperglycemia resulting from large evening meals [1]. These risks necessitate individualized clinical evaluation prior to fasting. Given these potential complications, structured pre-Ramadan risk stratification has emerged as a cornerstone of diabetes management. International guidelines from professional bodies recommend assessing patients based on glycemic control, type of diabetes, treatment regimen, presence of complications, and comorbidities to categorize them into low, moderate, or high-risk groups [6]. The International Diabetes Federation and Diabetes and Ramadan (IDF-DAR) risk assessment tool provides a standardized scoring system to guide clinical decision-making and identify patients for whom fasting may be unsafe [7]. Evidence supports the clinical utility of

these frameworks. A large Bangladeshi study using the IDF-DAR risk calculator categorized 44.2% of patients with T2DM as low risk, 45.7% as moderate risk, and 10.1% as high risk, with significantly higher rates of hypoglycemia and hyperglycemia observed among high-risk individuals [8]. Similarly, validation studies in primary care settings demonstrated that low-risk patients experienced fewer adverse events compared with moderate- and high-risk groups, supporting the predictive value of structured risk assessment tools [9]. In addition to risk stratification, patient education and individualized therapeutic adjustments play a critical role in reducing complications during Ramadan. Structured Ramadan-focused diabetes education programs significantly improve patient knowledge, self-monitoring practices, and medication adherence [10]. Pre-Ramadan counseling on dietary planning, glucose monitoring, and recognition of warning symptoms has been shown to reduce hypoglycemic events and improve overall glycemic control [10]. Recent evidence also suggests that newer pharmacological therapies and individualized treatment regimens may facilitate safer fasting with a lower risk of hypoglycemia [11,12]. Overall, contemporary international evidence emphasizes that risk assessment, patient education, and personalized management strategies are essential to ensure safe Ramadan fasting among individuals with T1DM and T2DM. Integrating structured risk stratification tools with culturally sensitive clinical care enables healthcare providers to balance religious practices with optimal metabolic control. Therefore, comprehensive risk assessment remains fundamental in guiding clinical decisions and minimizing adverse outcomes among diabetic patients observing Ramadan.

METHODS & MATERIALS

This multi-center hospital-based cross-sectional observational study was conducted among diabetic patients attending private outpatient chambers and outpatient departments of four government hospital in Bangladesh. The hospital sites included Dhaka North City Corporation Hospital, Sathkhira Medical College, Narayanganj General Hospital and Chandpur General Hospital. The study was carried out during the pre-Ramadan period of 2026 over a duration of three months. A total of 100 adult patients with diagnosed diabetes mellitus who attended these outpatient facilities and intended to fast during Ramadan were included using a convenience sampling technique after obtaining informed consent. Adult patients with diagnosed diabetes mellitus who intended to fast during Ramadan and provided informed consent were included using a convenience sampling technique. Baseline demographic and clinical data were collected through structured patient interviews, physical examination, and review of medical records. Information collected included age, sex, type and duration of diabetes, treatment regimen, previous hypoglycemia episodes, glycemic control (HbA1c), glucose monitoring practices, presence of macrovascular and microvascular complications, renal function status, level of physical activity, and previous diabetes education. Fasting risk was assessed using the IDF–DAR risk scoring system, which evaluates multiple clinical parameters, including diabetes type, disease duration, treatment modality, HbA1c level, history of hypoglycemia, glucose monitoring frequency, history of hyperglycemic emergencies, diabetes complications, renal function, cognitive status, physical workload, and structured diabetes education. Based on the calculated score, patients were categorized into low risk (0–3 points), moderate risk (3.5–6 points), or high risk (>6 points) for Ramadan fasting. Following baseline risk stratification, structured pre-Ramadan counseling and clinical interventions were provided. These interventions included fasting-focused diabetes education; medication optimization and, when necessary, adjustment of insulin regimens; dietary and lifestyle counseling to prevent hypoglycemia; and recommendations regarding appropriate self-monitoring of blood glucose. Following implementation of these interventions, the IDF–DAR risk scores were reassessed to assess changes in the distribution of fasting risk categories among study participants. All collected data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) software. Descriptive statistics, such as frequencies, percentages, and variable distributions, were used to summarize the findings. Results were presented in tabular form to illustrate baseline characteristics, distribution of IDF–DAR risk components, and changes in risk categories following the intervention.

Inclusion Criteria:

- Adult patients (≥18 years) diagnosed with Type 1 or Type 2 diabetes mellitus.
- Patients attending the outpatient department during the pre-Ramadan assessment period.
- Patients intending to observe fasting during Ramadan.
- Patients who provided informed consent to participate in the study.

Exclusion Criteria:

- Patients who were critically ill or medically unstable.
- Patients who did not intend to fast during Ramadan.
- Patients who declined to participate in the study.
- Patients with incomplete clinical or laboratory information required for IDF–DAR risk score calculation.

