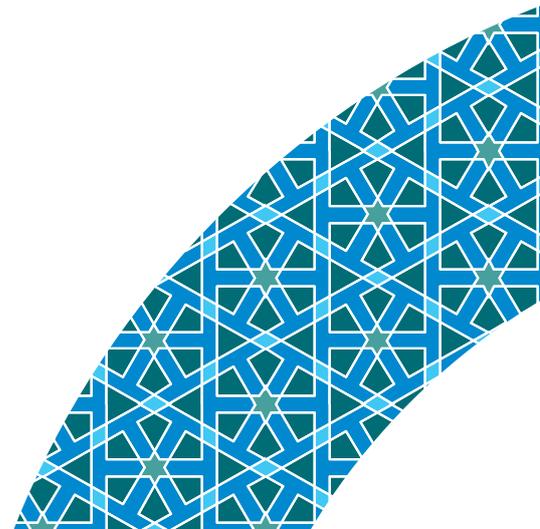


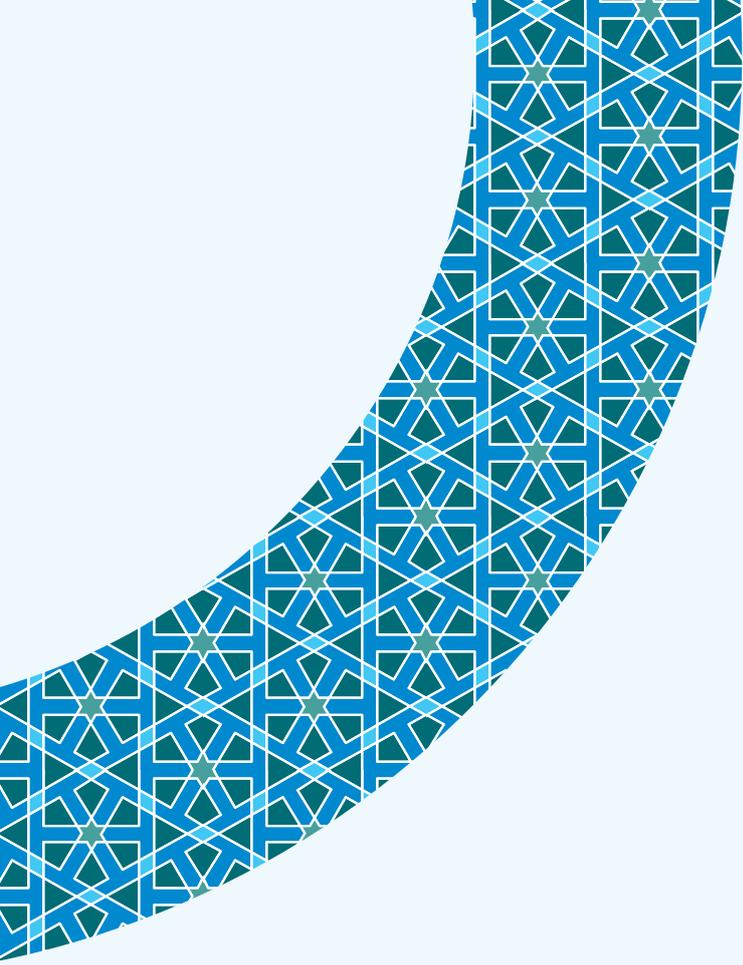
CHAPTER 4

The effects of fasting during
Ramadan on physical
and mental wellbeing

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CHAPTER 4

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WHAT IS KNOWN?

- Ramadan is a holy month in which people do good deeds and enhance their spirituality.
- Fasting during Ramadan can lead to changes in lifestyle.
- Fasting during Ramadan in people with diabetes can present specific challenges such as the need to adapt meals and medications.

WHAT IS NEW?

- Fasting during Ramadan can have positive effects on one's physical and mental wellbeing.
 - This can include weight loss, improvements to metabolic markers, potential improvements to hepatic health and reductions to feelings of stress and anxiety.
- People with diabetes experience both negative and positive mental and psychological outcomes when fasting during Ramadan and in intermittent fasting (IF) outside of Ramadan
- The changes, benefits and risks to one's physical and mental wellbeing that can occur when fasting during Ramadan need to be considered when healthcare professionals (HCPs) provide guidance and when individuals with diabetes are making the decision to fast.

