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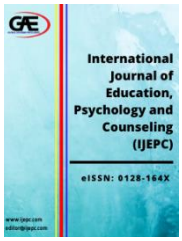

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RAMADHAN EXPERIENCE – A STREAMLINED DIABETES IN RAMADHAN PATIENT EDUCATION PROGRAM

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Abstract:

Introduction. The incidence of Type 2 Diabetes Mellitus (DM) in Malaysia is increasing, with 59% in Malays followed by other races. Fasting in Ramadhan for those with DM is challenging and requires comprehensive medical advice. Diabetic complications during fasting is mainly seen in patients with improper disease control or inadequate information. This novel diabetes in Ramadhan patient education program aims to facilitate knowledge attainment and improve dissemination of information to mitigate the risk of complications in Ramadhan and to pave the way to fasting safely. **Methods**. A compilation of important information on managing diabetic challenges during fasting month was assembled, gathered mainly from the Malaysian DM practice guidelines and the International Diabetes Federation (IDF) Diabetes in Ramadan Guideline. **Result**. This program provided comprehensive education on fasting in Ramadhan for people with DM in an engaging manner, conducted at the UiTM clinic facilities by the Endocrine team consisting of physicians and diabetic educators. The program was organised into three main parts: (1) personalized risk stratification; (2) lifestyle modification group session – participants were gathered for knowledge lectures and coaching on optimal dietary and physical

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activity; and (3) medication management -detailed explanation on treatment titration during fasting. This program was facilitated by a specially designed educational guide, describing important information on the risk categories for fasting in Ramadhan, timing of blood sugar monitoring, when to break the fast in the event of complication with management steps, and structured dietary tips. **Conclusion**. This innovative program has been tailored for use in the local population, and provides an essential service that is hugely beneficial, but currently lacking in this country. On this comprehensive and engaging platform, important information on managing diabetes in Ramadhan can be accessible to a wider population, leading to better patient care, and hence a has huge potential for sustainability.

Keywords:

Diabetes Mellitus, Education Program, Fasting, Ramadhan

Introduction

Fasting in the month of Ramadhan is one of the pillars of faith in Islam and is obligatory for healthy Muslim adults. It involves fasting continuously for one month, from dawn to sunset, and requires abstinence from a few factors, which includes eating, drinking, cigarette smoking, and notably refraining from taking oral medications.

Although Ramadhan fasting is obligatory, there are exemptions. These include those who have health limitations and chronic disease, including some people with diabetes mellitus. However, the vast majority of people living with diabetes choose to fast and sometimes choose to do so in contrary to medical advice (Hassanein M.M. et al, 2022). According to the latest estimates from the International Diabetes Federation (IDF), 463 million people are living with diabetes worldwide, a figure that is set to reach 700 million by 2045 (Hassanein M.M. et al, 2022). This dramatic rise will be highest in regions with large Muslim populations such as Africa, Middle-East and North Africa and South-East Asia (Saeedi P. et al, 2019).

Literature Review

The incidence of Type 2 Diabetes Mellitus (DM) in Malaysia is increasing, with an estimation of 3.9 million adults diagnosed according to the recent Malaysian National Health and Morbidity Survey (NHMS) in 2019. This is contributed largely by the Malay race with a prevalence of 59.1%, followed by the other races, namely the Chinese (19.6%), Indian (13.2%) and miscellaneous races (8.1%) (National Health and Morbidity Survey [NHMS] 2019), translating into a significant proportion of people with diabetes who will be fasting in the month of Ramadhan in Malaysia. Indeed, Malaysia lies in the geographical region with the highest Muslim population in the world (Hassanein M.M. et al, 2022), and in an international survey assessing people with Type 2 DM it was seen that more than 95% of these patients fast in Ramadhan regardless of their diabetic control, contributing to the largest number when compared to the other participating countries (Salti I, Benard E, & Detournay B et al, 2004).

