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Preparing Muslims with diabetes mellitus for Ramadan fasting in Singapore: a clinical approach and review of current practice

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ABSTRACT

Ramadan fasting, a month-long annual practice for Muslims, can be challenging for those who have diabetes mellitus with or without associated complications or pre-existing comorbidities, as well as healthcare providers involved in their care. Inadequate preparation for this fasting period can result in increased complications. We reviewed the current practice of Muslims with diabetes mellitus in Singapore who intend to fast during Ramadan, with particular attention on locally available evidence. Adequate preparation for Ramadan fasting, including pre-Ramadan assessment, optimisation of glycaemic control, structured Ramadan-focused diabetes education, medication adjustment, glucose monitoring and test fasting, can lead to benefits in terms of improvements in metabolic control and reduced risk of fasting-related complications in people with diabetes mellitus. While there are ongoing efforts to reduce risk during this period, larger-scale national programmes are needed to avert complications and assess the long-term effects of Ramadan fasting in the local population.

Keywords: diabetes, fasting, Ramadan, Singapore

INTRODUCTION

Ramadan fasting, as one of the five pillars of Islam, is an annual obligatory religious practice by Muslims throughout the world in a month-long consecutive-day period from dawn to dusk. While this practice is obligatory for all adult healthy Muslims, there are religious exemptions for those facing serious medical conditions, including the many Muslims who have diabetes mellitus (DM).

As the Muslim calendar is shorter than the Roman calendar, the fasting experience in temperate countries differs from year to year depending on the different seasons. The duration of the daily fast may vary from 11 hours to as much as 20 hours, with a shorter duration in colder climates and a longer duration in hotter ones. Religious exemptions allow for a shorter fasting duration in countries where the duration is longer than the daylight hours in Mecca, the centre of Muslim pilgrimage.

During Ramadan fasting, there are changes to daily routines including altered meal timings, with an earlier morning meal at pre-dawn (*sahur*) and a later evening meal at sunset (*iftar*). While daytime physical activity may not differ by much, additional supplementary prayers are frequently performed due to added spiritual rewards during this period. Although optional, night-time prayers are particularly encouraged during this holy month with consequent effects on circadian rhythm from altered sleep patterns.[1]

In Singapore, with a relatively stable equatorial climate, the fasting hours remain relatively fixed at approximately 14 hours for 29 or 30 consecutive days year-on-year. The challenges then include the long duration of fasting in the hot and humid climate and managing the cultural differences in this Muslim minority country with a progressively increasing proportion of people with DM. Based on the 2019 National Health Survey, the prevalence of DM among Malays was 14.4%, as compared to Chinese (8.2%) and Indians (14.2%).[2] According to the General Household Survey 2015, the majority of Malays (99.2%) in

Singapore and some Indians (21.3%) make up most of the Muslim population in Singapore, which accounts for 14.0% of the resident population.[3] The cultural differences and potential language barriers between healthcare providers and patients prove to be challenging, as there can be difficulties in reaching a consensus on the individualised risk and care needed during this religious practice.[4]

Abstaining from food and fluid intake for Ramadan during the fasting hours has become an annual routine for the healthy Muslim adult, conferring benefits as a practice in discipline to regulate meals and physical activity. However, this annual practice poses additional challenges for Muslims with comorbidities, including certain populations of people with DM, with potentially harmful consequences. The multifold increased risk of acute DM-related complications arising during this period[5] necessitated an international expert consensus in 2005 advising physicians to prepare Muslims with DM for Ramadan fasting.[6] Since then, more studies have been done evaluating the metabolic changes related to fasting and interventions aimed at reducing the risk of fasting for Muslims with DM. Various international recommendations have arisen thereafter to prepare physicians and patients for Ramadan fasting, culminating in the IDF-DAR (International Diabetes Federation-Diabetes and Ramadan International Alliance) Practical Guidelines, an extensive international guideline that was developed through a collaboration between the International Diabetes Federation and the Diabetes and Ramadan International Alliance with input from the Mufti of Egypt in 2017,[1] and updated in 2021.[7] A limitation that was recognised by the IDF-DAR Practical Guidelines was that much of the guidance available for the management of DM during Ramadan represents expert opinion rather than evidence-based clinical studies.