WHAT IS MISSING?

- There needs to be greater research into the effects of fasting during Ramadan and IF in people with diabetes
 - This research needs to include people with both type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), people with diabetes that are elderly, pregnant and those with pre-existing physical and mental health comorbidities.
- There also needs to be greater research into the motivations of people that are considered high risk seeking to fast during Ramadan
 - This will help HCPs in understanding the needs of individuals and will lead to better and more individualised guidance.

1. INTRODUCTION

Practicing the fast during Ramadan can herald a sudden shift to one's usual lifestyle including to mealtimes, levels of physical activity, sleeping patterns and social interactions. The basic purpose of fasting during Ramadan is for an individual to change their usual behaviours to enhance their virtue of self-control, cleanse their body, be grateful to God, empathise with people that are less fortunate, and to carry out more good deeds. It is stated in the Qur'an that "O you who believe! Fasting is prescribed to you as it was prescribed to those before you so that you can learn Taqwa" [1] (good deeds and God-consciousness).

Ramadan, the holy month of fasting, disciplines the mind and body and is associated with improvements to both one's physical and mental wellbeing.

Fasting can be beneficial for many individuals, including healthy people, people with non-insulin treated diabetes and for people that have recovered from mild to severe psychological conditions [2, 3]. Over the last 30 years, there has been a significant increase in the number of studies investigating potential health-related issues of fasting during Ramadan reflecting increases in awareness and motivation [4, 5]. Research into this area can help to determine whether there are any effects of fasting during Ramadan on the physical or mental health of individuals that observe it.

The World Health Organisation (WHO) constitution defines 'health' as a state of complete physical, mental, and social wellbeing and not merely the absence of disease or immunity [6]. Assessing mental wellbeing includes looking at aspects of cognitive, emotional, and behavioural health (see **Figure 1**). Wellbeing can be measured through self-reported evaluations; for example, asking people whether they have a specific health conditions, or asking an individual to self-rate their wellbeing. These approaches enable individuals to self-reflect and think of ways to improve their wellbeing. Encompassing this is mental wellbeing – one's mental wellbeing is often viewed as the first step in achieving good health. Importantly, the opposite is also true where negligence of one's mental wellbeing can lead to health issues.



FIGURE 1

Basic factors of psychology which can affect one's wellbeing



There are many studies that have investigated the health implications of fasting during Ramadan and these have been explored in other chapters in these guidelines. In addition, specific studies have investigated the behavioural psychology of health in individuals that choose to fast [7-9]. It has also been reported that various types of fasting, including spiritual Ramadan fasting, can have positive health effects. It has even been suggested that fasting can be a complementary treatment method under the supervision of healthcare professionals (HCPs) [10].

There is a need to conduct more research on the effects fasting during Ramadan to shed light on the effects of physical and mental wellbeing. Findings to date suggest that through proper education, risk assessment and management, people with diabetes can safely fast during Ramadan. This chapter will first address the physical changes that can occur then consider the mental and psycho-social aspects of fasting during Ramadan.

2. PHYSICAL EFFECTS OF FASTING DURING RAMADAN

Fasting in general has been shown to be beneficial to health. Preclinical studies consistently show the efficacy of intermittent fasting in animal models on a wide range of chronic disorders, including obesity, diabetes, cardiovascular disease (CVD), cancer, and neurodegenerative brain diseases [11-15]. Fasting can also have positive mental and physical effects [16, 17]. Various studies have implicated beneficial metabolic outcomes in healthy individuals that fast during Ramadan. The positive physiological effects in healthy individuals include reductions in bodyweight and improvements in HbA1c, lipid, and blood pressure levels [18-23].

Differences in culture are also very important to consider when providing guidance to individuals seeking to fast during Ramadan. A study identified differences in the metabolic outcomes as a result of fasting during Ramadan across three different Islamic countries (Sudan, United Arab Emirates, and Pakistan). In this study, total cholesterol was significantly higher in the Pakistani population compared to that of the Sudanese and Emiratis at the end of Ramadan [24]. This may be due to the differences in eating patterns; these guidelines have provided individualised Ramadan Nutrition Plans so that people of different countries can receive tailored nutrition advice for fasting during Ramadan, please see **chapter 8: The Ramadan Nutrition Plan (RNP) for people with diabetes**.