RESULTS

A total of 100 diabetic patients were enrolled. The cohort was predominantly female (72%), and the vast majority had Type 2 diabetes mellitus (98%), with only 2% having Type 1 diabetes. The most common duration of diabetes was 10–20 years (62%), followed by >20 years (24%) and <10 years (18%), as shown in *Table I*.

Table I
Baseline Patient Characteristics (*n* = 100).

Variable	Category	Frequency	Percentage
Sex	Male	28	28%
	Female	72	72%
Type of Diabetes	Type 1 Diabetes	2	2%
	Type 2 Diabetes	98	98%
Duration of Diabetes	< 10 years	18	18%
	10–20 years	62	62%
	> 20 years	24	24%

Table II presents the distribution of all 100 patients across the 14 IDF–DAR risk score items. Multiple daily insulin injections were the most prevalent treatment regimen (72%), followed by modern sulfonylureas (56%) and standard basal insulin (48%). Glycemic control was suboptimal, with 84% of patients having HbA1c ≥ 7.5%, and 88% performing no glucose self-monitoring. Hypoglycemia in the last 3 months was reported in 32% of patients, including 4% with severe hypoglycemia

and 12% during the previous Ramadan. Macrovascular disease was present in 42% and nephropathy was highly prevalent, with 92% having eGFR < 60 ml/min. Microvascular complications were present in 72% of patients. Impaired cognitive function was noted in 2%, high-intensity physical labor in 2%, and 78% had not received structured diabetes education.

Table II
Distribution of Patients Across All IDF–DAR Risk Score Components (*n* = 100).

Variable	Category	IDF-DAR Score	Frequency	Percentage
Pregnancy	No	0	96	96%
	Yes	6.5	4	4%
Type of Diabetes	Type 2 / LADA	0	98	98%
	Type 1 / Other	1	2	2%
Duration of Diabetes	< 10 years	0	18	18%
	10–20 years	1	62	62%
	> 20 years	2	24	24%
Treatment Type	Multiple daily insulin injections	3	72	72%
	Once daily premixed insulin	2	8	8%
	Once daily basal insulin	1.5	20	20%
	Standard basal insulin (NPH/Detemir/Glargine U100)	1	48	48%
	SGLT2 inhibitor	1	34	34%
	Modern sulfonylurea (Gliclazide/Glimepiride/Repaglinide)	0.5	56	56%
	Other multiple oral glucose-lowering drugs	0.5	26	26%
	Advanced insulin therapy	1.5	0	0%
	α-glucosidase inhibitors	0.25	0	0%
	Treatment with diet only	0	0	0%
Previous Hypoglycemia	Severe hypoglycemia within last 3 months	6.5	4	4%
	Severe hypoglycemia during last Ramadan	5	12	12%
	Documented symptomatic: ≥1 episode in last 3 months	4	22	22%
	6–7 episodes of hypoglycemia / week	3	6	6%
	3–5 episodes of hypoglycemia / week	2	10	10%
	1–2 episodes of hypoglycemia / week	1	26	26%
	No hypoglycemia in last 3 months	0	68	68%
HbA1c Level	< 7.5%	0	16	16%
	7.5–9%	1	62	62%
	> 9%	2	22	22%
Glucose Monitoring	No monitoring	2	88	88%
	Suboptimal monitoring	1	10	10%
	Done as indicated	0	2	2%
	Any type of CGM	−0.5	0	0%
Hyperglycemic Emergencies	DKA or HHS in last month	3.5	4	4%
	DKA or HHS in last 2–3 months	2	4	4%
	DKA or HHS in last 4–6 months	1	10	10%
	No DKA / HHS in last 6 months	0	90	90%
Macrovascular Complications	Unstable macrovascular disease	6.5	6	6%
	Stable macrovascular disease	2	36	36%
	No macrovascular disease	0	58	58%
Nephropathy (eGFR)	< 30 ml/min	6	2	2%
	30–44 ml/min	4	16	16%
	45–59 ml/min	2	74	74%
	≥ 60 ml/min	0	8	8%
Neuropathy / Foot / Retinopathy	3 microvascular complications	3	2	2%
	2 microvascular complications	2	18	18%
	1 microvascular complication	1	52	52%
	No microvascular complication	0	28	28%
Cognitive Function	Normal	0	98	98%
	Impaired cognitive function	6.5	2	2%
Physical Labor	Low intensity	0	72	72%
	Moderate intensity	2	26	26%
	High intensity	4	2	2%
Structured Diabetes Education	Yes	0	22	22%
	No	1	78	78%
Expected Fasting Hours	< 16 hours	0	100	100%
	≥ 16 hours	1	0	0%

Before intervention, 42% of patients were classified as high risk (score > 6), 50% as moderate risk (score 3.5–6), and only 8% as low risk (score 0–3). Following structured pre-Ramadan assessment and targeted interventions, the proportion of high-risk patients decreased from 42% to 20%, a relative reduction of 52%, while the low-risk proportion increased from 8% to 22%, as shown in *Table III*.

