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Hypoglycaemia during Fasting: A Narrative Review

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Abstract

While exempt from fasting, many muslims with diabetes during holy month Ramadan is observing this religious duty for one month in a year, all around the World, especially in the Middle-East and North Africa. Meanwhile recent guidelines published by the International Diabetes Federation Diabetes and Ramadan Alliance (IDF-DaR) declared increased rate of hypoglycaemia during fasting especially in the afternoon before sunset meal (supper/dinner/iftar). Epidemiologic studies since from the quarter century ago revealed increased rate of fasting exercise even during time of Covid 19 pandemic. Self--monitoring blood glucose rate were lower as well as the participation of the Ramadan fasting related structured education programs which would help decrease the rate of hypoglycaemia. Recent studies with Artificial Intelligence looks promising outcomes for both glucose monitoring and treatment in order to help manage diabetes with acute complications during Ramadan fasting.

Keywords: Hypoglycaemia, Diabetes, Ramadan, Fasting, Artificial Intelligence

Introduction

Fasting had been very popular for the last quarter century owing to disappointments on the use of weight lowering drugs and their –even if not that frequent- adverse effects [1] and increasing appreciation to lifestyle change with different modalities of experiences (intermittent fasting-alternate-day fasting, time-restricted eating, etc) [2-6]. Ramadan intermittent fasting is a special one due to its global nature rather then individual one, without skipping the day –different then alternate day fasting- and lasting for thirty days which is starting before sunrise until sunset [7, 8]. Unless structured education program is organized several months before Ramadan, many people with diabetes may experience hypoglycaemia (hypo) especially adjustments for medications –particularly on sulfonylureas and or insulin therapy- are not organized carefully. This mini-narrative review aims to emphasize the significant number of people fast Ramadan throughout the earth although many carry risk of hypo that may lead to detrimental consequences. International multi-country collaborative studies are selected in the literature and consensus based statements are declared as a respect to current guidelines that would help healthcare professionals (HCPs) on this one month long fasting journey of their patients with diabetes.

Hypoglycaemia

Numbers less than 70 mg/dl (3.9 mmol/L) is defined as hypo that might be associated with sweating, headache, tremor (shaking), palpitations, feeling hungry or dizzy or anxious [9], and those having even less than 54 mg/dl (3.0 mmol/L) is a warning sign named as 'severe hypoglycaemia'.

Hypoglycaemia and Fasting

Although physiologically in the normal metabolism hypo is not being seen as a consequence of glucogenolyses and gluconeogenesis [7,8]. Meanwhile certain groups such as elderly [7, 8, 10, 11], people with diabetes mellitus (DM) and those having kidney disease [12] have a special concern so that IDF-DaR Alliance group is generated for providing consensensus statement [13] and updated guidelines [7, 8, 13, 14]. Although exempt from fasting in the holy book Quran [15] many people with diabetes observed fasting even if their HCP told them not to do so [7, 8, 16-21].

Scoring the risks may help healthcare professionals whom to say 'at very high risk' (risk score over 6) so that fasting is not allowed [7, 8]. Unawareness of hypo solely is a reason not allow to fast regardless of the associated complications that might be seen with diabetes of any type [7, 8]. The most hypo seen both in type1 and type 2 diabetes was in the afternoon, pointing out the time frame before iftar should be carefully taken into consideration via self-monitoring blood glucose checking [10, 18]. Same surveys found that less people even performed finger prick test be-lieving that it may lead to break the fast [7, 8].

Education of the people with DM is the key for better management by using 'Diabetes Conversation Map™' education tools for diabetes self-management education [22]. Those who were eager to fast, empowerment-based diabetes self-management education to maintain glycemic targets who were on conventional Insulin had also provided affirmative outcomes [23]. Actually these were all about facilitating positive health behavior startegies for well-being to improve the health [14, 24].

Ahmedani et al performed numerous studies - where he demonstrated 4 fold less hypo for those having structured Ramadan specific diabetes education than others receiving none- such as assessing the awareness and care of people with diabetes related to Ramadan fasting [25], investigating the role of Ramadan specific diabetes education (RSDE) which was a prospective study [26], and CARE study, a multinational survey [27]. Diabetes education should include medication adjustment also in Ramadan as provided in DEAR program prepared with tele-health support from pre-Ramadan to post-Ramadan [28] so that an impact of individualized type 2 diabetes education program would give rise to better clinical outcome during fasting [29]. Timing is important so it was advised to perform education before Ramadan (Pre-Ramadan education) owing to increased benefits and reduced hazards of fasting for people with diabetes [30]. This program would include training of advanced glucose monitoring [31] as well the flash glucose monitoring system [32] especially in the high risk patients.

One of the fearful complications of DM is hypo

rather than higher readings (hyperglycaemia) especially when insulin is being prescribed by the HCPs [33]. During fasting Ramadan especially when either on sulphonylureas [34] or on insulin [9, 16-18, 35, 36] or on both [7, 8, 14], hypo risk should be a concern. Meanwhile not every insulin preperations are the same [35, 36], since with the ORION Study -where in collaboration with middle –east and Türkiye involved- proved that second generation insulin glargine (insulin glargine U300) may provide both efficacy and safety for people with T2DM who were fasting during the holy month Ramadan [35]. In that study most people with hypo were seen located in Canada owing to the northern hemisphere where duration of fasting is increased more than 16 hours which put people more on risk of experiencing hypo [7, 8, 35]. DaR Alliance group is preparing an updated version of the guidelines as a respect to latest published data found that the odds of severe hypoglycemia requiring medical intervention occurred with increased number of microvascular complications (neuropathy, retinopathy and nephropathy) [37].

Hypo rate had been found to be interestingly rather low in people with both types of diabetes (type 1 & type 2) in epidemiologic multi-center, multi-country study, EPIDIAR 2001 due to unawareness of hypo and limited use of intensive therapies [16]. Recent DaR Global Studies during Covid 19 [10, 18] carried out amidst curfew using questionnaires applying via telephone conversation on twenty countries and hypo rates found that pandemics did not make any change for decision making on fasting for both types, however for people with type 1 DM hypo rate was higher (60.7 %) [18].

Actually, hypo had been found to be detrimental in many large studies (VADT & ACCORD), while considering to obtain the same HbA1c levels in the elderly population [38]. Even though the aim was to increase the lifespan, contrarily early mortality rate became a concern owing to hypo experience at this specific age population that gave rise to development of miyocardial infarction and early death. Hypo had been problematic in the aged since the forgetfulness of this group of people -with or without Alzheimer's disease (type 3 diabetes)- so that receiving same pills at the same day, increasing the glucose lowering efficacy [11].

Since the last two decades tremendous efforts provided for better care using the technology for DM [39-41], thus having less hypoglycaemia [42-50], as well as early recognition of hypo via using developed artificial intelligence (AI) tools became increasingly popular [51-55] Among the studies conducted; PROFAST-Ramadan Study Group demonstrated AI-based machine learning models that predicted glucose variability and hypo risk in patients with type 2 DM on a multiple drug regimen during fasting [54].

Conclusion

Hypoglycaemia still is one of the leading acute complications of DM during fasting. Meanwhile, counciling before the holy month Ramadan through structured education programs considering prescriptions with less hypoglycaemic agents for management and using new tools such AI models-equipped insulin pumps will both reduce the rate of hypo's and even lead to early recognition before hazardous consequences happen.

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