A recent meta-analysis of 70 studies investigated some of the physical changes that can occur as a result of fasting during Ramadan. It was found that weight significantly reduced after Ramadan and this effect was also seen among different subgroups of body mass index (normal, overweight, and obese). Moreover, it was found that weight loss may be transient, whereby pre-Ramadan ranges returned around 2–5 weeks after Ramadan [25]. Another meta-analysis found similar results. However, the fasting duration, time in the year and country influenced the degree of weight loss [26].

The recent ABCD study showed that people with diabetes that fasted during Ramadan also had a modest reduction in weight after measurements were compared before and in the last week of Ramadan. It was shown that any changes to weight and other metabolic measures, such as HbA1c, HDL and LDL, returned back to normal within 12 weeks post Ramadan [27].

The multiregional CREED study found similar reductions to weight [28].

2.1 Fatty liver disease

The improvements in total body weight can translate into improvements to visceral adiposity. Various studies have demonstrated this in studying non-alcoholic fatty liver disease (NAFLD) [29-31]. NAFLD can present in different stages with hepatic steatosis being the earliest stage.

Hepatic steatosis is defined as an excessive accumulation of triglycerides (TG) in the hepatocytes (> 55 mg per g of liver) or as the presence of cytoplasmic TG droplets in more than 5% of hepatocytes [31]. Arabi *et al.* demonstrated, through studying individuals aged 18–65 years with NAFLD, that participating in fasting during Ramadan could reduce BMI, total cholesterol levels, fasting blood glucose levels and alanine aminotransferase [31].

Further, others have assessed the effects of fasting during Ramadan in people with NAFLD on measures of liver function, visceral adiposity index (VAI) and atherogenic index of plasma (AIP) values. Among those that fasted, there were improvements in liver enzymes and cholesterol levels in the period after Ramadan. There were also improvements in VAI and AIP after Ramadan but no differences among the fasting and non-fasting groups [30]. Another study investigating the effects of Ramadan fasting on people with NAFLD showed there were greater reductions in circulatory inflammatory markers, fasting blood sugar levels and serum insulin in people that fasted than those that did not fast [29].

However, greater research is still needed to fully understand the effects of Ramadan on people with NAFLD. These studies should ideally be in the form of randomised trials and also assessing people that have diabetes to provide specific guidance to people with diabetes.

All of these changes that can occur while fasting during Ramadan can have effects on one's mental wellbeing. It is very important that HCPs consider this when providing advice to ensure people with diabetes know what to expect and are fully prepared for fasting during Ramadan, this is particularly important in young and newly diagnosed individuals.



3. LIFESTYLE CHANGES THAT ACCOMPANY RAMADAN FASTING AND THEIR EFFECTS ON MENTAL WELLBEING

An individual's daily routine will change when fasting during Ramadan. These include changes to daily habits, eating patterns, sleeping schedules and physical activity patterns. In the context of people with diabetes this will lead to changes to the doses and regimens of medication and frequency of self-monitoring of blood glucose (SMBG) levels. These changes may seem uncomfortable or even unfeasible to some and will need to be considered by individuals when taking the decision to fast during Ramadan and by HCPs during the pre-Ramadan assessment.

3.1 Dietary changes

Though people with diabetes are exempt from fasting many will continue to do so. Fasting will significantly change the usual eating patterns and people with diabetes will need to be adequately prepared for this. Food cannot be eaten during the daylight hours; fasting occurs from dawn until sunset. The meal eaten pre-dawn (*Suhoor*) marks the beginning of the daily fast and then the meal at sunset (*Iftar*) marks the breaking of the fast. This means there is a short time period in which one can hydrate and eat food and careful planning is needed to achieve a safe and successful fast in healthy individuals, even more so in people with diabetes.

A healthy balanced diet is vital for overall wellbeing and mood. The gap in between meals will lead to changes in energy and this can lead to feelings of lethargy (see **chapter 3: What happens to the body? Physiology of fasting during Ramadan**). It is very important that any feelings of being unwell are recognised and that one regularly monitors their blood glucose levels to prevent any risks of hypoglycaemia.