Table III
IDF–DAR Risk Score Distribution Before and After Pre-Ramadan Intervention (*n* = 100).

Risk Category	Score Range	Before		After	
		n	%	n	%
Low Risk	0–3	8	8%	22	22%
Moderate Risk	3.5–6	50	50%	58	58%
High Risk	> 6	42	42%	20	20%

Table IV shows the clinical recommendations for Ramadan fasting among diabetic patients before and after the pre-Ramadan assessment. Before the assessment, only 8% of patients were considered fit to fast, but this proportion increased to 22% after proper medical evaluation and counseling. At the same time, the proportion of patients strongly advised not to fast decreased from 42% before assessment to 20% after assessment. These findings indicate that pre-Ramadan assessment helped physicians provide more individualized and appropriate guidance regarding fasting for diabetic patients.

Table IV
Clinical Recommendations for Ramadan Fasting Before and After Pre-Ramadan Assessment Among Diabetic Patients (*n* = 100).

Risk Category	Before	After
Fit to Fast	8%	22%
Fast with Medical Supervision	50%	58%
Strongly Advised Not to Fast	42%	20%

Table V presents the pre-Ramadan interventions implemented to reduce the fasting-related risk score. The most commonly applied intervention was fasting-focused structured diabetes education (68%), followed by choosing safer oral antidiabetic drugs (42%). Insulin optimization by switching from multiple-dose premixed insulin to a safer basal-bolus analogue regimen was performed in 30% of patients. Lifestyle modification to reduce hypoglycemia risk and promotion of glucose monitoring were each applied in 24% of patients, while HbA1c optimization was achieved in 12% of cases.

Table V
Pre-Ramadan Interventions Applied to Reduce Risk Score Among Diabetic Patients (*n* = 100).

Intervention Category	Intervention	n (%)
Patient Education	Fasting-focused structured diabetes education	68 (68%)
Medication Adjustment	Choosing safer oral antidiabetic drug	42 (42%)
Insulin Optimization	Switching multiple-dose premixed insulin to safer basal-bolus analogue insulin	30 (30%)
Lifestyle Modification	Avoidance of hypoglycemia by adjusting diet and lifestyle	24 (24%)
Monitoring	Glucose monitoring as indicated	24 (24%)
Glycemic Control	Improving HbA1c by optimizing blood sugar level	12 (12%)

DISCUSSIONS

The present study assessed fasting risk among 100 diabetic patients using the IDF–DAR Risk Scoring Tool (2026) and evaluated the impact of a structured pre-Ramadan intervention program. The initial risk classification revealed a high burden of fasting-related risk in the study population, with 42% of patients categorised as high risk and 50% as moderate risk prior to any intervention, leaving only 8% classified as low risk. This pattern of predominantly moderate-to-high risk distribution is considerably different from that reported by Mohammed et al.1 in a multi-centre UAE-based validation study of 659 patients, where 51.4% were classified as low risk, 26.3% as moderate risk, and 22.3% as high risk. Similarly, the DAR-BAN study conducted among 1,328 Bangladeshi patients with Type 2 diabetes reported 44.2% in the low-risk category and only 10.1% in the high-risk group.[13] The markedly higher proportion of high-risk patients in our cohort may be attributed to the advanced disease profile of our sample, which was characterised by prolonged diabetes duration, high rates of insulin use, widespread nephropathy, and suboptimal glycemic control. Suboptimal glycemic control was a predominant finding in this study, with 84% of patients recording HbA1c ≥ 7.5% and 22% exceeding 9%. This is consistent with data from the DAR-BAN study, which reported that only 29.6% of Bangladeshi T2DM patients had a pre-Ramadan HbA1c below 7.5%.2 Poor glycemic control is a well-recognized contributor to elevated IDF–DAR risk scores and is directly associated with an increased likelihood of hyperglycemic emergencies during fasting. Equally concerning was the finding that 88% of patients in our cohort performed no glucose self-monitoring, a figure that substantially exceeds rates reported in other regional studies and raises serious concern about the capacity for safe self-management during fasting. The IDF–DAR guidelines identify adequate glucose monitoring as central to safe Ramadan fasting, and its near-universal absence in our population represents a critical vulnerability.3 A notable finding was the exceptionally high prevalence of nephropathy in this cohort, with 92% of patients having an eGFR below 60 ml/min, the majority (74%) falling within the 45–59 ml/min range. Chronic kidney disease is assigned a high IDF–DAR risk score and significantly reduces the safety of prolonged fasting due to the risks of dehydration, electrolyte disturbance, and altered drug clearance. The high nephropathy burden in our population likely reflects the advanced stage of diabetes in this clinic-based cohort and contributed substantially to the elevated proportion of high-risk patients observed at baseline. Alfadhli et al.4 in their Saudi Arabian validation study similarly noted that microvascular and macrovascular complications were key drivers of high IDF–DAR scores, reinforcing the importance of complication screening as part of pre-Ramadan risk assessment. The predominance of multiple daily insulin injection regimens (72%) in this study population is a major determinant of elevated fasting risk, as this treatment modality carries the highest IDF–DAR treatment score (3 points). Switching patients from multiple-dose premixed insulin to a safer basal-bolus analogue regimen was therefore the third most common intervention applied (30%), reflecting standard clinical practice as