Ramadhan fasting may have an impact on metabolic profile as a reflection from lifestyle changes during continuous fasting, including caloric restrictions, alteration in physical activities and sleeping patterns. Those fasting in Ramadhan generally consume two main meals per day, namely the predawn meal (suhoor) and the sunset or breaking of fast meal (iftar), but many, depending on the region, may also eat snacks during permitted hours; and this can

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inevitably disturb glycaemic balance (Almulhem et al, 2019), (Lessan et al, 2018) leading to erratic diabetic control. In addition, alteration of dietary composition during Ramadhan to meals with high in carbohydrates and saturated fats may also have a negative impact on sugar levels (Al-Arouj et al, 2010). These observations highlight the issues with diabetes control in Malaysia, where the food consumed is generally high in carbohydrate and saturated fat, especially during iftar and even post late-night prayers, contributing to erratic blood sugar and poor disease control.

Diabetes mellitus is a chronic disease with high risk of complications, especially in those with long duration of disease and inadequate control. Observing approach and management practices in different regions may aid in mitigating the complications, especially in high risk situations such as continuous fasting. In a global survey evaluating Ramadhan fasting practices among adults with Type 2 diabetes in five separate regions, namely South Asia (Bangladesh, Pakistan, India), Southeast Asia (Malaysia, Brunei), Gulf Nations (Kingdom of Saudi Arabia, United Arab Emirates), Middle East (Egypt, Iraq, Turkey) and North Africa (Algeria, Tunisia, Morocco) (Hassanein M.M. et al, 2024), it was ascertained that acute diabetic complications such as hypoglycaemia and hyperglycaemia occurred in every region analysed, albeit at variable rates, and almost half (45.9%) of the enrolled participants had received pre-Ramadhan advice on disease management. Notably, the population in Southeast Asia had the highest rate of both baseline co-morbidities, specifically hypertension (76.8%) and hyperlipidaemia (75.3%), as well as baseline complications, inclusive of retinopathy (24.4%), nephropathy (25.8%) and cardiovascular disease (14.4%). Of particular concern was the high incidence of hypoglycaemia (17.7%), including need for cessation of fasting due to hypoglycaemia (67.7%) in the Southeast Asia region, again at a much higher rate compared to other areas studied (Hassanein M.M. et al, 2024). This survey emphasizes the staggering burden of deleterious diabetic health effects in Malaysia and an imperative need to address this situation, targeting a solution that is customized for local residents.

In a review of three large epidemiological studies looking at the evolution of fasting patterns during Ramadan and associated clinical outcomes in adults with type 2 diabetes mellitus over two decades (2000–2020) (Hassanein M.M. et al, 2021), it was shown that over a period of time people with diabetes choosing to fast during Ramadan manifest increasingly complex profiles in terms of their diabetes, with increased disease duration, greater body mass index, and elevated pre-Ramadan mean glycated haemoglobin (HbA1c) levels (Hassanein M.M. et al, 2021). This again illustrates the challenges Malaysians with diabetes face, as a high number of the population planning to fast have high body mass index and a significant proportion have poorly controlled diabetes resulting in inevitable fluctuations in blood sugar readings during fasting, portending a poorer outcome.

Numerous studies have shown contradicting results on both the advantages and drawbacks of fasting in people with diabetes mellitus. In a prospective cohort study performed in Malaysia looking at various risk factors for hypoglycaemia in people with diabetes who fast in Ramadhan, it was found that old age (defined as above 60 years old) increased the relative risk of hypoglycaemia, whereas taking breakfast or predawn meal (suhoor) before fasting reduced the relative risk by more than half (Loke S.C. et al, 2010). A subsequent meta-analysis comprising of studies conducted in Asian, Middle-Eastern and African countries attested to a relatively low incidence of hypoglycaemia among people with type 2 diabetes mellitus fasting

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in the month of Ramadhan with a slight improvement in anthropometry and metabolic profile in this population (Dicky L.T. et al, 2020) (Table 1).