Fasting during Ramadan can also help people learn how to conduct self-control and this may help with people who previously had bad eating habits. For further guidance on nutrition and diet during the Ramadan fast, please refer to **chapter 8: The Ramadan Nutrition Plan (RNP) for people with diabetes**.

3.2 Changes to physical activity

It is well established that exercise can cause the release of 'feel-good' chemicals called endorphins in the brain, which can lead to positive feelings and improve an individual's mental wellbeing. People might also use exercise as a coping mechanism to help deal with stress. During the month of Ramadan, however, physical activity and the frequency of exercise can decrease [32]. In people with diabetes this may be a precautionary measure to help avoid hypoglycaemia or due to the feelings of lethargy and being weak.

HCP's might inform people with diabetes to avoid excessive physical activity during the day and advise them to do light exercise after breaking the fast. In addition, during Ramadan many individuals will undertake the prayer of *Taraweeh*. While the participating in *Taraweeh* is a *Sunnah* (established customs and practices) and can provide an immense feeling of spiritual satisfaction there are the physical implications that need to be considered. In this prayer there could be more than 20 *raka'ahs* (iterations of movements in prayers) where a significant amount of energy can be expended. It has been demonstrated that people with type 2 diabetes mellitus (T2DM) that participated in the *Taraweeh* prayers achieved better outcomes such as reductions

in HbA1c and weight loss when compared to those that did not participate in *Taraweeh* prayers [33]. In all people with diabetes, especially those that are at relatively higher risks such as those that are pregnant, elderly or with comorbidities, there is a need to be cautious.

There will be a greater need to monitor blood glucose levels and stay on top of hydration requirements at Iftar if individuals are going to practice the Taraweeh prayer.

These changes to activity levels and exercise schedules will be dramatic to people that are used to regular routines and will need to be discussed with HCPs prior to Ramadan to ensure the best fitting plan is made for when Ramadan arrives in the calendar year.

Some studies assessing healthy athletic individuals have shown that feelings of depression, anger, anxiety, confusion, and a lack of concentration can occur during Ramadan due to the impacts of fasting upon normal exercise and training routines [34, 35]. These impacts on mental wellbeing may be different in people with diabetes and need to be investigated in further research.

3.3 Changes to sleep

In general, a lack of sleep is often associated with psychiatric disorders. Individuals with manic episodes and/or depression can go through periods of interrupted sleep and can often be in a sleep deprived state. Indeed, sleep has been used as therapy for severe cases of depression and can often help with feelings of fatigue or lethargy.

When fasting during Ramadan, normal sleep schedules will have to change in order to accommodate for the *Suhoor* meal which can often be very early in the morning (depending on the time of the year that Ramadan falls). Diet can have a direct effect on sleep quality during Ramadan. There is no limit on the amount of food that can be consumed at the two mealtimes during Ramadan and often people consume foods that are heavy in fats and sugar which can directly disturb sleep [36, 37]. This is even more important for people with diabetes; specific recommendations for an optimal diet for people with diabetes are mentioned in **chapter 8: The Ramadan Nutrition Plan (RNP) for people with diabetes**.

It is expected that participating in fasting during Ramadan will lead to a decreased total sleep time (TST), a delayed onset of sleep, a decrease in the duration of rapid eye movement (REM) sleep, a decrease in the proportion of REM sleep, and an increase in the proportion of non-REM sleep. These changes can affect mood [38], feelings of wakefulness, concentration and cognitive function. Indeed, these changes can also affect physiology and there could be physiological implications such as changes to the circadian rhythm [39], further information characterising these changes are available in **chapter 3: What happens to the body? Physiology of fasting during Ramadan**.



During Ramadan, social factors such as working/school hours and geographical factors such as location, can all affect the sleeping schedule of individuals and, therefore, also the overall experience of fasting [40].

It is particularly important for people with diabetes to get an adequate amount of sleep in order to prevent the expenditure of too much energy during the fasting hours. This will help to prevent the onset of hypoglycaemia alongside proper management. On the other hand, sleep itself can be affected due to periods of nocturnal hypoglycaemia, whereby blood glucose levels drop too low during periods of sleep.

