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Keywords

Diabetes Mellitus, Ramadan Fasting, Knowledge, Attitudes, and Practices (KAP), IDF-DAR Risk Stratification, Glycemic Control, Palestine

List of abbreviations

DAR – Diabetes and Ramadan International Alliance

DM – Diabetes Mellitus

T1DM – Type 1 Diabetes Mellitus

T2DM – Type 2 Diabetes Mellitus

eGFR – Estimated Glomerular Filtration Rate

HbA1c – Glycated Hemoglobin

IDF – International Diabetes Federation

IDF-DAR – International Diabetes Federation–Diabetes and Ramadan International Alliance

KAP – Knowledge, Attitudes, and Practices

MENA – Middle East and North Africa

Abstract

Background: Ramadan fasting presents unique challenges for people living with diabetes, as prolonged abstinence from food and fluids may increase the risk of acute metabolic complications, particularly among individuals with poor glycemic control or established comorbidities. We aimed to estimate fasting-related risk among Palestinian adults with diabetes and to identify the clinical characteristics most commonly associated with higher-risk categories.

Methods: We conducted a post-Ramadan, multicenter cross-sectional study in primary healthcare clinics and hospitals across the West Bank, Palestine. Trained medical interns interviewed participants using an adapted validated questionnaire and verified key clinical variables from medical records when available. Adults with confirmed diabetes and complete data on glycemic control and renal function were included. Fasting risk was classified according to the IDF–DAR 2021 framework as low (0–3), moderate (4–6), or high (>6). Associations were examined using descriptive and bivariate statistical analyses, with $p < 0.05$ considered statistically significant.

Results: The study included 635 adults (mean age 55.5 ± 16.1 years), 52.9% of whom were male, and 85.2% had type 2 diabetes. High fasting risk was observed in 60.6% of participants, compared with 22.4% classified as low risk and 17.0% as moderate risk. Higher-risk categories were significantly associated with type 1 diabetes, HbA1c >9%, prior hypoglycemia, eGFR <60 mL/min/1.73 m², unstable macrovascular disease, insulin therapy, diabetes duration ≥10 years, and negative prior Ramadan fasting experiences. Gender was not significantly associated with fasting risk (p = 0.444).

Conclusion: Fasting-related risk was frequently high in this cohort and was primarily associated with indicators of disease severity. These findings support the need for routine pre-Ramadan risk assessment and individualized counseling to promote safer fasting decisions among people with diabetes.

Introduction

Diabetes mellitus (DM) is a major global public health problem and one of the most prevalent non-communicable diseases worldwide, with a rapidly increasing burden, particularly in regions with large Muslim populations. Globally, an estimated 537 million adults aged 20–79 years are living with diabetes, the majority of whom have type 2 diabetes mellitus (T2DM). The Middle East and North Africa (MENA) region is among the areas with the highest prevalence, estimated at approximately 12.2% in 2019 [1]. In Palestine, recent estimates indicate that 15.5% of adults—approximately 315,300 individuals—are affected by diabetes [2].

Ramadan fasting is one of the five pillars of Islam and is obligatory for healthy adult Muslims. Fasting duration during Ramadan varies by geographic location and season, typically ranging from 10 to 20 hours per day [3]. Due to the metabolic nature of diabetes, individuals with DM are particularly vulnerable to the physiological changes associated with prolonged fasting, including alterations in meal timing, caloric intake, and hydration. These changes may increase the risk of acute complications such as hypoglycemia, hyperglycemia, and dehydration, especially in patients treated with glucose-lowering medications [4]. Despite

these potential health risks, many individuals with diabetes choose to fast during Ramadan, including some who are medically exempt [4].

To address these challenges, the International Diabetes Federation (IDF) and the Diabetes and Ramadan International Alliance (DAR) have jointly developed comprehensive, evidence-based guidelines for the management of diabetes during Ramadan. These guidelines emphasize structured pre-Ramadan assessment, individualized risk stratification, medication adjustment, dietary counseling, and patient education aimed at minimizing fasting-related complications [5]. A core component of these recommendations is the systematic evaluation of fasting risk using standardized criteria to support informed, patient-centered decision-making.

Despite the availability of international guidelines, several studies conducted in Muslim-majority countries have identified significant gaps in patients' knowledge and practices regarding safe Ramadan fasting. Published evidence indicates that many patients lack essential self-care knowledge, including appropriate dietary choices and glucose monitoring during fasting. For example, approximately 30% of patients in previous studies believed that consuming excessive starchy foods at Suhoor is necessary, a misconception that may adversely affect glycemic control [6]. These findings reflect persistent misunderstandings related to diabetes management during Ramadan.

In addition to knowledge gaps, unsafe attitudes and practices during hypoglycemic events have been reported. In a survey conducted in Singapore, nearly half of patients with diabetes experienced hypoglycemic symptoms while fasting, yet 10.8% continued fasting without appropriate treatment of low blood glucose levels [7]. Such behaviors place patients at considerable risk for serious acute complications.

Collectively, these findings highlight the critical importance of understanding patients' knowledge, attitudes, and practices (KAP) related to Ramadan fasting. Unsafe practices may lead to adverse health outcomes, whereas appropriate education, risk awareness, and preparation can substantially improve fasting safety. Although several studies have explored KAP related to Ramadan fasting in Muslim-majority populations, evidence from Palestine remains limited [8].

To date, no study has comprehensively examined the knowledge, attitudes, and practices related to Ramadan fasting among patients with diabetes in Palestine, nor explored their relationship with standardized fasting risk stratification. Therefore, the primary aim of this study was to assess KAP and their related determinants among patients with diabetes regarding self-care and diabetes management during Ramadan. Secondary objectives included stratifying patients with type 1 and type 2 diabetes according to IDF-DAR risk categories and examining the association between fasting risk and KAP levels. Additionally, the study sought to identify key demographic and clinical factors associated with unsafe practices or increased fasting-related risk in order to inform targeted interventions and reduce preventable complications.

Methodology

Study Design and Setting

This cross-sectional study was conducted between April 20, 2025 and October 22, 2025 to assess the Knowledge, Attitudes, and Practices (KAP) of patients with diabetes mellitus using the IDF–DAR Risk Assessment Tool. Data were collected from multiple healthcare facilities across the West Bank, Palestine, including primary healthcare clinics and governmental hospitals in Hebron (city center), Dura, Halhul, Ramallah, Jericho, Tubas, Tulkarm, Bethlehem, Yata, Salfit, and Nablus, in addition to Ahli Hospital and selected private clinics.

