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## FASTING OF PERSONS WITH DIABETES MELLITUS DURING RAMADAN

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### INTRODUCTION

#### *Classification of diabetes mellitus*

In the late 1970s, both World Health Organization (WHO) (1) and the National Diabetes Data Group (NDDG) (2) produced new diagnostic criteria and a new classification system for diabetes mellitus. This brought order to a chaotic situation in which nomenclature varied and diagnostic criteria showed enormous variation using different oral glucose loads. In 1985 WHO slightly modified their criteria to coincide more closely with the NDDG values (3). With much more data available on the etiology of diabetes, an American Diabetes Association (ADA) Expert Group was convened to discuss these issues. It published its recommendations in 1997 (4). WHO convened a Consultation on the same subject in London, United Kingdom, in December 1996. In general, the ADA and WHO groups reached similar conclusions.

#### **REPORT OF THE EXPERT COMMITTEE ON THE DIAGNOSIS AND CLASSIFICATION OF DIABETES MELLITUS (4)**

I Type 1 diabetes\* ( $\beta$ -cell destruction, usually leading to absolute insulin deficiency)

- A. Immune mediated
- B. Idiopathic

II Type 2 diabetes\* (may range from predominantly insulin resistance with relative insulin deficiency to a predominantly secretory defect with insulin resistance)

III Other specific types

- A. Genetic defects of  $\beta$ -cell function
  - 1. Chromosome 12, HNF-1 (MODY3)
  - 2. Chromosome 7, glucokinase (MODY2)
  - 3. Chromosome 20, HNF-4 (MODY1)
  - 4. Mitochondrial DNA
  - 5. Others
- B. Genetic defects in insulin action
  - 1. Type A insulin resistance
  - 2. Leprechaunism
  - 3. Rabson-Mendenhall syndrome
  - 4. Lipotrophic diabetes
  - 5. Others
- C. Diseases of the exocrine pancreas
  - 1. Pancreatitis
  - 2. Trauma/pancreatectomy
  - 3. Neoplasia
  - 4. Cystic fibrosis
  - 5. Hemochromatosis
  - 6. Fibrocalculous pancreatopathy
  - 7. Others
- D. Endocrinopathies
  - 1. Acromegaly
  - 2. Cushing's syndrome
  - 3. Glucagonoma
  - 4. Pheochromocytoma
  - 5. Hyperthyroidism
  - 6. Somatostatinoma

7. Aldosteronoma
  8. Others
- E. Drug- or chemical-induced
1. Vacor
  2. Pentamidine
  3. Nicotinic acid
  4. Glucocorticoids
  5. Thyroid hormone
  6. Diazoxide
  7.  $\beta$ -adrenergic agonists
  8. Thiazides
  9. Dilantin
  10. Interferon
  11. Others
- F. Infections
1. Congenital rubella
  2. Cytomegalovirus
  3. Others
- G. Uncommon forms of immune-mediated diabetes
1. "Stiff-man" syndrome
  2. Anti-insulin receptor antibodies
  3. Others
- H. Other genetic syndromes sometimes associated with diabetes
1. Down's syndrome
  2. Klinefelter's syndrome
  3. Turner's syndrome
  4. Wolfram's syndrome
  5. Friedreich's ataxia
  6. Huntington's chorea
  7. Laurence-Moon-Biedl syndrome
  8. Myotonic dystrophy
  9. Porphyria
  10. Prader-Willi syndrome
  11. Others
- IV Gestational diabetes mellitus (GDM)

### *What is Ramadan?*

Ramadan is the ninth month of the Muslim calendar, and 1.9 billion Muslims of the world celebrate their holiest month of Ramadan each year. It is the month of fasting in the Muslim calendar, when it is believed the Holy Quran (the holy book of Muslims) "was sent down from heaven, as a guidance unto men, a declaration of direction, and a means of Salvation".