Fasting in Ramadhan for those with DM is challenging and needs close monitoring with sufficient and comprehensive medical advice. A Malaysian survey assessing the perception and behaviour of people with Type 2 Diabetes towards management of diabetes during Ramadhan revealed that although the majority of respondents seemed to be able to fast without difficulties, most of these patients did not adjust their antidiabetic medications or monitor their blood sugar routinely during Ramadan although they were aware of the importance of doing so (Lee W.H. et al, 2021). In another survey evaluating fasting practices among people with diabetes attending primary health clinics at a state in Malaysia, it was shown that 70.9% of the population enrolled were able to fast effectively, and knowledge regarding their medication was significantly associated with successful fasting (Leow S.N, Tong S.F, 2019). A separate semi-structured quantitative survey judging the perspective of Malaysia patients with diabetes on fasting in Ramadhan confirmed that patients generally choose to fast the whole month even against medical advice, with reported difficulties in lifestyle and blood sugar management as well as reduced interaction with treating practitioners (Jun Y.L. et al, 2017) (Table 1). These findings emphasize the limitations in the current approach of diabetes management during the fasting the month in Malaysia, as even with patient realization of the importance of treatment and medication education, translation into adherence is lacking.

Complications due to diabetes during fasting is mainly seen in patients with improper disease control or inadequate information. In a nationwide survey assessing the characteristics of Malaysians with diabetes fasting in the month of Ramadhan, it was found that more than a quarter of the population break their fast due to diabetic-related conditions, with low blood sugar (hypoglycaemia) occurring in 17.8%, whereas 10.6% had high blood sugar (hyperglycaemia), leading to increased need for hospital visits (Zanariah H. et al, 2021). This was further illustrated in a countrywide study looking at admissions to general hospitals across the different states in Malaysia during the month of Ramadhan, which revealed a high number of admission due to diabetic emergencies, with more than half of the assessed population unable to recall receiving medical advice regarding managing diabetes in Ramadhan (Chin V.T. et al, 2021). Additionally, in another study assessing diabetes knowledge and management principles among Malaysian fasting in Ramadhan, which utilized self-administered questionnaires, it was revealed that only half of the population studied had average understanding on the condition, and factors such as education level, monthly income and working status were associated with better knowledge (Salimah Japar et al, 2022) (Table 1), further underlining the need to improve education and self-management practices among the population of people with diabetes during the fasting month.

Table 1. Summary Of Recent Relevant Literature On Diabetes In Ramadhan

Author(s)	Design/ Population enrolled	Main Findings/ Interpretation
Hassanein et al (2024)	Global survey (2020) (N= 4889) Breakdown: South Asia (n = 1247) Southeast Asia (n = 896) Gulf Nations (n = 1041)	Southeast Asia: ▪ Highest rate on co-morbidities – hypertension (76.8%), hyperlipidaemia (75.3%) ▪ Highest rate on baseline diabetic complications - retinopathy

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	Middle East (n = 1203) North Africa (n = 502)	(24.4%), nephropathy (25.8%), cardiovascular disease (14.4%) ▪ Highest incidence of hypoglycaemia (17.7%), fasting interruption due to hypoglycaemia (67.7%)
Hassanein et al (2021)	Review of 3 epidemiological studies (2000-2020) EPIDIAR (2001): n = 11,173 CREED (2010): n = 3250 DAR-MENA (2016): n=1749	Increased complexity ▪ Longer disease duration ▪ Higher BMI ▪ Elevated pre-Ramadan HbA1c ▪ Reduced risk of hypoglycaemia
Loke et al (2018)	Prospective cohort study at tertiary hospital (2007-2008) (n = 135)	Hypoglycaemia - RR 1.60 (95% CI 1.05 to 2.43). High risk: ▪ Acceptable control (HbAlc < 8%) – RR 2.33 ▪ Advanced age (> 60 years) – RR 2.14 Lower risk: ▪ Meal before fasting (suhoor) - RR 0.38
Dicky et al (2020)	Meta-analysis - 28 observational studies	Metabolic changes ▪ FPG decrease by −15.28 (95% CI -17.22, −13.34) mg/dl, ▪ HbA1c reduction by −0.27 (95% CI -0.32, −0.22) % ▪ TC lowered by −12.88 (95% CI -14.68, −11.09) mg/dL ▪ improved anthropometry ▪ No fatal hypoglycaemia
Lee et al (2021)	Cross-sectional study at tertiary medical centre (2018) (n = 30)	Self-management practices ▪ No hypoglycaemia during fasting – 73% ▪ No medication adjustment - 60% ▪ Awareness of SMBG importance – 60% ▪ Blood sugar monitoring – 26% ▪ Financial constraint as a barrier to SMBG – 53%
Leow et al (2019)	Retrospective recall study at primary health clinic (2018) (n = 113)	Contributors of successful fasting ▪ Recognition of diabetic medications - significant association (Adjusted OR=8.56, 95%CI: 2.04;35.8, p=0.003).