Nonetheless, differences in the practice of Ramadan fasting in different climates and cultures, and differences in healthcare systems and community support, raise the need for a localised adaptation of the guidelines for healthcare practice in Singapore. With the increasing

armamentarium of available blood-glucose-lowering medications, fasting recommendations also need to be evaluated regularly to anticipate issues with sudden alterations in lifestyle routines. In addition, advancements in technology, particularly in glucose monitoring devices and the increasing use of telemedicine, can be promoted to ease the management of these patients.

Moreover, in the current climate of the ongoing COVID-19 pandemic, while the risk of infection is not increased during Ramadan fasting, there remains a concern of higher risk of complications, including diabetic ketoacidosis from acquired infections.[8] Hence, there is a need to manage DM well and stay away from potential sources of infection.

In this review, we examine the current status of DM management during Ramadan fasting for the Singapore population, including summarising available local data.

PRE-RAMADAN PERIOD

In the landmark observational EPIDIAR (Epidemiology of Diabetes and Ramadan) study involving 13 countries with Muslim-majority populations, the risk of both severe hypoglycaemia and severe hyperglycaemia with ketoacidosis during Ramadan was high, with a sixfold increase when compared to before Ramadan for those who fasted for more than 15 days.[5]

With the consensus guideline[6] recommending the need for pre-Ramadan evaluation and education, healthcare providers both internationally[9] and locally have prepared Muslims with DM for Ramadan fasting through a multi-pronged approach.[10] Globally, studies support the role of Pre-Ramadan counselling to reduce the incidence of DM-related and fasting-related complications in people with DM.[7]

Muslims with DM should be assessed regarding their plans to fast during Ramadan several months prior to Ramadan when attending their regular clinic appointments, to enable

scheduling of their pre-Ramadan assessment and evaluation of the need for structured education at least 2–3 months before Ramadan (Fig. 1). Recommendations can be delivered via face-to-face consultations (one-to-one or group) or via telemedicine (phone consultation, email or video consultations). A computerised system to alert the physician and/or schedule patients would enable this to be performed systematically and is available in certain local polyclinics, as polyclinics handle a large proportion of the national population of people with DM. However, further enhancements to the system are needed to ensure comprehensiveness in patient selection and wider availability to all polyclinics, primary care clinics and specialist diabetes centres.