**Fasting is one of the five pillars of Islam, which include:**

- Announcement of Faith
- Salaat (praying 5 times a day)

- Zakaat (the right of the poor of the wealth of the financially able)
- Fasting during the month of Ramadan
- Hajj (once a life time pilgrimage to Mecca)

The Arabic word "sawm" is used for fasting. The word sawm (plural siyam) literally means 'to refrain', but as an Islamic term, it means refraining from food, drinks and sexual activity from dawn to sunset (5).

Part and parcel of fasting during Ramadan is avoiding immoral behavior, anger and showing compassion to others. Fasting in the month of Ramadan is compulsory for every Muslim adult. The month of Ramadan contains 28 days to 30 days. The dates of observance differ each year because Ramadan is set to a lunar calendar. Fasting extends each day from dawn until sunset, a period that varies by geographical location and season. In summer months and northern latitudes, the fast can last up to 18 hours or more, whereas in winter the fast is much shorter as the days are shorter.

### *The Purpose of Ramadan*

The purpose of fasting is manifold. Allah (the God Almighty) has mentioned in the Holy Book of the Muslims (Quran) that the fasting is prescribed for the believers as it was prescribed for the people before them, so that they may acquire self-control and God-consciousness. Therefore the purpose of the fasting is to develop God-consciousness, self-control, and improvement of health by reducing or eliminating impurities from the body, and to become aware of the plight of the poor, hungry, and the sick. Ramadan is a month of spiritual consciousness and high sense of social responsibility.

To many Muslims the month of Ramadan brings a sense of calm and spiritual satisfaction. There is also strengthening of ties within families and a sense of belonging (6).

### *Who can fast and who is excluded*

Fasting is obligatory for every adult Muslim who is sane, is able to perform it without any harm to his health, and is not traveling. If he cannot meet any one of these conditions, he is excused from the fast without any penalty.

#### **Fasting is excluded in:**

- disabled individuals such as very old persons or persons suffering from chronic diseases such as diabetes in whom fasting may be harmful are not

required to fast. However, they must compensate for this by feeding one needy person for every day of fasting that they miss. This applies to persons who may never be able to fast due to their underlying condition;

- children are not required to fast until they reach adolescence. However, they should be encouraged as much as possible while they are still young to practice fasting by gradually expanding the time that they can observe it;

- those who are insane, retarded, or mentally impaired. Persons who are very old and feel they are unable to fast are also exempted from fasting;

- those who fall ill unexpectedly (acute illnesses) and feel that their condition would worsen if they observed the fast are excused. After they recover, they must make up the fast by fasting the number of days that they missed;

- pregnant and nursing mothers do not have to fast;

- women who are having their menstrual period or experiencing bleeding due to recent childbirth are not required to fast. They must fast for the days they have missed later once their period or bleeding has finished;

- people who need to break the fast in order to save the life of someone else (i.e. being caught in a fire or drowning) are allowed to break their fast and to make it up at a later date; and

- those who are traveling are given the option to fast or not. Those who choose not to fast during their journey must make it up after reaching their destination. This applies to all types of travel; for business, for personal reasons, or due to one's job (i.e. long distance haulers).

### *Fasting in Ramadan*

#### **How fasting is done**

Muslims fast from dawn to dusk. While fasting Muslims are required not only to abstain from eating and drinking, but also from consuming oral medications and nutritional fluids. Should the need for medication or intravenous fluids arise in acute medical situations a person is allowed to break his fast and make up for it later. Islam recommends that fasting Muslims eat a meal before dawn, called "sahur". On completion of a day's fast there are no restrictions in what one can eat or drink till dawn of the next day, however, foods and drinks such as pork or alcohol, which are prohibited in Islam, may not be consumed.

**There are several actions that nullify immediately one's fast. Among these are the following :**

- engaging in sexual intercourse during the daylight hours during the month of Ramadan;

- engaging in any activity that excites one to the point of causing a discharge of semen, such as self-gratification, caressing, hugging, kissing;

- eating or drinking anything. This also includes smoking and the consumption of other items that are not really considered food items (i.e. chewing gum or tobacco); and

- taking injections or dietary drugs used as food or drink substitutes. These are held to be just as good as the items they are meant to replace and are treated accordingly. Injections that have no food value are permitted, regardless of whether they are intramuscular or intravenous and whether or not they can be tasted.