HCPs working with people with diabetes, in particular insulin treated diabetes, must consider nocturnal hypoglycaemia when formulating eating plans and adjustments to medications.

It is recommended that sleeping schedules are thought of before Ramadan and adhered to during Ramadan. This will help alleviate any of the adverse effects associated with changes to sleep.

3.4 Cessation of Smoking

Smoking has a clear negative impact on one's physical and mental wellbeing. Smoking is a risk factor for many diseases such as cancer, obesity, diabetes, CVD, infections such as tuberculosis, problems of the immune system and many others. During Ramadan the sudden reduction of smoking can be very stressful [41] and lead to irritability [42], but the challenge is to maintain this for after the month of Ramadan. Faith based interventions for smoking cessation have been found to be effective for the post-Ramadan period [43].

The true observance of fasting during Ramadan provides an opportunity for all people to break patterns of smoking, and generally any addictive patterns, and can significantly improve wellbeing. HCPs can utilise the period of Ramadan to help put in place programmes and work with individuals to gradually break their addictive behaviours.

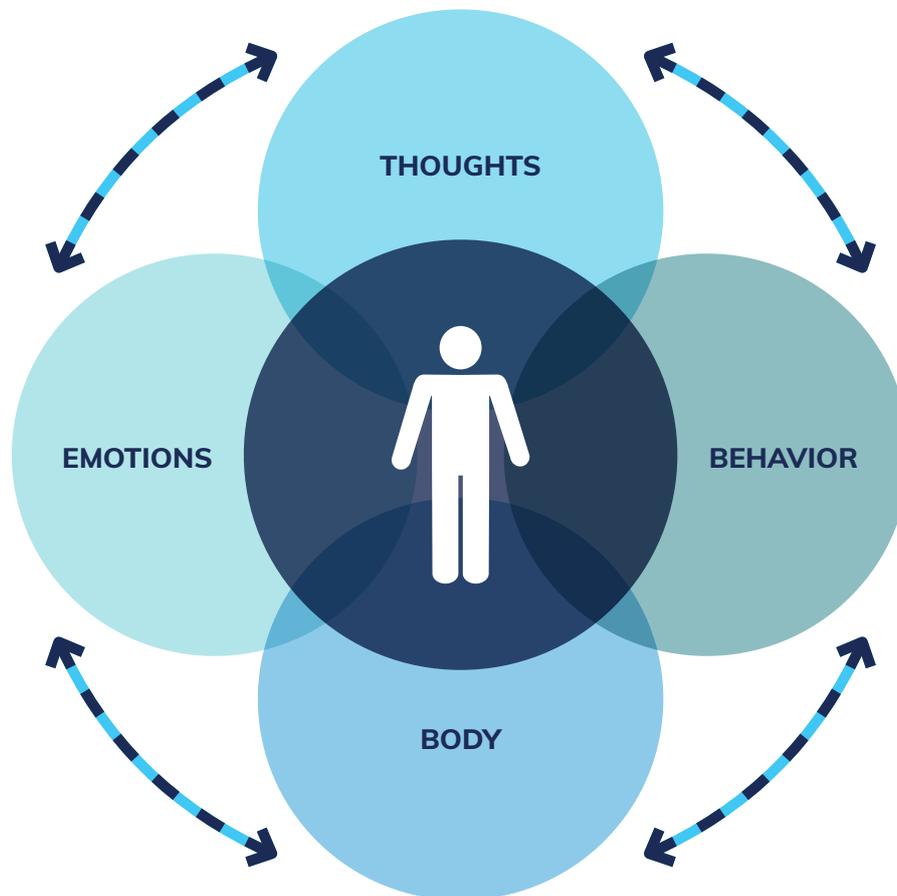


FIGURE 2

The interplay between the body and mind in the overall wellbeing

4. THE HOLISTIC IMPORTANCE OF RAMADAN

Fasting during Ramadan helps people to develop social and moral values such as the feeling of true compassion and empathy for people that are less fortunate. Moreover, Ramadan is a holy month in which people practice hospitality and do good deeds that help facilitate the feeling of happiness [44].