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		▪ Prior fasting in Ramadhan advice – not significant (OR=0.74, CI: 0.32; 1.72, p=0.48)
Jun et al (2017)	Cross-sectional qualitative study in a health clinic (2014-2015) (n = 53)	Influencers of knowledge ▪ Fasting with diabetes cause lethargy and limit activities – 11% ▪ Diabetes education by clinician sufficient, no additional session required – 9.4% ▪ Medication self-titration – 17% ▪ Hypoglycaemia during Ramadhan – 43% ▪ Fasting interruption due to hypoglycaemia – 26% ▪ Difficulty in controlling diet – 11%
Zanariah et al (2021)	Global survey – observational study (2021) (n = 748)	Effect of acute diabetic complications ▪ Cessation of fast due to diabetes-related illness - 16.3%. ▪ Rate of hypoglycaemia – 17.8% ▪ Incidence of hyperglycaemia - 10.6% ▪ Breaking fast: 68.5% for hypoglycaemia vs 14.9% for hyperglycaemia.
Chin et al (2021)	Cross sectional prospective study done in public hospitals (2019) (n = 295)	Admission for diabetic emergencies ▪ Hypoglycaemia - 37% pre-Ramadan vs 32.1% during Ramadan ▪ Hyperglycaemia - highest during Ramadan (36.1%) →DKA more than HHS (n= 119 versus 77) ▪ Recalled receiving pre-Ramadhan advice - 31.5%
Salimah et al (2022)	Cross-sectional study at outpatient clinic (2021) (n = 306)	Diabetes knowledge predictors ▪ Significant association with knowledge - education level (p = 0.000), working status (p = 0.030), monthly income (p = 0.000) ▪ Significant association with a better diabetes knowledge score - late suhoor (p = 0.012), regular SMBG (p = 0.026)

BMI: Body Mass Index; HbA1c: Glycated Haemoglobin; FPG: Fasting Plasma Glucose; TC: Total Cholesterol; SMBG: Self-Monitoring Blood Glucose; DKA: Diabetic Ketoacidosis; HHS: Hyperglycaemic Hyperosmolar State

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These findings underline the aspects that need to be addressed in successful management of diabetes during Ramadhan in Malaysia. Comprehending the magnitude of this undertaking, the scope of the proposed solution will have to include not only effective education of people with diabetes as well as the caregiver and family members, the emphasis on adherence and sustained monitoring will need incorporation, with additional use of specific audio-visual aids, all tailored to requirements in the local population. To address this issue, a special program was fashioned for patients attending the endocrine clinics in Universiti Teknologi MARA (UiTM) medical centre. This program aimed to fulfil a few objectives, namely: 1) To facilitate knowledge attainment and improve dissemination of information, 2) To mitigate the risk of diabetic complications in Ramadhan and 3) To pave the way to fasting safely.

Method

This diabetes in Ramadhan patient education program was specifically designed and conducted for the Muslim population with diabetes attending the endocrine clinics in UiTM, and was held for a whole month leading to the month of Ramadhan, targeting about 40 patients per week. Adult patients with Type 2 diabetes mellitus who were planning and eligible to fast were recruited and enrolled in this program. Ineligible patients, including those with advanced kidney disease, patients with dementia or reduced understanding of the risks of fasting, and patients with type 1 diabetes mellitus were excluded.

Participants enlisted in this program understood the importance of participating in the program fully, as well as adherence to the information and advice shared. This was a quantitative program study design, enrolling qualified patients attending the relevant clinics in a consecutive manner. The program was held for six weeks, starting from the month before Ramadhan, to the first two weeks of fasting. The record of all the participants in this program was tabulated in a structured manner, risk categories of each patient collected and stored, and the data analysed using the IBM SPSS® program. To ensure information from all the participants were included and to prevent data loss, every patient enrolled had identification tags attached to their appointment cards, and the materials collected was checked in a two-step process, by the attending doctors and the diabetic educator or support staff.