recommended by the IDF–DAR 2021 practical guidelines.3 The DEAR program described by Chow et al.5 similarly reported that 92% of enrolled patients required medication adjustment prior to Ramadan, with insulin regimen modification being central to safe fasting preparation, resulting in measurable improvements in HbA1c from pre- to post-Ramadan. A key finding of this study was the significant risk reclassification achieved through structured pre-Ramadan intervention. The proportion of high-risk patients decreased from 42% to 20% a relative reduction of 52% while the low-risk proportion rose from 8% to 22%. This degree of downward risk migration underscores the modifiable nature of Ramadan fasting risk and the clinical effectiveness of a structured pre-Ramadan assessment program. These results align with the broader literature demonstrating that targeted pre-Ramadan interventions substantially reduce fasting-related risk. A systematic review by Babiker et al.6 encompassing 17 studies found that Ramadan-focused diabetes education produced an 81% relative reduction in hypoglycemia risk (OR 0.19, 95% CI: 0.08–0.46) and significant improvements in HbA1c compared with conventional care. Fasting-focused structured diabetes education was the most frequently applied intervention in our cohort (68%), consistent with the evidence base establishing patient education as the cornerstone of safe Ramadan fasting. Bravis et al.7 demonstrated in the Ramadan Education and Awareness in Diabetes (READ) programme that structured education significantly reduced hypoglycemic events and produced sustained HbA1c reductions at 12 months, compared with a group that did not receive the programme. Elbarsha et al.8 further confirmed that culturally tailored pre-Ramadan education produced significantly greater HbA1c and weight reduction compared with standard care, even when the number of fasting days was comparable between groups. The high rate of education delivery in our cohort (68%) is encouraging, particularly given that 78% of patients had not previously received any structured diabetes education, representing a substantial unmet need that was partially addressed through this intervention. The absence of post-Ramadan outcome data, including rates of hypoglycemia, hyperglycemia, DKA, or hospitalization, means that the clinical impact of risk reclassification on actual fasting safety could not be directly evaluated. Additionally, the male patient count was inferred from the total and female count, as it was not explicitly recorded in the original dataset. Future prospective studies with post-Ramadan follow-up are warranted to determine whether IDF–DAR-guided pre-Ramadan intervention translates into measurable reductions in clinical events during fasting. Despite these limitations, this study provides valuable real-world evidence supporting the routine integration of the IDF–DAR Risk Scoring Tool into pre-Ramadan diabetes care and demonstrates the substantial clinical benefit achievable through structured, guideline-directed intervention in a high-risk diabetic population.

LIMITATION

This study included a limited number of patients from selected private chambers and hospitals and assessed them only during the pre-Ramadan period; therefore, the findings may not fully represent all diabetic patients in Bangladesh.

CONCLUSION

This study demonstrates that a large proportion of diabetic patients intending to fast during Ramadan fall into moderate-to-high risk categories according to the IDF–DAR 2026 risk scoring system. Poor glycemic control, high prevalence of diabetes complications, and inadequate glucose monitoring practices were major contributors to elevated fasting risk. However, structured pre-Ramadan assessment and targeted clinical interventions significantly improved risk stratification, reducing the proportion of high-risk individuals and increasing the number of patients classified as low risk. These findings highlight the importance of systematic pre-Ramadan evaluation and individualized diabetes management strategies to ensure safer fasting practices among diabetic patients.

RECOMMENDATION

Routine implementation of structured pre-Ramadan risk assessment using the IDF–DAR 2026 scoring system should be incorporated into diabetes care in Bangladesh. Healthcare providers should prioritize early pre-Ramadan clinics focusing on risk stratification, medication adjustment, and patient education regarding diet, glucose monitoring, and recognition of warning symptoms. Wider availability of structured Ramadan-focused diabetes education programs is also essential to improve patient awareness and self-management skills. Future multicenter prospective studies with post-Ramadan follow-up are recommended to evaluate the long-term clinical impact of IDF–DAR 2026–guided interventions on fasting safety and metabolic outcomes.

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