Equally important are the social aspects of Ramadan. People form closer bonds with family, friends and member of the community and generally enhance their social interactions [45]. Maintaining healthy relationships can fulfil an individual's need for contact, love and affection and can help people become more emotionally intelligent [2]. Ramadan is a time that a lot of people look forward to and mark on their calendars. Indeed, Ramadan is an important social time that facilitates interaction while combatting feelings of isolations and loneliness.

Likewise, the strong sense of community and social interaction during Ramadan can be harnessed in the implementation of guidance. Guidelines must target people that are wishing



to fast during Ramadan that have diabetes but also their support networks. Further information on the implementation of guidelines is available in **chapter 14: Identifying and overcoming barriers to guideline implementation.**

5. THE EFFECTS OF FASTING DURING RAMADAN ON MENTAL WELLBEING

There are many spiritual and mental benefits of Ramadan – the opportunity to self-reflect on aspects of life that need improving, and on doing good deeds, the ability to grow spiritually through prayers, and the chance to spend more time with loved ones and people within the community.

Islam teaches and empowers oneself to achieve a feeling of inner peace and tranquillity. During Ramadan, individuals build on their faith, read and listen to recitations of the Qur'an and participate in prayers and these have all been associated with declining rates of depression, anxiety, stress and improvements in memory [46, 47] and overall mental wellbeing [48]. However, these effects may not be the same for all — a systematic review by Pourabbasi *et al.*, found out that fasting may affect spatial memory, visual memory and attention in adolescents showing an, albeit temporary, but negative impact on their education [49].

Studies have also demonstrated that participating in fasting during Ramadan can provide benefits to mental wellbeing, including alleviating feelings of anxiety, depression, and reducing stress levels in healthy individuals [50-53] and people with diabetes [54]. Another study conducted in healthy graduate students showed that fasting led to improvements in self-acceptance, self-sufficiency, social relations and personal growth conducted among Muslim graduate students [48]. In a longitudinal study conducted in people with T2DM it was shown that fasting during Ramadan could help alleviate feelings of depression and that this could perhaps be linked to the spiritual and emotional benefits of fasting during Ramadan [55].

On the other hand, others found that pre-existing feelings of depression can lead to worse outcomes in diabetes such as poorer glycaemic control [56]. Moreover, Ovuyolu *et al.* reported that fasting during Ramadan could increase fatigue and negatively impact mental wellbeing [57]. Others also found that people who fasted during Ramadan experienced a reduction in mood, lower energy levels and greater irritability during the fast [58]. Deeb *et al.* reported that there was a fear of complications which may influence the experience of Ramadan and the initial decision to fast taken by younger individuals with T1DM or their parents/carers [59].

Further research is needed assessing people with diabetes in order to truly assess the psychological effects of fasting during Ramadan. In addition, research should ideally investigate people with type 1 diabetes mellitus (T1DM), T2DM and special populations such as the elderly, pregnant women and people with physical and mental comorbidities.

Altogether, the mental and psychological effects of fasting during Ramadan can be varied. Both healthy individuals and people with diabetes can experience opposing psychological outcomes for different reasons including the changes that accompany the practice of fasting

during Ramadan, the spiritual mental benefits of participating in the fast and aspects of their diabetes that can impact the experience of fasting during Ramadan (see **Figure 3**).

5.1 The effect of intermittent fasting (IF) on mental wellbeing

Intermittent fasting (IF) is a time restricted manner of eating or a method to restrict caloric intake, whereas fasting during Ramadan is abstaining from drinking and eating during the daylight hours for a month.

In Islam, there are other types of fasting that can occur (*Sunnah*) that involve IF outside of the month of Ramadan. Studies have investigated the effects of IF on mental wellbeing and, on the whole, fasting lead to improvements. In people that had to undergo laparoscopic cholecystectomy, IF was found to increase post-operative comfort and reduce levels of stress [60]. Moreover, Hussin *et al.* showed that people that underwent caloric restriction and fasting could enhanced their mood and significantly decreased levels of tension, feelings of anger and confusion compared to controls [61]. Indeed, IF has been associated with better pain management in people with chronic pain [62] and reductions in fear in people with fear related disorders [63]. Similarly, among the elderly IF has been shown to reduce levels of anxiety and stress and which could lead to an increased quality of life (QOL) [64]. Others have shown that IF can benefit the cardiovascular system and brain through brain derived neurotrophic factor (BDNF) signalling [65] and that IF could exert its benefits in a similar manner to exercise [66].