Referencing the Malaysian Type 2 DM clinical practice guidelines (Ministry of Health, 2020) and the International Diabetes Federation (IDF) Diabetes in Ramadan Guideline (IDF, 2021), important information on managing the challenges DM patients face in the fasting month was assembled and subsequently translated into an interactive and educational training program tailored for the local population. Risk stratification for patients fasting in Ramadhan was taken from the IDF guideline, which has itemized the specific factors influencing diabetes control, with further categorization into mild, moderate and high risk for fasting in people with diabetes. Lifestyle modification tips and glucose monitoring recommendations were taken from both the IDF guideline and the Malaysian clinical practice guidelines (CPG). The Malaysian CPG had the added advantage of being tailored to local requirements, and hence added a more personalized flavour to the program.

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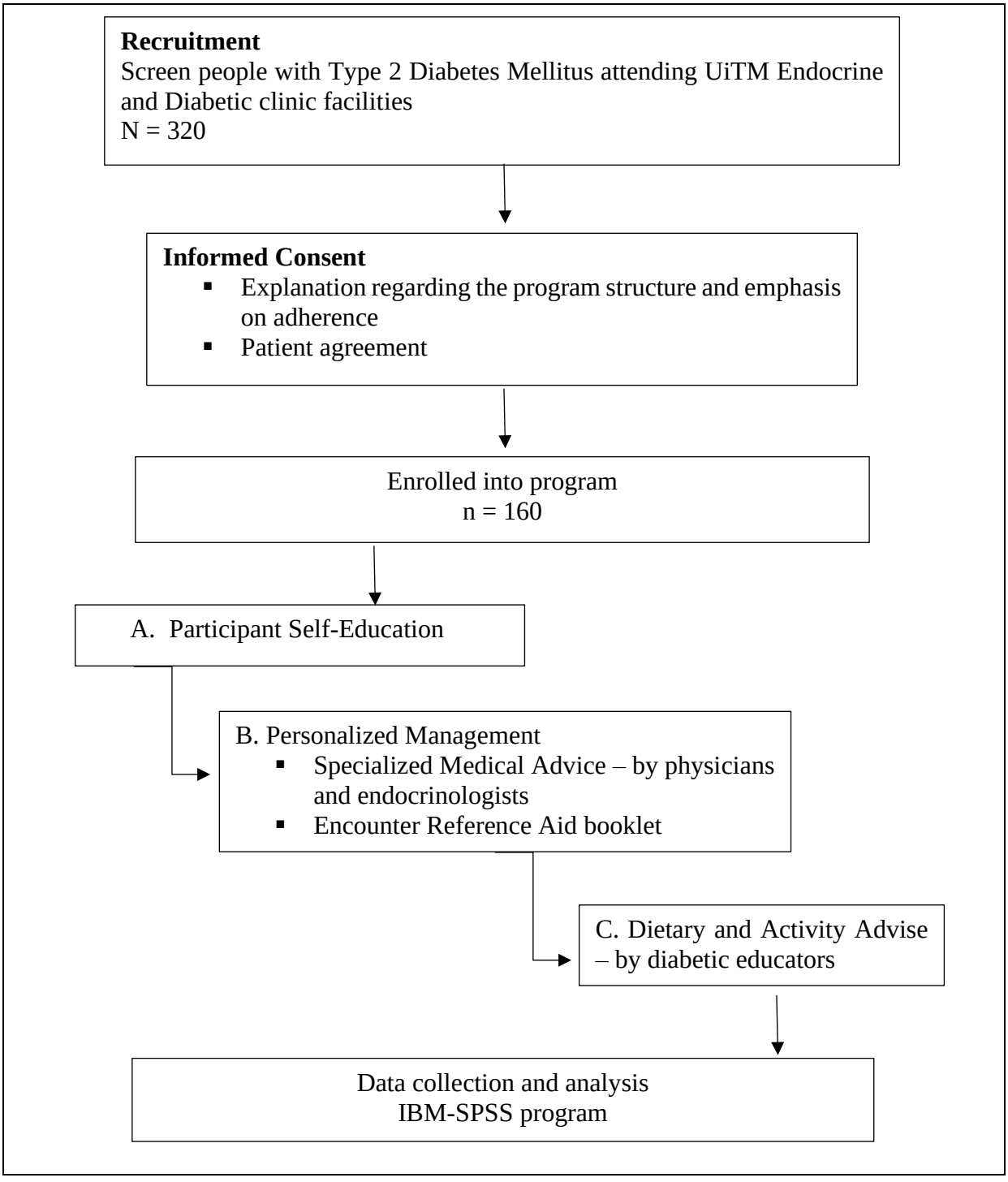
Process Flow Chart