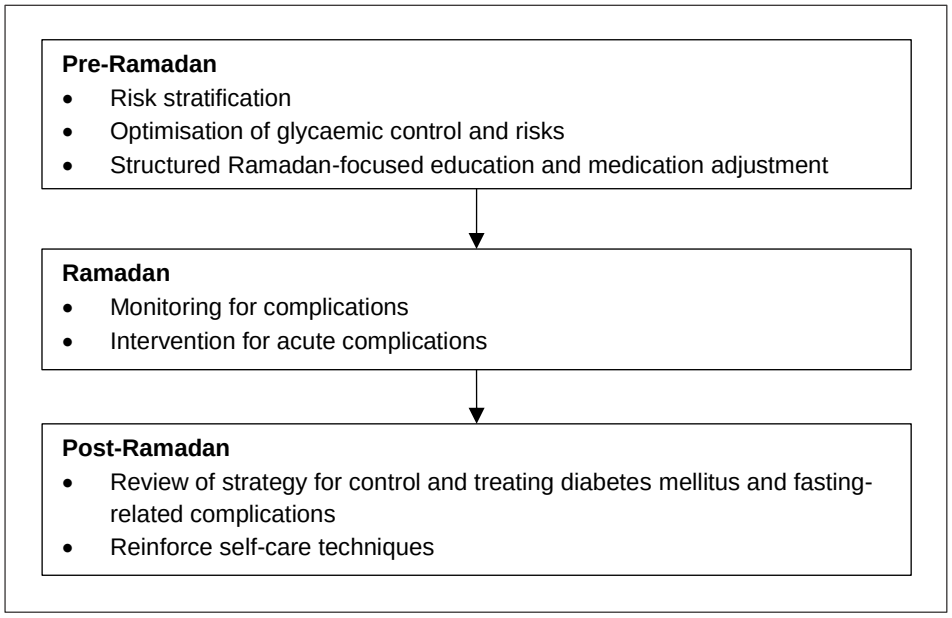

Fig. 1 Chart shows approach to preparation for Ramadan fasting for Muslims with diabetes mellitus.

Pre-Ramadan assessment

During the Pre-Ramadan consultation, a targeted assessment of risk stratification and plans is needed. Individualised risk profiles for acute DM-related complications during fasting should be evaluated, taking into consideration glycaemic control, recent or pre-existing illness, and

chronic DM complications, social support and ability for self-care, and treatment-related risk.[1] The Diabetes and Ramadan Practical Guidelines 2021 provides recommendations based on risk elements, as stated in Tables I and II.[7] These should be conveyed to the patients.

While cultural differences may complicate the discussion,[4] this approach enables the patient to make an informed personal decision on fasting or seek further consultation from their trusted, culturally similar religious leaders on religious exemptions that are applicable to their individual circumstances. In a minority Muslim country, support from a culturally similar healthcare provider team may be preferred by the patient[10] and also assist healthcare providers.[11] This consultation is an opportune moment for optimisation of glycaemic control through reiterating the need for general DM education, regular glucose monitoring, timely feedback and medication adjustment to improve the risk profile for DM complications during fasting.

Table I. Elements in risk calculation and suggested risk score for people with diabetes mellitus (DM) who seek to fast during Ramadan.[7]

Risk element	Risk score
DM type	
Type 1	1
Type 2	0
Duration of DM	
≥ 10 yr	1
< 10 yr	0
Presence of hypoglycaemia	
Hypoglycaemia unawareness	6.5
Recent severe hypoglycaemia	5.5
Multiple weekly hypoglycaemia	3.5
Hypoglycaemia < 1 time per wk	1
No hypoglycaemia	0
Glycaemic control (HbA1c)	
> 9.0% (11.7 mmol/L)	2
7.5%–9.0% (9.4–11.7 mmol/L)	1
< 7.5% (9.4 mmol/L)	0
Type of treatment	
Multiple daily mixed insulin injections	3
Basal bolus/insulin pump	2.5
Once-daily mixed insulin	2

Basal insulin	1.5
Glibenclamide	1
Gliclazide MR or glimepiride or repaglinide	0.5
Other therapy not including SU or insulin	0
Self-monitoring of blood glucose†	
Indicated but not conducted	2
Indicated but conducted suboptimally	1
Conducted as indicated	0
Acute complications	
DKA/HONC in last 3 mth	3
DKA/HONC in last 6 mth	2
DKA/HONC in last 12 mth	1
No DKA/HONC	0
MVD complications/comorbidities	
Unstable MVD	6.5
Stable MVD	2
No MVD	0
Renal complications/comorbidities (eGFR)	
< 30 mL/min	6.5
30–45 mL/min	4
45–60 mL/min	2
> 60 mL/min	0
Pregnancy*	
Pregnant not within targets	6.5
Pregnant within targets	3.5
Not pregnant	0
Frailty and cognitive function	
Impaired cognitive function or frail	6.5
> 70 years old with no home support	3.5
No frailty or loss in cognitive function	0
Physical labour	
Highly intense physical labour	4
Moderately intense physical labour	2
No physical labour	0
Previous Ramadan experience	
Overall negative experience	1
No negative or positive experience	0
Fasting hours	
≥ 16 hr	1
< 16 hr	0