### *Reported psychosocial benefits of fasting*

Fasting helps in conditioning the heart, the soul, and the body on the virtues of patience, tenacity, and firmness in the face of adversity. Patience is the pinnacle of self-mastery, discipline and spiritual agility.

A study on behavior modification during Ramadan noted that more people were involved in stress reducing and spiritual activities. They drank less caffeine-containing beverages and smoked less (7).

The psychological effect of Ramadan fasting has also been well observed by the description of people who fast. They describe a feeling of inner peace and tranquility. A study to investigate the impact of national and religious events on the rate of suicidal tendencies in persons without recognizable mental disorders (parasuicides) was carried out in Jordan. In the study a comparison was made between the number of reported parasuicides during the month of Ramadan and the month before and after Ramadan for the years from 1986 to 1991. Significantly fewer parasuicides were reported during Ramadan than during the month preceding it and the month following Ramadan. The findings confirm previous observations that national events reduce the rate of parasuicide, but protective effect does not persist into the month that follows Ramadan. (6).

## DIABETES AND FASTING – A GLOBAL CONCERN

Currently there are about 1.9 billion Muslims worldwide following Islam. The prevalence of diabetes in the Muslim predominant Eastern Mediterranean and Middle East region in the adult populations (20-79 yrs) is 7.7%, whereas the prevalence of type 1 diabetes is 0.11% (8). In most Islamic countries as in the whole world the prevalence of diabetes is raising with the changes in lifestyle. The above statistical data suggest that the number of Muslim diabetics is large as is the problem of fasting during Ramadan.

Although diabetics may be exempted from fasting many of them prefer not to accept the exemption (9) and they often refuse to accept this concession. Unfortunately, diabetics feel physiologically different from other members of the community due to their disease (10). They wish to fast and be able to follow their religious convictions just as other members of the community. Ramadan being a very special month they feel spiritually inclined to fast as with other Muslims. Many diabetics fast without medical guidance and often end up developing acute complications.

Physicians managing diabetics often find it difficult advising persons with diabetes on whether it is safe to fast, as well as recommending the dietary and drug regimens diabetics should follow if they decide to fast. The lack of appropriate literature on this subject makes it difficult to answer these questions. To judge correctly whether to grant medical permission to fast to a diabetic patient, it is essential for the physicians to have an appreciation of the effect of Ramadan fasting on the pathophysiology of diabetes mellitus (11).

## STANDARD NUTRITIONAL NEEDS IN DIABETICS

Historically, nutritional recommendations for those with diabetes have spanned everything from starvation diets to high fat diets. In 1994, the American Diabetes Association (ADA) developed nutritional guidelines that presented a major change in the philosophy of nutritional care for those with diabetes (12). An individually developed dietary plan based on metabolic, nutritional and lifestyle requirements replaced defined caloric prescription. These nutritional recommendations acknowledge that a single diet does not appropriately treat all types of diabetes.

**The goals of medical nutritional therapy in diabetes care are (13):**

- maintenance of near-normal blood glucose levels by balancing food with intake of insulin;
- achievement of optimal lipid levels;
- provision of adequate energy for maintaining or attaining reasonable weight and normal growth;
- prevention and treatment of acute and chronic complications of diabetes; and
- improvement of overall health through optimal control.

### *Proteins*

There are limited scientific data on which to establish firm recommendations for protein intake in diabetics. Currently, the recommended protein intake is 10%-20% of total energy for persons with diabetes. Excessive protein has been implicated in the pathogenesis of diabetic nephropathy since high protein intake increases glomerular filtration rate (GFR) (14).