To minimize recall bias related to fasting during Ramadan, data collection was conducted approximately one month after Ramadan 2025, which extended from March 1 to March 30, 2025. During this period, daily fasting duration ranged from approximately 12 hours and 40 minutes to 13 hours and 30 minutes.

Participants and Sampling

Given the heterogeneity of the Palestinian population and the variability in sample sizes reported in previous KAP studies, a sample size sufficient to allow subgroup analyses (e.g., by age, gender, and educational level) was targeted. The final sample included 635 Palestinian patients with confirmed diagnoses of diabetes mellitus who met the inclusion criteria and had complete essential clinical data, including HbA1c levels, documented hypoglycemia history, and renal function tests.

Patients with incomplete medical records, particularly missing laboratory data required for eGFR estimation, or those unable to reliably recall diabetes-related complications were excluded from the analysis.

Participants were selected using simple random sampling from patient lists at participating hospitals and primary healthcare centers. Self-reported information was verified against medical records where applicable. Uniform inclusion criteria and standardized data collection procedures were applied across all sites to minimize selection and information bias, in line with STROBE reporting recommendations.

Data Collection and Statistical Analysis

Data were collected using a validated KAP questionnaire adapted from Alsunni et al. (2020), administered through face-to-face interviews conducted by trained medical interns at Palestinian governmental hospitals [9]. All participants provided written informed consent prior to participation. Ethical approval was obtained from the Institutional Review Board (IRB) at Al-Quds University.

Patients were classified into fasting risk categories according to the IDF-DAR 2021 guidelines (low risk: 0–3, moderate risk: 4–6, high risk: >6), based on clinical variables including age, gender, type and duration of diabetes, glycemic control (HbA1c), history of hypoglycemia, renal function (eGFR), and macrovascular complications such as myocardial infarction or stroke.

Statistical analyses were performed using IBM SPSS Statistics. Descriptive statistics were used to summarize sociodemographic and clinical characteristics, with continuous variables presented as means ± standard deviations (SD) and categorical variables as frequencies and percentages. Bivariate analyses were employed to assess associations between clinical variables and fasting risk categories, using Chi-square tests for categorical variables, independent samples t-tests for comparisons between two groups, and one-way ANOVA for comparisons across multiple groups.

Given the potential non-normal distribution of risk scores, parametric results were confirmed using non-parametric tests, including the Mann–Whitney U test and the Kruskal–Wallis H

test. All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant.

Results

Socio-demographic and Clinical Characteristics

A total of 635 patients with diabetes mellitus were included in this study. The mean age of the study population was 55.5 ± 16.1 years. Patients with type 2 diabetes mellitus (T2DM) were significantly older than those with type 1 diabetes mellitus (T1DM) (59.5 vs. 32.5 years, p < 0.001). The majority of participants were male (52.9%) and had T2DM (85.2%). More than half of the patients (54.0%) had a diabetes duration of ≥10 years. Regarding treatment modalities, 48.0% of patients were treated with insulin, while 52.0% were managed with non-insulin therapies or diet alone. Baseline characteristics of the study population are presented in Table 1.

Risk Stratification

Based on the IDF-DAR 2021 risk stratification guidelines, most participants were classified as High Risk. Specifically, 385 patients (60.6%) were categorized as High Risk (score >6), while 17.0% were classified as Moderate Risk and 22.4% as Low Risk (Table 2, Figure 1).

Factors Associated with Risk Category

Bivariate analysis demonstrated significant associations between fasting risk categories and several clinical variables (Table 3).

T1DM was strongly associated with high fasting risk, with 91.5% of patients classified as High Risk compared to 55.3% of patients with T2DM (p < 0.001) (Figure 2). Poor glycemic control showed a strong association with higher risk categories; 91.5% of patients with HbA1c >9% were classified as High Risk, compared to 26.5% of those with HbA1c <7.5% (p < 0.001).

The presence of diabetes-related complications was also significantly associated with increased risk. All patients with unstable macrovascular disease and 91.5% of those with impaired renal function (eGFR <60 mL/min/1.73 m²) were classified as High Risk. Similarly, 89.6% of patients with a documented history of hypoglycemia fell into the High-Risk category.

Age group showed a statistically significant association with risk category (p = 0.019), with a higher proportion of elderly patients (≥65 years) classified as High Risk compared to those younger than 65 years (68.7% vs. 57.0%). Gender was not significantly associated with risk category (p = 0.444).

Impact of Clinical Variables on Risk Score

Comparisons of mean total risk scores across key clinical variables revealed significant differences (Table 4).

Patients receiving insulin therapy had markedly higher mean risk scores compared to those managed with non-insulin treatments (15.3 ± 8.6 vs. 5.7 ± 5.4, p < 0.001) (Figure 3). Longer diabetes duration (≥10 years) was associated with significantly higher mean risk scores compared to shorter disease duration (<10 years) (12.6 ± 8.9 vs. 7.7 ± 7.3, p < 0.001).

Participants reporting negative experiences during previous Ramadan fasting exhibited substantially higher current risk scores than those reporting neutral or positive experiences (16.9 ± 9.5 vs. 7.5 ± 6.4, p < 0.001). Risk scores did not differ significantly according to fasting duration (<16 hours vs. ≥16 hours, p = 0.152). Age differences by diabetes type are presented in Table 5.

Discussion:

In this multi-center cross-sectional study, we evaluated Ramadan fasting risk among Palestinian patients with diabetes using the IDF-DAR risk stratification criteria. The majority of participants were classified as high risk for fasting during Ramadan, indicating a substantial burden of clinically significant risk within this population. High-risk classification was predominantly associated with clinical characteristics rather than demographic factors, including diabetes type, poor glycemic control, insulin therapy, longer disease duration, the presence of diabetes-related complications, and prior negative fasting experiences.

Patients with type 1 diabetes were almost uniformly classified as high risk, while among patients with type 2 diabetes, higher risk categories were more frequently observed in those with suboptimal metabolic control, insulin use, and established renal or macrovascular complications. In contrast, demographic variables such as gender showed no significant association with risk category, and age demonstrated only a modest relationship with higher risk classification. Collectively, these findings underscore the central role of disease severity and clinical status in determining fasting risk and highlight the importance of structured pre-Ramadan assessment based on standardized risk stratification tools rather than demographic profiling alone.