**Pregnant and breastfeeding women have the right to not fast regardless of whether they have DM.*
†Frequency of self-monitoring of blood glucose needs to be guided by risk stratification and individualised. All individuals should break their fast if blood glucose < 3.9 mmol/L, check within 1 hour if 3.9–5.0 mmol/L or > 16.6 mmol/L, or symptoms or hypoglycaemia or acute illness occur.[7]
DKA: diabetic ketoacidosis; eGFR: estimated glomerular filtration rate; HONC: hyperglycaemic hyperosmolar non-ketotic coma; MVD: macrovascular disease; SU: sulfonylurea

Table II. Risk score, risk categories and medical and religious recommendations for fasting.[7]

Risk score/level	Medical recommendations	Religious recommendations
Low risk (score 0–3)	Fasting is probably safe. 1. Medical evaluation 2. Medication adjustment 3. Strict monitoring	1. Fasting is obligatory. 2. Advice not to fast is not allowed, unless patient is unable to fast due to the physical burden of fasting or needing to take medication or food or drink during the fasting hours.
Moderate risk (score 3.5–6)	Fasting safety is uncertain. 1. Medical evaluation 2. Medication adjustment 3. Strict monitoring	1. Fasting is preferred but patients may choose not to fast if they are concerned about their health after consulting the doctor and taking into account the full medical circumstances and patient's own previous experiences. 2. If the patient does fast, they must follow medical recommendations, including regular blood glucose monitoring.
High risk (score > 6)	Fasting is probably unsafe.	Advise against fasting.

Structured Ramadan-focused education on glucose monitoring, dietary modification, physical activity and medication adjustment

Despite receiving general DM knowledge through widespread public health education[12] and DM education, unsafe self-management practices are still seen among local DM patients who fast during Ramadan.[13] Thus, preparing for fasting through structured Ramadan-focused education should provide a means to bridge the gap between knowledge and self-management of DM and promote safer fasting by monitoring for and intervening to prevent untoward complications during fasting.

Locally, Siaw et al[14] showed that Muslim patients with DM have significant improvements in their glycaemic control with minimal hypoglycaemia, especially when DM treatments were adjusted, despite minimal self-reported changes in their overall diet and physical activity. Similarly, Yeoh et al[15] showed that with prior patient education and

medication adjustment, Ramadan fasting can be performed safely and is beneficial in terms of metabolic profile and body composition, with slightly greater benefit seen in females.

Hence, apart from risk stratification, structured education on religious exemptions, glucose monitoring for complications, dietary modification, regulation of physical activity and medication adjustment, as used in the local Diabetes Education and Medication Adjustment in Ramadan (DEAR) programme,[10] could help to improve glycaemic control and reduce DM complications during Ramadan fasting. In the restructured hospitals in Singapore, these Ramadan-focused education sessions have been performed in the form of conversation maps or small-group interactive workshops by various speakers, which may or may not include a religious leader to clarify any religious doubts or myths. Patient education materials are easily accessible and widely distributed in the form of videos, social media and pamphlets through these institutions and mainstream media. Similar sessions are also conducted in community settings by public institutions, faith-based organisations, non-profit organisations and the Health Promotion Board as part of public outreach.

Glucose monitoring for medication adjustment and complications

While education on recognising symptoms of hypoglycaemia and hyperglycaemia is important and needs to be reiterated,[13] it is pertinent to advocate for self-monitoring of blood glucose. The frequency of blood glucose monitoring depends on several factors such as type of DM, current medications and risk stratification level. A seven-point monitoring guide may be recommended at the following time points: pre-dawn meal (*sahur*), morning, midday, mid-afternoon, pre-sunset meal *(iftar)*, two hours after *iftar* and whenever there are symptoms of hypoglycaemia, hyperglycaemia or feeling unwell.[7] This adjunct to avert hyperglycaemia/hypoglycaemia and the need to monitor during sick days should be emphasised, as dysglycaemic symptoms could be misconstrued as fatigue (which occurs during

fasting) in the absence of corresponding blood glucose readings. This is especially likely at the point when blood glucose levels tend to dip in the afternoon to late afternoon period[16] after several hours of fasting.