Structured Education Program

Themed 'The Ramadhan Experience', this comprehensive patient education program was conducted in the diabetes and endocrine clinics at UiTM clinical facilities – both at Sungai Buloh Specialist Centre and at Hospital Al-Sultan Abdullah (HASA) UiTM Puncak Alam. Organized into three distinct parts, this program enabled effective multi-directional communication between patients, family members and healthcare professionals.

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Participant Self-Education

Commencing with an independent empowering activity, patients and care-givers familiarized themselves with handling diabetes during fasting from information posted on poster boards, prepared specifically for the program. This part of the program enabled patients to discover various information regarding diabetes in Ramadhan and some of the conceivable challenges in management. This serves as a kick-start measure to the program as well as fulfilling the objective for knowledge attainment.

Personalized Management

Next, each patient had an individualized consultation with an appointed specialist from the endocrine team, where they had a risk calculation of fasting in Ramadhan and further explanation on managing diabetes during the fasting month. The risk of fasting was calculated based on the International Diabetes Federation – Diabetes in Ramadan (IDF-DAR) practical guideline (IDF, 2021), where the personalized score was categorized into high, moderate and low risk of fasting in Ramadhan. The participants were taught the optimal timing for monitoring their blood sugar levels with contingency strategies. They even received guidance on recognizing the complications, especially symptoms of low blood sugar and the prescribed action plan. They were also acquainted with situations where they would have to break their fast and the reasons for doing so. The patients were then given detailed information on management of their medications during fasting, ranging from the timing to titration. This phase of the program aims for realization of most of the program objectives, with advanced knowledge accruement and comprehending both prevention as well as handling prospective diabetic complications and overall contributing to safe fasting practices.

Dietary and Activity Advice

The subsequent part of this program was information sharing by diabetic educators. The participants received customized guidance on dietary recommendations and judicious physical activity endorsed during the month of Ramadhan. Further avenues of assistance were provided for the patients to communicate with the diabetic educators during the fasting month if required.

Detailed Reference Aid

This whole education process was facilitated by a booklet, which was designed and produced specially for this program. This compendium was fashioned mainly in the Malay language to enable better understanding in the local population. This guide detailed essential knowledge on fasting in Ramadhan for people with diabetes, starting off with describing the challenges encountered by people with DM fasting in Ramadhan and the possible complications, and going on to detail approaches and approved steps in management. This guide was then divided into a few categories, comprising of: the population at high risk for continuous fasting (Figure 1), adequate and timing of blood sugar monitoring (Figure 2), when to break the fast in the event of complication and steps to handle the situation, medication adjustment, dietary advice (Figure 3) and tips on keeping active during the fasting month. This reference aid addresses the requirement for knowledge retention and dissemination, enabling better fasting experience.