The high prevalence of high-risk classification observed in this study likely reflects the underlying clinical profile of the study population rather than fasting behavior alone. A substantial proportion of participants had long-standing diabetes, suboptimal glycemic control, and a high burden of diabetes-related complications, all of which are key determinants incorporated within the IDF-DAR risk assessment framework. These characteristics collectively contribute to elevated fasting risk and may explain the predominance of high-risk categorization in this cohort.

In addition, the high frequency of insulin use and the notable proportion of patients with impaired renal function or macrovascular disease suggest a population with advanced or complex disease. In such settings, fasting risk is inherently increased due to reduced physiological reserves and limited metabolic adaptability during prolonged fasting periods. The findings therefore emphasize that fasting risk is closely linked to cumulative disease burden and clinical instability rather than to isolated patient characteristics.

Contextual factors related to healthcare delivery may also have contributed to the observed risk distribution. Limited access to structured pre-Ramadan counseling, inconsistent application of standardized risk stratification tools, and delayed optimization of glycemic control prior to Ramadan may further amplify fasting-related risk in routine clinical practice. Together, these factors underscore the importance of systematic, guideline-based pre-Ramadan assessment to identify high-risk individuals and guide individualized fasting recommendations.

The findings of the present study are largely consistent with previously published literature examining Ramadan fasting risk and diabetes management across different populations. Several regional and international studies have demonstrated that a substantial proportion of

patients with diabetes fall into moderate-to-high risk categories for fasting, particularly those with poor glycemic control, insulin dependence, longer disease duration, and established complications. Our observation of a predominance of high-risk classification aligns with these reports and supports the external validity of the IDF-DAR risk stratification framework in diverse clinical settings.

The near-universal classification of patients with type 1 diabetes as high risk in our cohort is concordant with existing evidence and international consensus recommendations. A recent systematic review and meta-analysis focusing on adolescents with type 1 diabetes demonstrated a high incidence of fasting-related hypoglycemia despite careful monitoring, underscoring the inherent vulnerability of this group during Ramadan fasting [10]. Although some studies suggest that fasting may be feasible in selected individuals with type 1 diabetes under intensive supervision, the consistently high rates of acute glycemic events reported in the literature support the cautious approach advocated by IDF-DAR guidelines and reflected in our findings.

With respect to glycemic control, our results reinforce prior evidence identifying poor HbA1c control as a central determinant of fasting risk. Previous Ramadan-focused studies have repeatedly shown that elevated HbA1c levels are associated with increased risks of hypoglycemia, hyperglycemia, and ketoacidosis during fasting periods. The graded increase in risk classification observed across HbA1c categories in our study is in line with these findings and further supports the role of HbA1c as a key parameter in pre-Ramadan risk assessment.

The association between insulin therapy and higher risk scores observed in our study is also consistent with prior research. Insulin use has been widely reported as a marker of disease severity and metabolic instability rather than an independent causal factor. Studies from Saudi Arabia and Pakistan have similarly demonstrated that insulin-treated patients are more likely to interrupt fasting due to hypoglycemia or glycemic instability, emphasizing the need for individualized counseling and close monitoring in this subgroup [11].

In contrast to studies primarily focused on knowledge, attitudes, and practices, such as the work by Alsunni et al. [9], which highlighted the influence of sociodemographic factors on fasting-related behaviors, our findings indicate that clinical determinants outweigh demographic characteristics in defining fasting risk. While educational level and health literacy have been shown to influence patient behavior and self-management, the lack of a significant association

between gender and fasting risk in our cohort mirrors observations from several guideline-based studies emphasizing clinical status over demographic profiling.

Overall, the consistency between our findings and previous studies from neighboring regions and international settings underscores the generalizability of the observed risk patterns. Importantly, our study extends the existing literature by providing population-specific data from Palestine, a setting that has been underrepresented in Ramadan fasting research, and highlights the ongoing need for systematic, risk-based pre-Ramadan assessment using standardized tools.

The findings of this study have important implications for both clinical practice and public health planning in populations where Ramadan fasting is widely observed. The high prevalence of patients classified as high risk underscores the need for systematic, structured pre-Ramadan assessment rather than reliance on individual judgment or patient preference alone. Incorporating standardized risk stratification tools, such as the IDF-DAR framework, into routine clinical care can facilitate early identification of individuals for whom fasting may pose significant health risks [12].

From a clinical perspective, the strong association between fasting risk and disease-related factors highlights the importance of individualized, risk-based counseling. Patients with poor glycemic control, insulin dependence, long-standing diabetes, or established complications require tailored management plans that include medication adjustment, intensified glucose monitoring, and clear guidance on when to break the fast. Routine pre-Ramadan consultations should therefore prioritize comprehensive clinical evaluation, review of recent laboratory parameters, and patient-specific education rather than generalized advice [13].

The observed relationship between previous negative fasting experiences and higher current risk scores further emphasizes the value of detailed clinical history-taking. Incorporating prior Ramadan experiences into risk assessment may improve clinician–patient communication and support shared decision-making regarding the safety of fasting. This approach can also help align religious considerations with medical recommendations in a culturally sensitive manner [14].

At the public health level, the findings suggest a need to strengthen pre-Ramadan education and risk stratification initiatives within primary healthcare systems. Given that primary care

settings often represent the first point of contact for patients with diabetes, equipping healthcare providers with standardized tools and training on Ramadan-focused diabetes management may reduce preventable fasting-related complications. Such interventions are particularly relevant in resource-limited settings, where access to specialized endocrinology services may be constrained [15].

Additionally, these results support the integration of multidisciplinary approaches involving physicians, nurses, dietitians, and diabetes educators to optimize fasting safety. Public health campaigns targeting both patients and healthcare providers could improve awareness of fasting-related risks and reinforce the importance of medical consultation prior to Ramadan. Collectively, these measures may contribute to improved patient safety, reduced acute complications, and more informed decision-making around Ramadan fasting among individuals with diabetes [16].