It is still a challenge to tackle myths that blood testing, including capillary glucose monitoring, is forbidden during Ramadan fasting. Assurances from the respective religious leaders that capillary blood glucose monitoring during fasting hours does not invalidate fasting and more widespread public awareness through the media, led by the Islamic Religious Council of Singapore (MUIS), will also help the public to attain better understanding and acceptance of this common practice of DM self-management.

Newer technologies available for glucose monitoring (such as flash or continuous glucose monitoring) may be suitable for some patients who need even closer monitoring. This method may also circumvent frequent finger pricking for capillary glucose monitoring while providing greater insight into blood glucose trends, especially during fasting hours, for those who remain averse to capillary glucose monitoring. Furthermore, these sensors are implanted into subcutaneous tissue and therefore do not invalidate fasting nor have any religious contentions about or restrictions to their use.

In recent years, studies investigating the use of these glucose monitoring devices have emerged and demonstrate that based on flash glucose monitoring, there is a higher incidence of frequent and more prolonged hypoglycaemia episodes[17] as well as an increased risk of asymptomatic hypoglycaemia during Ramadan fasting.[18] However, these findings are not replicated by other continuous glucose monitoring studies that demonstrate no significant differences in the time spent in euglycaemia, hypoglycaemia and hyperglycaemia.[16] Even so, after *iftar*, a rapid rise in glucose level is seen on continuous glucose monitoring, which can be attributed to the carbohydrate-rich foods that are taken at this meal.[16] The limitations of these studies are often the small number of patients recruited. Nonetheless, as these glucose

monitoring devices become more widely used, physicians can discuss the use of these devices with patients who require a higher level of care or are at increased risk of hypoglycaemia and hyperglycaemia.

Dietary modification

The IDF-DAR Practical Guidelines[7] proposed a Ramadan Nutrition Plan as a guide to meal planning to avert unhealthy compensatory eating habits during non-fasting hours and post-Ramadan festivities. It includes a guide for weight maintenance or weight reduction during Ramadan, adjusted based on height, weight and gender, and is based on total caloric intake, taking into account the macronutrient meal composition for a balanced meal. This guide covers various cultural backgrounds globally and is accessible via the website daralliance.me[19] and a smartphone application (DaR SaFa)[20] for easy access by both healthcare providers and patients. Suggested meal plans for *iftar* and *sahur* with the provision of two snacks are shown with details on portion sizes and calorie distribution for each meal. For use in Singapore, we recommend selecting the guidance for Malaysia, as it is most similar to our local diet.

Additional advice should be given to avoid post-Ramadan feasting on high-calorie, carbohydrate-rich foods in order to maintain a healthy weight.

Additional physical activity in the form of night prayers

Apart from regular activity, strenuous exercise should be avoided during the fasting hours due to the increased risk of hypoglycaemia and/or dehydration. The risk of hypoglycaemia is higher for patients on insulin and sulfonylurea therapy. However, light to moderate physical activity is encouraged. Every Muslim performs five compulsory prayers consisting of a total of 17 prescribed movements and words (*rakaat*) daily, spread out from dawn to bedtime. Each *rakaat* consists of a series of seven postures: standing, bowing and repeated prostration alternating

with sitting, each of a short duration. These postures are similar to those in yoga. During a prayer, repeated cycles of the *rakaat* are performed, resulting in simple stretching exercises, consisting of muscle contraction and relaxation.[21] Hence, the additional night prayers (*tarawih*) of 11–23 *rakaat* daily should be counted as part of daily physical activity. While there have been minimal studies on physical activity during Ramadan fasting, the effect of an additional 12 units of prayers has been reported to have similar effects as 30 minutes of light exercise daily.[21]

Initial medication adjustment for fasting

Initial DM medication adjustment (Tables III & IV) and precautionary measures for the use of different medications during fasting have been proposed in the guidelines.[7] Locally, certain restructured hospitals and all polyclinics have their own in-house guidance for medication adjustment and conduct training updates for physicians and nurses.