Others have found the opposite where IF has been shown to invoke stress but not affect mood, cognition or motor control when investigating overweight women [67]. Carey *et al.* identified an association between greater levels of discomfort and prolonged fasting [68].

As mentioned, further research is yet needed to fully elucidate the effect of IF on wellbeing. Currently, there are links with IF and fasting during Ramadan that can help improve mental wellbeing but these need to be confirmed through more randomised trials and in applicable study populations.



6. OVERVIEW OF THE EFFECTS OF FASTING DURING RAMADAN ON WELLBEING

Individuals and their HCPs need to consider the impact that Ramadan can have on one's lifestyle and physical and mental wellbeing. Individuals with diabetes that are seeking to fast should understand the potential negative effects that can occur so that there are no unexpected outcomes during Ramadan. Information on the negative effects of fasting during Ramadan can also be implemented in pre-Ramadan education programmes and risk stratification plans.

The benefits of Ramadan are also extremely important to understand and form the basis for why individuals that have been considered 'high-risk' or those previously considered "Very high risk" still participate in the fast. Through understanding these, HCPs can provide better guidance ensuring people with diabetes can fast safely while also experiencing the true mental and spiritual benefits of Ramadan (see **Figures 2** and **3**).

Health care providers, members of the community, individuals with diabetes alongside their family, friends and carers should be made aware that those that are high risk towards fasting can be exempt, but also receive spiritual rewards by alternative steps like donations of food or helping the poor with money (Fidya) [69].



LIFESTYLE CHANGES OCCURRING WHEN FASTING DURING RAMADAN	PHYSICAL AND MENTAL BENEFITS OF FASTING DURING RAMADAN	POTENTIAL ADVERSE PHYSICAL AND MENTAL EFFECTS OF FASTING DURING RAMADAN
<ol style="list-style-type: none">1. Sleeping schedules2. Meal plans and diet3. Physical activity patterns4. Reduction of vices such as smoking5. Medication adjustments	<ol style="list-style-type: none">1. Sense of fulfilment in participating in all aspects of Ramadan2. Improvements in weight or BMI3. Improvements in self-control and ability to resist temptations4. Greater sense of empathy with those less fortunate5. Participation in <i>Sunnah</i> practices for greater spiritual benefits6. Greater sense of community and an opportunity to strengthen relationships7. Reducing potentially harmful vices, such as smoking, for greater physical and mental wellbeing	<ol style="list-style-type: none">1. Sleep deprivation and disruption of circadian rhythm leading to an increase in fatigue and reduction in cognition2. Glucose excursions causing feelings of being unwell3. Greater feelings of lethargy,4. Heightened feelings of fear for diabetes related complications5. Temporary changes in weight6. Short term feelings of stress anxiety, irritability and agitation

FIGURE 3
Lifestyle, physical and mental changes that can occur during Ramadan



SUMMARY

- Ramadan is a time for Muslims to practice self-restraint and do good deeds.
- Fasting during Ramadan can lead to metabolic changes and changes to clinical measurements such as blood pressure and BMI and might help with fatty liver disease.
- Holistically fasting during Ramadan can have positive effects such as improving compassion, empathy and social interactions.
- Fasting during Ramadan can also:
 - lead to greater spirituality and mental wellbeing
 - bring both positive and negative psycho-social outcomes to feelings of stress, depression and mood.
- Intermittent fasting (IF) outside months of Ramadan may also be beneficial to one's mental wellbeing.
- The lifestyle changes that accompany Ramadan such as to eating times and diet, physical activity patterns and sleeping schedules can have effects on mental and physical wellbeing
- These should be considered by people with diabetes that are seeking to fast prior to Ramadan and by their HCPs that advise them.
- Further research is still needed to assess IF and fasting during Ramadan and their specific effects on mental wellbeing among people with diabetes and in special populations such as people with diabetes that are elderly, pregnant or with physical and mental comorbidities.

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