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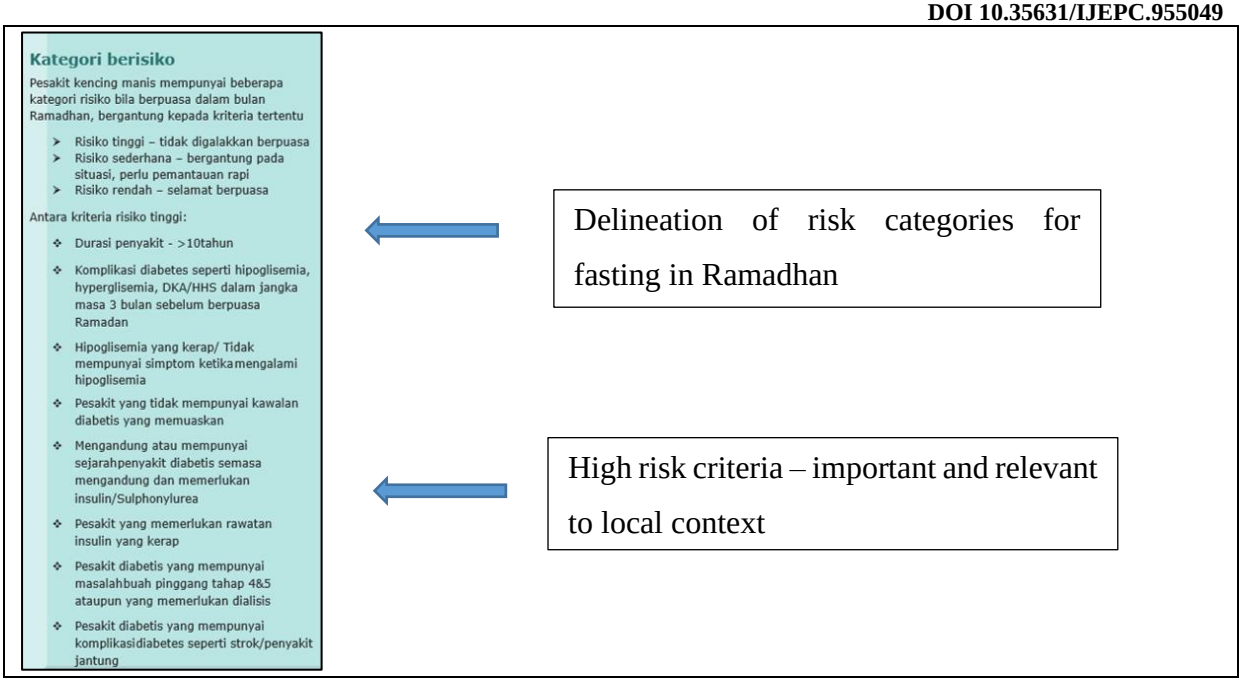