Table III. Medication adjustment for Ramadan fasting in Type 2 diabetes mellitus (DM).[7]

DM medication	Non-fasting regimen	Fasting regimen
Metformin	Once, twice or thrice daily	• Once daily or prolonged release: no dose modification usually required, to be taken at *iftar*. • Twice daily: no dose modification usually required; take at *iftar* and *sahur*. • Thrice daily: morning dose taken before *sahur*, afternoon dose to be combined with dose taken at *iftar*.
Acarbose	Once, twice or thrice daily before meals	Limited evidence to guide adjustment. No dose modification is considered necessary, but the authors consider it prudent to observe the same dose adjustment as for metformin.
Thiazolinediones	Once daily	No dose modification required, dose should be taken with *iftar*.
Glinides	Thrice daily before meals	Reduced or redistributed to two doses according to meal sizes

Sulfonylureas	Once or twice daily before meals	• Once daily: take at *iftar*; for individuals with well-controlled blood glucose levels, dose may be reduced. • Twice daily: *iftar* dose remains the same; for individuals with well-controlled blood glucose levels, the *sahur* dose should be reduced. • Older drugs such as glibenclamide should be avoided due to higher risk of hypoglycaemia. Second-generation sulfonylureas such as gliclazide, gliclazide MR and glimepiride should be used instead.
Dipeptidyl peptidase-4 inhibitors	Once or twice daily	No treatment modification required.
Sodium-glucose co-transporter-2 inhibitors	Once daily	No dose adjustment required.
Glucagon-like peptide-1 receptor agonists	Once or twice daily before meals	As long as appropriately dose-titrated at least 2–4 weeks before Ramadan, no further treatment modifications are required.
Premixed insulin	Once or twice daily	• Reduce *sahur* dose by 20%–50%. • Take normal dose at *iftar*.
	Thrice daily	• Adjust *sahur* and *iftar* dosage based on subsequent premeal glucose readings every 3 days.* • Omit afternoon dose.
Long- or intermediate-acting insulin	Once daily	Reduce by 15%–30% to be taken at *iftar*.
	Twice daily	• Take usual morning dose at *iftar*. • Reduce evening dose by 50% and take at *sahur* meal. • Adjust further based on pre-*iftar* glucose.*
Short-acting insulin	Once, twice or thrice daily	• Take normal dose at *iftar*. • Adjust further based on post-*iftar* meal reading.* • Omit lunchtime dose. • Reduce *sahur* dose by 25%–50%.

**If < 3.9 mmol/L or symptoms, reduce by 4 units, and if > 11.1 mmol/L, increase by 4 units; if < 5 mmol/L, reduce by 2 units; and if > 7 mmol/L, increase by 2 units. Blood glucose targets should be individualised. (Adapted from Diabetes and Ramadan: Practical Guidelines 2021 by the International Diabetes Federation and Diabetes and Ramadan International Alliance.)*

Table IV. Medication adjustment for Ramadan fasting in Type 1 diabetes mellitus, by age group.[7]