This study has several notable strengths. First, the relatively large sample size and multi-center recruitment across multiple healthcare facilities enhance the robustness and generalizability of the findings within the Palestinian context. Second, the use of the IDF-DAR risk stratification framework provides a standardized, internationally recognized approach to assessing fasting-related risk, allowing meaningful comparison with studies from other regions. Third, the inclusion of objective clinical parameters, such as HbA1c, renal function, and documented diabetes-related complications, strengthens the validity of the risk classification and minimizes reliance on self-reported data alone.

Despite these strengths, several limitations should be acknowledged. The cross-sectional design limits the ability to infer causal relationships or assess temporal changes in risk status or clinical outcomes related to fasting. Data collection occurred after Ramadan, which may introduce recall bias, particularly regarding fasting experiences and hypoglycemic events. In addition, the clinic-based sampling approach may limit generalizability to individuals with diabetes who do not regularly attend healthcare facilities or who receive care outside the formal health system. The absence of multivariable regression analysis restricts the ability to evaluate independent predictors of high-risk classification after adjustment for potential confounders. Finally, the study focused on risk stratification rather than direct measurement of fasting-related clinical outcomes, such as hospitalization or emergency presentations, which may underestimate the full clinical impact of fasting in high-risk individuals.

Future research should aim to build upon these findings by employing longitudinal study designs to assess the relationship between pre-Ramadan risk stratification and actual fasting-related clinical outcomes. Prospective studies following patients before, during, and after Ramadan would allow more precise evaluation of the predictive value of IDF-DAR risk categories and their association with acute complications such as hypoglycemia, hyperglycemia, and diabetic ketoacidosis.

Further research is also needed to examine the effectiveness of structured pre-Ramadan education and risk-based counseling interventions in reducing fasting-related complications, particularly among high-risk groups. Randomized or quasi-experimental studies evaluating tailored educational programs, medication adjustment protocols, and enhanced glucose monitoring strategies could provide valuable evidence to inform clinical guidelines and public health policies.

In addition, integrating comprehensive assessments of patients' knowledge, attitudes, and practices with clinical risk stratification may offer deeper insights into behavioral determinants of fasting safety. Exploring healthcare provider perspectives and system-level barriers to implementing standardized pre-Ramadan care may further inform strategies to improve diabetes management during Ramadan. Collectively, these research directions can contribute to the development of context-specific, evidence-based approaches to support safer fasting practices among individuals with diabetes.

Conclusion

In conclusion, this study demonstrates that a substantial proportion of Palestinian patients with diabetes are classified as high risk for Ramadan fasting when assessed using the IDF-DAR framework, with risk predominantly driven by clinical factors such as diabetes type, glycemic control, insulin therapy, disease duration, and the presence of diabetes-related complications. These findings highlight the importance of systematic, guideline-based pre-Ramadan risk stratification and individualized counseling to support safer fasting practices. Integrating standardized risk assessment into routine diabetes care, particularly within primary healthcare settings, may improve patient safety and facilitate informed, culturally sensitive decision-making around Ramadan fasting.

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Data availability:

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Ethics approval and consent to participate

All procedures involving human participants were conducted in accordance with the ethical standards of the Institutional Review Board (IRB) at Al-Quds University and in compliance with the Declaration of Helsinki (1964) and its subsequent amendments or comparable ethical standards. Ethical approval for the study was obtained from the Institutional Review Board of Al-Quds University.

Informed consent was obtained from all participants prior to data collection. Participants were informed that no personal identifiers (such as names, phone numbers, or contact information) were collected. Participation was voluntary and anonymous, and participants were free to withdraw from the study at any time without any consequences. All data were securely stored and accessible only to the research team.

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Consent for publication:

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Competing interests:

The authors declare no competing interests.

Contributions:

All authors (Farid K. AbuSham'a, Nour yaser shadeed, Alaa R. AL-Ihribat, Nadeemkram Akram Awawda, Alhareth M. Amro, Yahya Kayed AbuJwaid, Fatimah Iyad Shawar, Areen H. Qunaibi, Balqis Shawer, Laith I. I. Azim, Abdallah Qawasmeh) contribute the same effort.

References

-1 Khan, H., Ali, K., Fahim, T., Aman, I., & Sufyan, M. (2025). Literature Analysis on The Prevalence of Type 2 Diabetes Mellitus in Adolescents and Young Adults. A review study. *Vascular and Endovascular Review*, *8*(10s), 184-194.

-2 https://idf.org/our-network/regions-and-members/middle-east-and-north-africa/members/palestine/

-3 Rahman, S. (2022). Ramadan Fasting and its health benefits: what's New?. *Open Access Macedonian Journal of Medical Sciences*, *10*(E), 1329-1342.

-4 Chamsi-Pasha, H., & Aljabri, K. S. (2014). The diabetic patient in Ramadan. *Avicenna journal of medicine*, *4*(2), 29–33. https://doi.org/10.4103/2231-0770.130341

-5 Ibrahim, M., Davies, M. J., Ahmad, E., Annabi, F. A., Eckel, R. H., Ba-Essa, E. M., ... & Umpierrez, G. E. (2020). Recommendations for management of diabetes during Ramadan: update 2020, applying the principles of the ADA/EASD consensus. *BMJ Open Diabetes Research and Care*, *8*(1), e001248.

-6 Ahmed, S., Khokhar, N., & Shubrook, J. H. (2022). Fasting during Ramadan: a comprehensive review for primary care providers. *Diabetology*, *3*(2), 276-291.

-7 Ko, M. S. M., Lee, W. K., Ang, L. C., Goh, S. Y., Bee, Y. M., & Teh, M. M. (2022). A Cross-Sectional study on risk factors for severe hypoglycemia among Insulin-Treated elderly type 2 diabetes Mellitus (T2DM) patients in Singapore. *Diabetes Research and Clinical Practice*, *185*, 109236.

-8 Hillier, K. A., Longworth, Z. L., & Vatanparast, H. (2023). Healthcare professionals knowledge, attitude, practices, and perspectives providing care to Muslims in Western countries who fast during Ramadan: a scoping review. *Applied Physiology, Nutrition, and Metabolism*, *49*(4), 415-427.