Figure 1. A Page From Education Booklet – Risk Categories

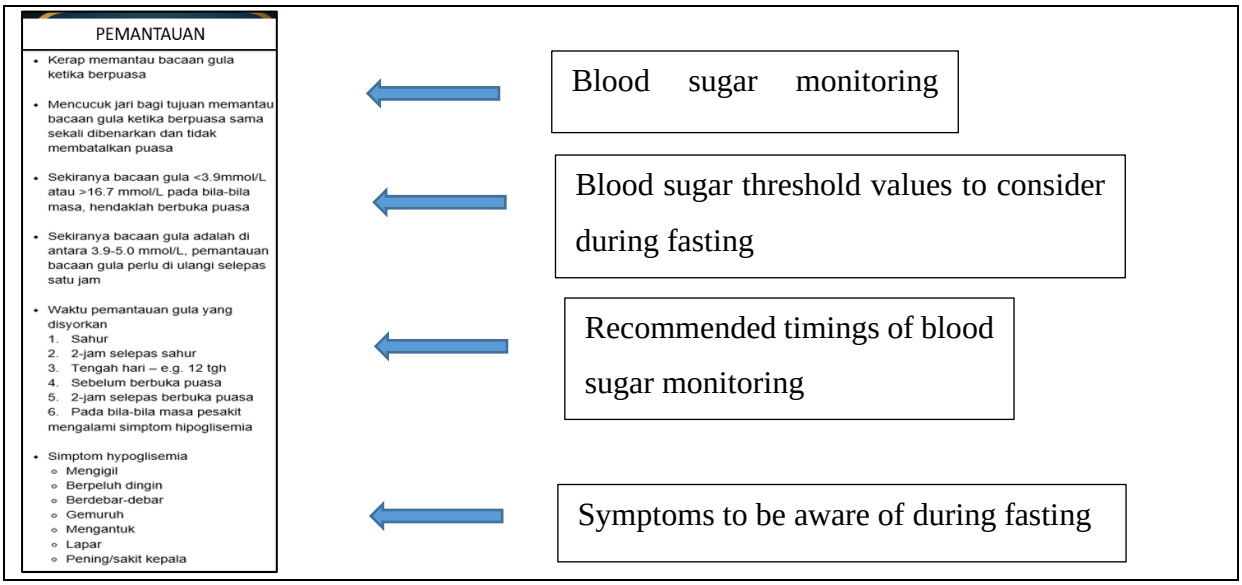

Figure 2. A Page From Education Booklet – Monitoring Recommendations

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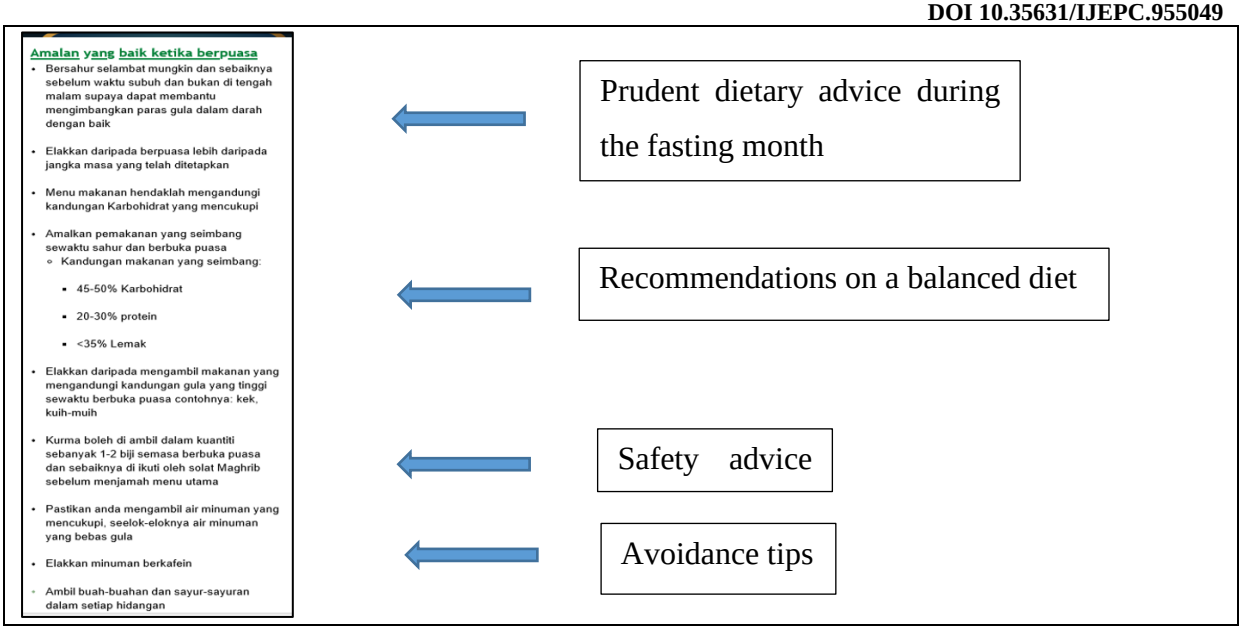

Figure 3. A Page From Education Booklet – Dietary Advice

Impact of Program

This program attracted more than 160 participants, and was well received with positive feedback from the attendees. The main benefits derived from this program was seen through better understanding of glycaemic monitoring and dietary modification, leading to improved fasting experience. Among the encouraging feedback was the ability to manage medications better due to enhanced ability to monitor blood sugar and titrate treatment accordingly, leading to better self-management practices, hence fulfilling the objectives.

As evidenced by this program, a multifaceted diabetes in Ramadhan educational activity is essential in increasing awareness and improving diabetes control during fasting. This program utilized a cohesive structure of integrated diabetes management, with a team consisting of physicians, endocrinologists, diabetic educators and dietitians. To provide a greater impact, a recommendation is crucial for a similar comprehensive program that can be translated to a larger group of participants, with multi-centre engagement, involving primary, secondary and tertiary medical care centres. It will also be necessary to provide adequate training to the relevant healthcare providers, including medical officers, physicians, diabetic educators and support staff for better knowledge dissemination and improved patient care.

Conclusion

This novel and innovative diabetes in Ramadhan patient education program was specially designed for better management of diabetes for patients fasting in the month of Ramadhan. It provides an essential service and aims to fill the gap in crucial knowledge dissemination that is urgently required in this country. This comprehensive and engaging program has been tailored to local specifications with potential for multi-centre engagement, as well as to enable patient empowerment and pave the way to fasting safely.

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