Type of insulin	Glycaemic control	Medication adjustment
Adolescents		
Basal insulin	HbA1c < 7.5%	Reduce dose by 20%–30% and take at *iftar* or bedtime
	HbA1c > 7.5%	Keep same dose and take at *iftar* or bedtime
Prandial insulin	On insulin-carbohydrate ratio or insulin sensitivity factor correction	Continue the same for *iftar* and *sahur*
	On fixed doses	• No change for *iftar* • Reduce *sahur* dose by 20%–30%
Insulin pump		• Basal rate adjustment – 20%–35% decrease last 4–5 hours of fast – 10%–30% increase first few hours after *iftar* up to midnight • Bolus doses – Same as prior to Ramadan based on insulin-carbohydrate ratio – CGM monitoring
Adults		
Insulin pump	• Basal rate adjustment – 20%–40% decrease last 3–4 hours of fast – 10%–30% increase first few hours after *iftar* • Bolus doses – Same as prior to Ramadan • CGM monitoring	
Basal bolus with rapid-acting insulin	• Basal insulin – 30%–40% reduced dose taken at *iftar* • Rapid-acting insulin – *Sahur* dose reduced by 30%–50% – Prelunch dose skipped – *Iftar* dose adjusted based on 2-hour post-*iftar* reading • Monitor 7-point blood glucose	
Basal bolus with conventional insulin	• Intermediate-acting insulin – Morning dose to be taken in evening – 50% evening dose at *sahur* • Regular insulin – Evening meal dose remains – Skip afternoon dose – 50% evening meal dose for *sahur* • Monitor 7-point blood glucose or 2–3 staggered readings	
Premixed insulin	• Shift morning dose to *iftar* • 50% of eveing dose at *sahur*	

	• Monitor glucose 2–3 times daily and whenever any hypoglycaemic symptoms develop

**An individualised approach is essential for treatment adjustment according to patients' self-monitoring of blood glucose or CGM data. Advisable to take prandial insulin 20 minutes prior to iftar to account for high fast and/or high-protein meals for better post-prandial control. Extra correction doses for high blood glucose values should be based on insulin sensitivity factor and target blood glucose. Correctional doses should not be given more frequently than 3 hourly to avoid insulin stacking and hypoglycaemia. CGM: continuous glucose monitoring (Adapted from Diabetes and Ramadan: Practical Guidelines 2021 by the International Diabetes Federation and Diabetes and Ramadan International Alliance.)*

With the advent of newer DM treatments with less hypoglycaemia risk, a systematic review has shown that certain treatments are associated with lower risk of complications during Ramadan fasting.[22] The newest class of oral anti-diabetic medication, sodium-glucose co-transporter-2 (SGLT2) inhibitors, have also been used without significant ketonemia, deterioration in renal function or hypoglycaemia in the local setting.[23] Those with well-controlled glycaemia on this class of drugs are deemed to have a low risk of hypoglycaemia during fasting, hence no dose adjustments are required during Ramadan. However, SGLT2 inhibitors should be initiated at least two weeks to a month before Ramadan for stabilisation and are recommended to be administered at *iftar*, with increased fluid intake during non-fasting hours.[7] If the SGLT2 inhibitors were initiated for cardiovascular or renal protection, they should be initiated with a lower dose prior to Ramadan.[7]

Those on multiple DM medications usually have a long duration of DM, multiple comorbidities and renal impairment. They are at higher risk of hypoglycaemia during Ramadan fasting. This risk is amplified in individuals with Type 2 DM who are on three or more antidiabetic agents; in these cases, a review of the medication dosages should be made, especially appropriate reduction of sulfonylurea and insulin dosage.[7]

Further titration of medication regimen based on self-monitoring of capillary blood glucose is pertinent, especially for those on insulin. Insulin regimen needs to be individualised, as there is limited data regarding the safest insulin type or regimen. Subsequent further adjustment based on blood glucose monitoring helps to avert hypoglycaemia or

hyperglycaemia. While there are recommendations, the lack of evidence points towards the need to individualise care plans.

Test fasting

With an adjusted treatment regimen for fasting, patients are advised to test out their adjusted regimen prior to the Ramadan fasting month as a simulation of the fasting period. In addition, some Muslims perform non-obligatory fasting in the months before and after Ramadan, which can be an ideal platform for testing their response to fasting.