### *Lipids*

If dietary protein contributes 10%–20% of the total caloric content of the diet, then 80%-90% of calories remain to be distributed between dietary fat and carbohydrate. Less than 10% of these calories should be from saturated fats and ≤10% of calories from polyunsaturated fats, leaving 60%-70% of total calories from monounsaturated fats and carbohydrates. Diabetes is a strong independent risk factor for cardiovascular disease (CVD), over and above the adverse effects of elevated serum cholesterol.

Therefore, <10% of daily calories should be from saturated fats and dietary cholesterol should be limited to ≤300 mg daily. However, even these recommendations must be incorporated with consideration of an individual's cultural and ethnic background.

The distribution of calories from fat and carbohydrate can vary and can be individualized based on the nutrition assessment and treatment goals (15). The recommended percentage of calories from fat is dependent on identified lipid problems and treatment goals for glucose, lipids and weight. People who are at a healthy weight and have normal lipid levels are encouraged to follow the recommendations of the National Cholesterol Education Program (NCEP). The NCEP recommends that all individuals over 2 years limit fat intake to <30% of total calories with saturated

fat restricted to <10% of total calories. Polyunsaturated fat intake should be <10% of calories with monounsaturated fat in the range of 10%-15% of calories.

Monitoring of glycemic and lipid status and body weight, with any dietary fat modifications, is essential to assess the effectiveness of the nutrition recommendations.

### *Carbohydrates*

The percent of calories from carbohydrate will also vary and is individualized based on the individual's eating habits and glucose and lipid goals. For most of this century, the most widely held belief about the nutritional treatment of diabetes has been that simple sugars should be avoided and replaced with starches. This belief appears to be based on the assumption that sugars are more rapidly digested and absorbed than are starches and thereby aggravate hyperglycemia to a greater degree. There is, however, very little scientific evidence to support this assumption. Fruits and milk have been shown to have a lower glycemic response than most starches, and sucrose produces a glycemic response similar to that of bread, rice and potatoes. Although various starches do have different glycemic responses, from a clinical perspective, the priority should be given to the total amount of carbohydrate consumed rather than the source of the carbohydrate (15).

### *Summary of nutritional recommendations*

Today there is no single 'diabetic' or 'ADA' diet. The recommended diet can only be defined as a nutrition prescription based on assessment and treatment goals and outcomes.

## **EFFECT OF FASTING ON VARIOUS METABOLIC PARAMETERS IN DIABETICS**

### *Variations of blood glucose*

During fasting in normal persons it has been found that a slight decrease in serum glucose from 3.9 mmol to 3.3 mmol (60 mg/dl to 70 mg/dl) occurs a few hours after fasting has begun. However, the reduction in serum glucose ceases due to the increased gluconeogenesis in the liver. This occurs because of a decrease in insulin concentration and a rise in glucagon and sympathetic activity (16). Most diabetic patients

who were under medical supervision showed no significant change in their glucose control (16,17). In a few studies where variations of blood glucose from prefasting levels were noted, it was suggested that these could be due to variation in the amount or type of food, physical activity, or irregular medicine taking. However, in most cases, no episode of acute complications (severe hypoglycemic or hyperglycemic) occurred in patients under medical management (18,19), and only a few cases of biochemical hypoglycemia without clinical hazards have been reported (20-22).

### *HbA<sub>1c</sub> and fructosamine levels*

Glycosylated hemoglobin (HbA<sub>1c</sub>) measurements are useful in assessing medium term glycemic control. HbA<sub>1c</sub> is formed by the post-translational, non-enzymatic glycation of the N-terminal valine residue of the beta chain of red cell hemoglobin. The proportion of HbA<sub>1c</sub> to total hemoglobin provides a useful index of average glycemic control over the preceding 6-8 weeks. The generic term fructosamine refers to protein-ketoamine products resulting from the glycation of plasma proteins (mainly albumin), reflecting average glycemic control over the last 2 to 3 weeks.

During Ramadan HbA<sub>1c</sub> showed no significant changes in diabetics in several studies (11). However, two studies have reported a slight increase in HbA<sub>1c</sub> (21,23). In one of these studies by Belkhadir *et al.* (23), however, there was an increase in HbA<sub>1c</sub> also in the control group of subjects. This is in keeping with various studies which have shown no significant changes in blood sugar during Ramadan fasting in diabetics who had been continuing with their respective treatments.