-9 Alsunni, A. A., Albaker, W. I., Almansour, A. H., Alenazi, A. S., Alaftan, M. S., & Badar, A. (2020). Knowledge, Attitude and Practice Regarding Ramadan Fasting and Related Determinants in Patients with Type 2 Diabetes at a Saudi Diabetes Clinic. *Diabetes, metabolic syndrome and obesity : targets and therapy*, *13*, 151–159. https://doi.org/10.2147/DMSO.S241496

-10 Safari, O., Shafiee, A., Heidari, A., Nafarzadeh, F., Aminzadeh, D., Abianeh, F. E., Amini, M. J., Bakhtiyari, M., & Monfared, A. B. (2025). Ramadan fasting among adolescents with type 1 diabetes: a systematic review and meta-analysis. *BMC endocrine disorders*, *25*(1), 45. https://doi.org/10.1186/s12902-025-01835-1

-11 Gazzaz, Z. J., Baig, M., Kanpurwala, M. A., Jamil, T., Mojaddidi, M. A., & Murad, M. A. (2022). Eid-al-Fitr festivity and Ramadan fasting attitude among individuals with diabetes from Saudi Arabia and Pakistan: a cross-sectional study. *BMJ open*, *12*(9), e054902. https://doi.org/10.1136/bmjopen-2021-054902

-12 Beshyah S. A. (2025). Evolution of the risk concept and assessment tools for diabetes during Ramadan fasting: A narrative review. *World journal of diabetes*, *16*(11), 110007. https://doi.org/10.4239/wjd.v16.i11.110007

-13 Haghighatpanah, M., Nejad, A. S. M., Haghighatpanah, M., Thunga, G., & Mallayasamy, S. (2018). Factors that Correlate with Poor Glycemic Control in Type 2 Diabetes Mellitus Patients with Complications. *Osong public health and research perspectives*, *9*(4), 167–174. https://doi.org/10.24171/j.phrp.2018.9.4.05

-14 Alsalman, M. H., Alsalman, Z., Alshams, M. M., Aljasem, J. M., Alsindi, Z. S., Almutairi, A. A., Alsunaikh, K. A., Buali, H. H., Algadeeb, K. B., Mohammed, N. E. O., Bushehab, A. A., & Shafey, M. M. (2025). Predictors and health impacts of Ramadan intermittent fasting among patients with sickle cell disease. *Frontiers in medicine*, *12*, 1584795. https://doi.org/10.3389/fmed.2025.1584795

-15 Alam A. Y. (2023). Pre-Ramadan diabetes risk stratification and patient education. *JPMA. The Journal of the Pakistan Medical Association*, *73*(3), 374–376. https://doi.org/10.47391/JPMA.17-23

Tables

Table 1. Socio-demographic and Clinical Characteristics of the Study Population (N=635)

Variable	Category	n	%
Age (Years)	Mean ± SD	**55.5 ± 16.1**	-
Gender	Male	336	52.9
	Female	299	47.1
Diabetes Type	T2DM	541	85.2
	T1DM	94	14.8
Duration of Diabetes	< 10 Years	292	46.0
	≥ 10 Years	343	54.0
Insulin Usage	Non-Insulin/Tablets	330	52.0
	Insulin Users	305	48.0

Table 2. Risk Stratification According to IDF-DAR Guidelines

Risk Category	Score Range	n	%
Low Risk	0 – 3	142	22.4
Moderate Risk	4 – 6	108	17.0
High Risk	> 6	385	60.6
Total		**635**	**100.0**

Table 3. Factors Associated with Risk Category (Bivariate Analysis)

Variable	Low Risk n (%)	Moderate Risk n (%)	High Risk n (%)	P-value
Gender				**0.444**
Male	70 (20.8%)	62 (18.5%)	204 (60.7%)	
Female	72 (24.1%)	46 (15.4%)	181 (60.5%)	
Diabetes Type				**<0.001**
T2DM	138 (25.5%)	104 (19.2%)	299 (55.3%)	
T1DM	4 (4.3%)	4 (4.3%)	86 (91.5%)	
Duration				**<0.001**
< 10 Years	105 (36.0%)	54 (18.5%)	133 (45.5%)	
≥ 10 Years	37 (10.8%)	54 (15.7%)	252 (73.5%)	
Glycemic Control				**<0.001**
HbA1c < 7.5%	126 (48.5%)	65 (25.0%)	69 (26.5%)	
HbA1c 7.5 – 9.0%	16 (6.5%)	32 (13.1%)	197 (80.4%)	
HbA1c > 9.0%	0 (0.0%)	11 (8.5%)	119 (91.5%)	
Hypoglycemia History				**<0.001**
No History	133 (39.6%)	86 (25.6%)	117 (34.8%)	
Any Hypoglycemia	9 (3.0%)	22 (7.4%)	268 (89.6%)	
Age Group				**0.019**
Adults (<65)	109 (24.8%)	80 (18.2%)	251 (57.0%)	
Elderly (≥65)	33 (16.9%)	28 (14.4%)	134 (68.7%)	
Renal Complications				**<0.001**
eGFR > 60 (Normal)	136 (35.1%)	93 (24.0%)	158 (40.8%)	
eGFR < 60 (Impaired)	6 (2.4%)	15 (6.0%)	227 (91.5%)	
MVD Complications				**<0.001**
No MVD	134 (36.8%)	80 (22.0%)	150 (41.2%)	
Stable MVD	8 (3.7%)	28 (12.8%)	182 (83.5%)	
Unstable MVD	0 (0.0%)	0 (0.0%)	53 (100.0%)	

Table 4. Impact of Clinical Variables on Mean Risk Score

Variable	Group	Mean Risk Score (SD)	t	df	P-value
Gender	Male	10.25 ± 8.39	-0.168	633	0.867
	Female	10.37 ± 8.81			
Insulin Status	Non-Insulin/Tablets	5.65 ± 5.38	-17.205	633	**<0.001**
	Insulin Users	15.34 ± 8.56			
Previous Experience	Neutral/Positive	7.47 ± 6.35	-14.708	633	**<0.001**
	Negative	16.90 ± 9.45			
Duration of DM	< 10 Years	7.67 ± 7.32	-7.441	633	**<0.001**
	≥ 10 Years	12.55 ± 8.94			
Fasting Hours	< 16 Hours	10.02 ± 8.16	-1.433	633	0.152
	≥ 16 Hours	11.15 ± 9.73			

Table 5. Comparison of Patient Age by Diabetes Type

Diabetes Type	n	Mean Age (Years) ± SD	Mean Difference	t	df	P-value
Type 2 DM	541	59.5 ± 12.1	26.9 Years	18.63	633	**<0.001**
Type 1 DM	94	32.5 ± 16.9				