For Muslims with DM who are planning to fast, it is advisable to test out their current treatment regimen with glucose monitoring and to be prepared to stop fasting when their glucose readings are below or above safe targets,[1] or during sick days. For those in moderate or high risk categories and/or those who are fasting for the first time on glucose-lowering treatment, this is especially advisable to enable them to become attuned to the differing schedule and treatment regimen during fasting, and to make further modifications if necessary to reduce their risk.

With glucose monitoring during this ‘test fasting’ period using the recommended adjusted medication regimen, further fine-tuning can be done to optimise control and preparedness for the Ramadan fasting month.

Exemption from fasting

For those in the high risk category, medical experts deem that fasting is unsafe. However, many individuals in this high risk category may insist on fasting, perhaps due to personal religious conviction or lack of awareness of the risks related to fasting, which poses a challenge to the healthcare providers caring for them. Other than risk stratifying patients and attempting to quantify the risks associated with fasting, healthcare providers should maintain open lines of

conversation and discuss an alternative to Ramadan fasting. In place of fasting, compensating through *fidya*, a donation of food or money to the poor, for every day of fasting that is missed is permitted by the religion. For those who remain in the high risk category, it is advisable to counsel them with the assistance of religious leaders to gain acceptance of *fidya* as an alternative to annual Ramadan fasting. Improving public awareness of the concept of *fidya* for spiritual attainment while avoiding harm in this circumstance needs to be done through actively engaging MUIS to provide greater clarity for the wider audience.

RAMADAN MONITORING

To reduce the need for frequent clinic visits to receive feedback on glucose readings, correlated with dietary records and physical activity patterns, various platforms have been used, from traditional phone calls and email feedback to telemonitoring platforms.[24] Locally, the DEAR programme provides telehealth support during Ramadan fasting to enable easy access to medical consultation for safe fasting, in the absence of face-to-face clinic consultations, and promotes self-care, supported by a culturally similar healthcare provider team.[10] A similar telemonitoring programme with feedback for patients with DM who were fasting during Ramadan showed improvements in glycated haemoglobin and reduced self-reporting of symptomatic hypoglycaemia when compared to usual care.[24] In addition, a self-management algorithm has also been proposed[25] for optimising glycaemic control for the fasting period to promote further patient self-empowerment. This has been found to improve glycaemic control with no major complications.[26] Empowering patients through these group- and individual-directed interventions could potentially improve their level of self-care for DM in the immediate and longer term.[27]

POST-RAMADAN EVALUATION

During the post-Ramadan clinic visits, patients' glycaemic control and complications that arose during the fasting period need to be evaluated for planning of DM management during future years of Ramadan fasting. In addition, this enables evaluation of risk during fasting and planning of DM treatment during intermittent fasting, as Muslims may continue to perform non-obligatory fasting during the month after Ramadan and throughout the rest of the year. With more positive experiences, patients will have improved confidence and better adherence to medical recommendations.[28]

CONCLUSION

While Ramadan fasting is safe for most Muslims with DM who fall into the low to moderate risk categories, it poses a challenge to medical practitioners who are managing people with DM in a Muslim minority country with cultural differences, especially in patients with poor glycaemic control and multiple comorbidities. Optimisation of glycaemic control and careful monitoring during Ramadan fasting, with a clear plan of intervention for any complications that arise, and the necessary healthcare support can make Ramadan fasting a safer experience for patients and caregivers. The IDF-DAR 2021 guidelines provide a useful resource for healthcare professionals managing patients with DM who intend to fast during Ramadan but need to be contextualised for our local population and healthcare setting.

Future collaborative studies are needed locally to evaluate large-scale cost-effective programmes to manage the increasing population of Muslims with DM who perform this annual religious practice in the context of a progressive chronic disease, with the aim of improving care during Ramadan and the effect of this practice on longer-term glycaemic control.

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