### *Body weight*

When fasting it has been noted that there is a decreased physical activity and a tendency to overeat when the fast is broken. During Ramadan more dishes and refined foods are prepared than other days plus many families inviting guests to break fast with them. This may lead to increased food intake. It is also thought that patients with the fear of hypoglycemia avoid exercising leading to minimal or no decrease in body weight or even increase in body weight despite the fast. This controversy in body weights has been noted when a review of the literature on weight changes in diabetics was done (11). In normal persons different trends in changes in body weight are also

noted during Ramadan (24). A study by Frost and Pirani, where energy intake was significantly higher during Ramadan than after Ramadan (3680 kcal/day *vs.* 2425 kcal/day) revealed a mean weight increase from 58.9 kg to 60.3 kg at the end of Ramadan (25). In both normal and diabetic population, especially in overweight diabetics, it seems that regulation of food intake and physical activity is important to attain desirable weights during and after Ramadan.

### *Lipid metabolism*

Fasting in Muslims differs from other fasting or diet plans where persons are subjected to fixed or selected meal plans and prescribed certain physical activity. In Islam there is no restriction on the quantity or type of food after opening fast and this may contribute to the differences noticed in lipid profiles. In both normal persons and diabetics there have been conflicting results on the effect of dietary fat on changes in blood cholesterol levels.

Patients with type 2 or type 1 diabetes mostly show no change or slight decreases in cholesterol and triglycerides (11). Like in healthy persons, several studies have reported increases in high-density lipoprotein (HDL) cholesterol in diabetics during Ramadan (17,21,26). One report points to an increase in low-density lipoprotein (LDL) cholesterol and a decrease in HDL-cholesterol (23). The differences in the results could be explained by the lack of standardizing energy intake and physical activity, which could have an effect on the lipid metabolism. According to the 1995 dietary guidelines from the US Department of Agriculture and Department of Health and Human Services, the energy from fat should not be more than 30%, a level that is appropriate for the general population; however, this level may be inappropriate during Ramadan fasting or similar restricted energy intake situations.

Under restricted energy intake conditions such as Ramadan fasting, anorexia nervosa, prolonged weight control dieting, and low energy intake conditions in underdeveloped or developing countries, there is a need for reassessment. A review by Nomani (28) has suggested that when energy is limited, a dietary fat increase from 30% to 36% favors a reduced breakdown of body protein including labile LDL cholesterol receptors that are protein in nature.

One of the major problems that contributes to the conflicting results on the effect of quantity or quality of dietary fat on blood cholesterol level is a failure to examine the effect of dietary fat in relation to body

weight or changes in body weight. There is an increase in blood cholesterol levels with increasing or decreasing weight from normal weight levels. Hallak and Nomani (24) noticed an increased blood cholesterol level with weight loss during the fasting month of Ramadan. Other investigators also recorded an increased blood cholesterol level with weight loss (29,30).

Among non-Muslim American female subjects there was an increase in blood cholesterol level with lowering of the body mass index below 18.5 (31). During Ramadan, no significant difference was noticed in blood cholesterol levels before and after fasting period when there was no significant difference in body weight either (32).

### *Uric acid*

Several studies have reported non-significant increases in urea and uric acid concentrations during Ramadan (33-35). Nomani *et al.* report that the increase in uric acid correlated positively with weight loss (35). Uric acid is formed as a product from purine metabolism and during Ramadan with weight loss it is postulated that this factor and the concomitant dehydration while fasting may lead to raised uric acid levels. El Ati *et al.* (33) observed that the uric acid level returned back to normal one month after the Ramadan period.