Figures

Figure 1. Distribution of Risk Categories

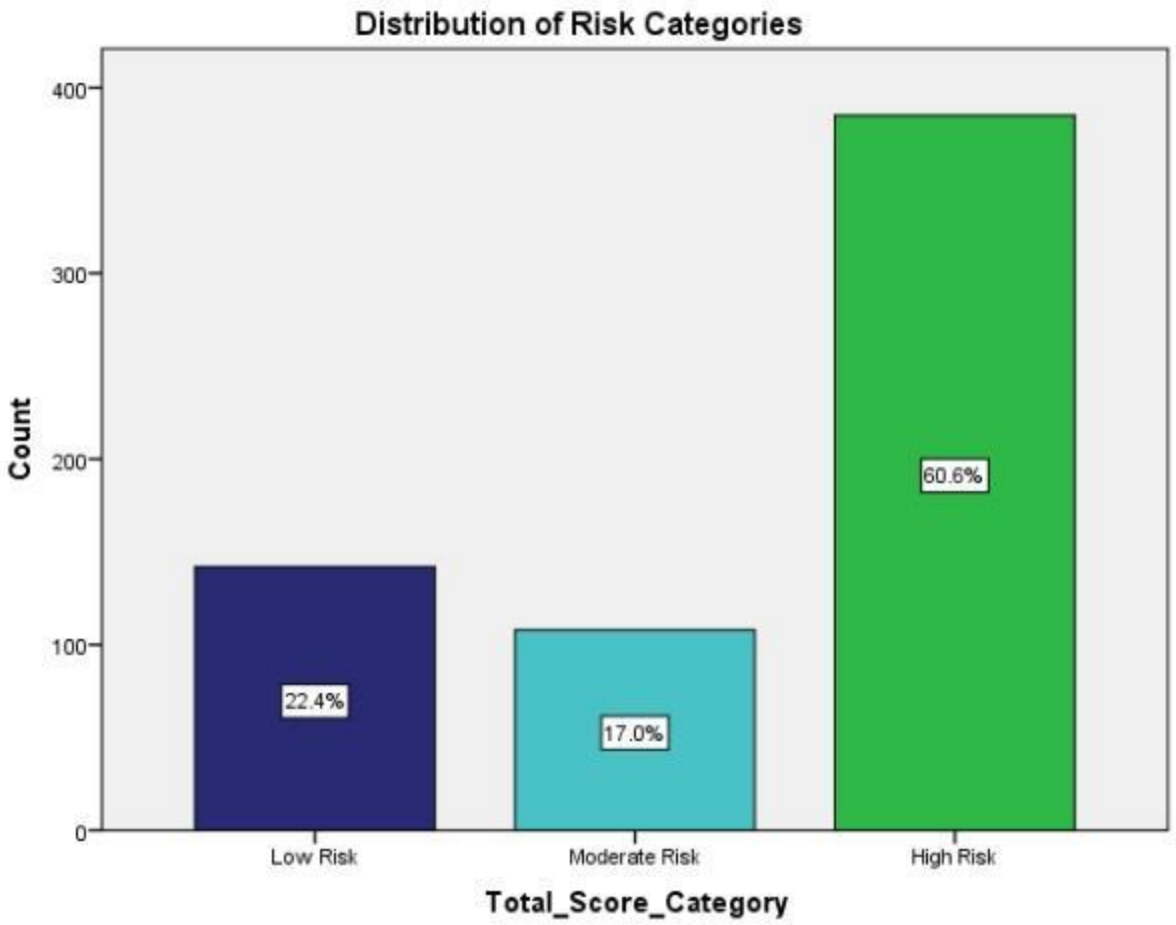


Figure 2. Distribution of Risk Categories According to Diabetes Type (T1DM vs. T2DM)

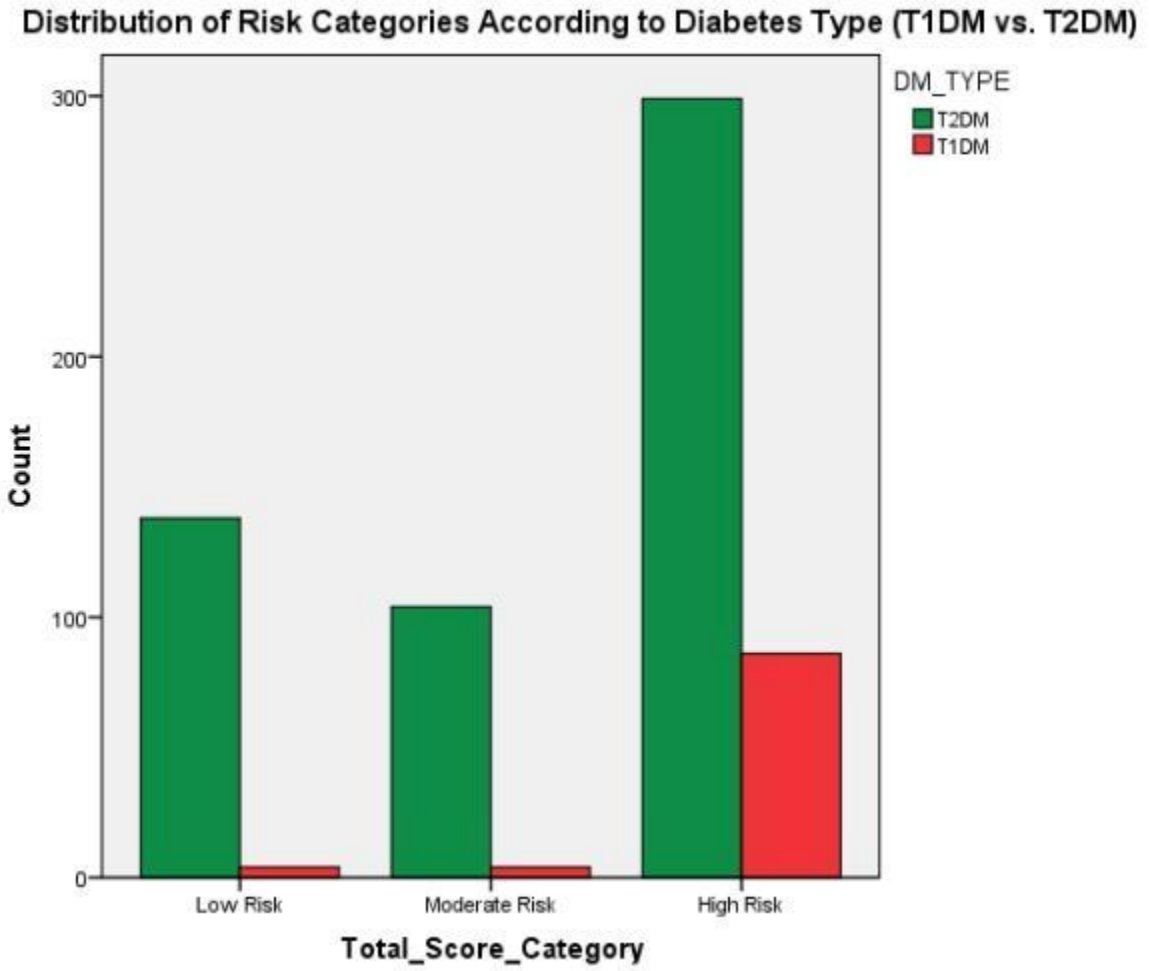


Figure 3. Impact of Insulin Treatment on Risk Score

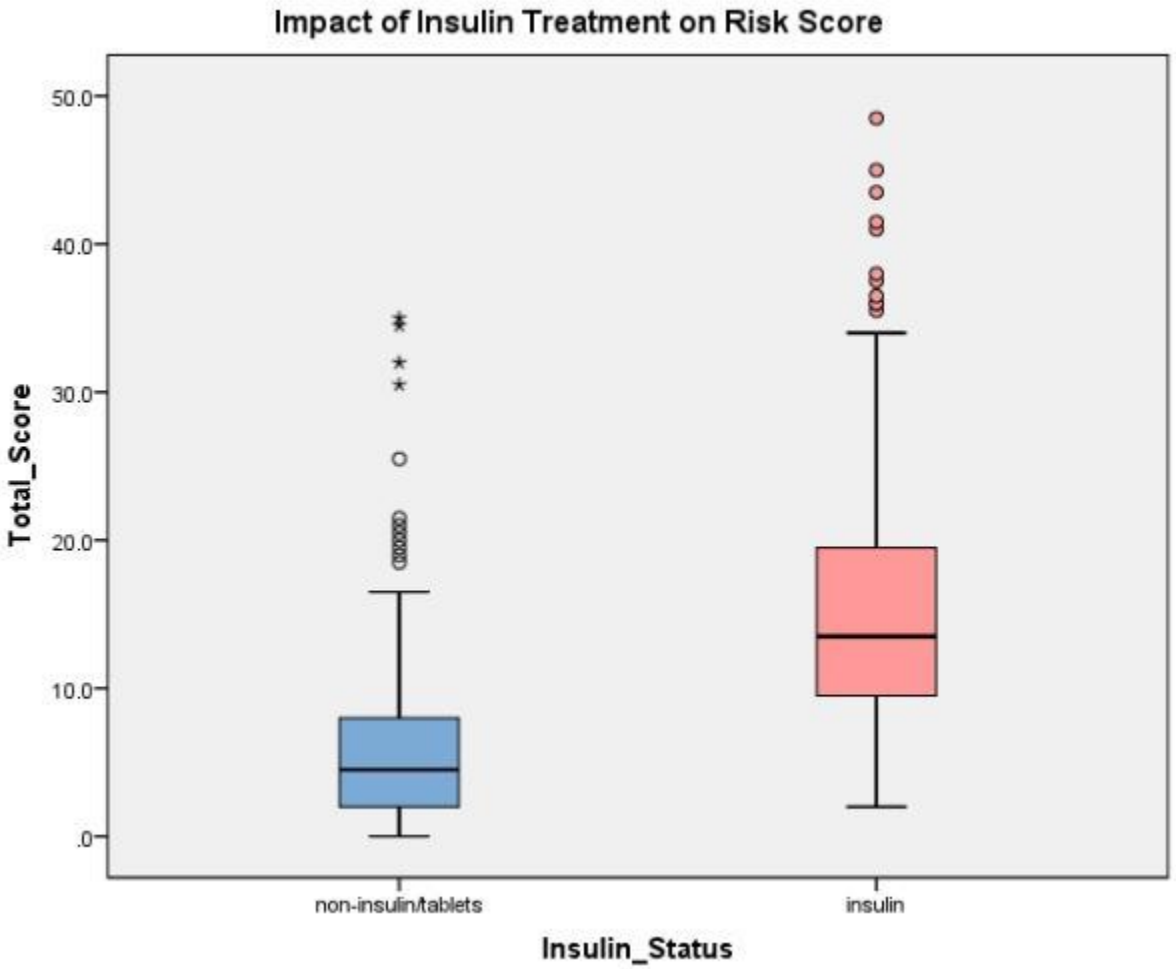


Figure 4. Impact of Diabetes Duration on Risk Score

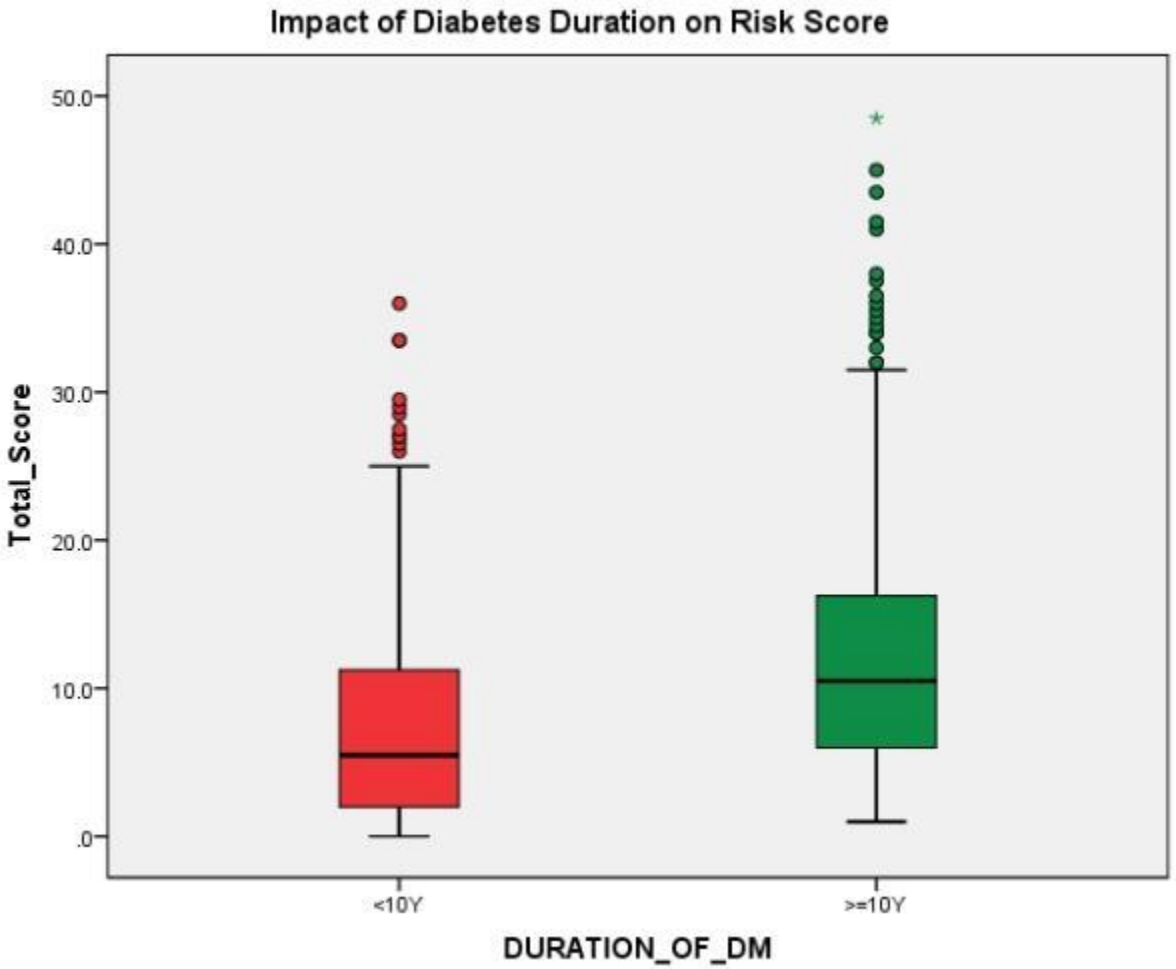
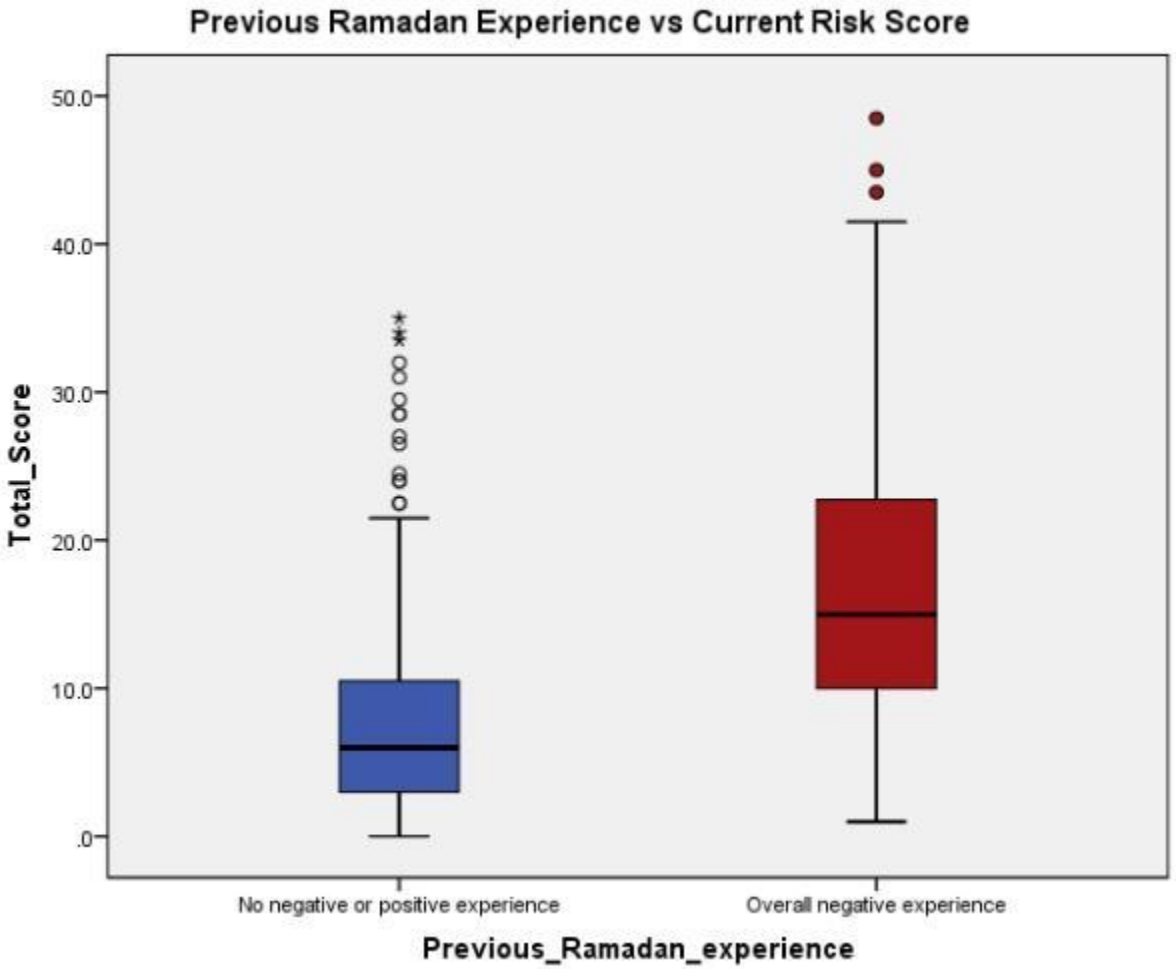


Figure 5. Previous Ramadan Experience vs. Current Risk Score


Previous Ramadan Experience vs Current Risk Score
Total_Score
50.0
40.0
30.0
20.0
10.0
.0
No negative or positive experience
Overall negative experience
Previous_Ramadan_experience