## **FASTING IN RAMADAN FOR PERSONS WITH DIABETES**

### *Pre-Ramadan preparation for diabetics who want to fast*

Prior to fasting diabetics need to be assessed and have appropriate education and treatment adjustments and advice. The following principles of pre-Ramadan considerations should be followed (36):

- (a) assessment of metabolic control
- (b) adjustment of the diet protocol for Ramadan fasting
- (c) adjustment of the drug regimen (e.g., changing long-acting hypoglycemic drugs to short-acting drugs to prevent hypoglycemia)
- (d) encouragement of continued appropriate physical activity
- (e) recognition of warning symptoms of dehydration, hypoglycemia and other possible complications

### *Guidelines to determine which diabetics can fast*

Each patient wishing to fast must be assessed as an individual. However, there are a few guidelines that may assist the physician to make the decision.

#### **Discourage fasting in (36):**

- all brittle type I diabetic patients

It is suggested that these patients may be more prone to acute complications. Type I diabetics who are well controlled and motivated may fast under medical advice and instructions. One study concludes that Ramadan fasting is feasible in older children and children who have had diabetes for a long time, and that fasting does not alter short-term metabolic control. Nevertheless, fasting should only be encouraged in children with good glycemic control and regular blood glucose monitoring at home (23).

- poorly controlled type I or type II diabetic patients
- diabetic patients known to be noncompliant in terms of following advice on diet, drug regimens, and daily activity
- diabetic patients with serious complications such as unstable angina or uncontrolled hypertension
- patients with a history of recurrent diabetic ketoacidosis
- pregnant diabetic patients
- diabetic patients with inter-current infections
- elderly patients with any degree of alertness problems who may be easily prone to hypoglycemic unawareness

#### **Allow fasting in (11):**

- patients who are keen on fasting and do not fall under the above exclusion criteria
- overweight or obese persons as fasting may improve their metabolic profiles as long as the patient has no other complications that may prevent safe fasting
- in all cases patients must be made aware of the risks involved in fasting even when under medical supervision

## **RECOMMENDATIONS AND TREATMENT OPTIONS DURING RAMADAN**

### *Nutrition*

During Ramadan it is advised that normal or overweight people should not gain weight. For over-

weight people Ramadan is an excellent opportunity to lose weight. Underweight or marginally normal weight people are discouraged from losing weight (37). Dietary indiscretion during the non-fasting period with excessive gorging, or compensatory eating, of carbohydrate and fatty foods contributes to the tendency towards hyperglycemia and weight gain (38).

During Ramadan in view of the long hours of fasting one should consume slow digesting foods including fiber-containing foods rather than refined foods. Slow digesting foods last for up to 8 hours, while refined foods last for only 3 to 4 hours and may cause acute rise in blood sugar.

The benefits of Ramadan fasting will only occur in patients who maintain their appropriate diets (39). Thus, in order to optimize control, diabetics must be reminded to abstain from the high-calorie and highly refined foods prepared during this month.

### *Physical activity and Ramadan fasting*

Exercise as in everyday life also plays a vital role in diabetics when fasting. Studies have shown that light to moderate regular exercise is harmless for non-insulin dependent diabetics (NIDDM).

### *Treatment regimens*

Both insulin dependent (IDDM) and NIDDM patients will require adjustment of the treatment regimens to ensure good blood glucose control. The adjustments are based on the changes in eating patterns and physical activity during Ramadan.

#### **Various drug regimens have been suggested in IDDM patients:**

1) Three-dose insulin regimen: two doses before meals (at sunset and dawn) of short-acting insulin and one dose of intermediate-acting insulin in the late evening (19). A study on multiple insulin injections recorded no serious acute complications and concluded that multiple insulin injection therapy could be safely used, with proper self-monitoring and close professional supervision in insulin dependent diabetics (19).

2) Two-dose insulin regimen using a combination of short-acting insulin or analogue insulins with intermediate-acting insulin before the morning and evening meals has been suggested. Two papers where analogue insulin lispro or regular human insulin were given together with NPH insulin twice daily before the

morning and evening meals showed that postprandial glycemic excursions were improved and hypoglycemia was significantly reduced with insulin lispro compared to regular insulin (40,41). The papers suggest that insulin lispro should be suitable for use during Ramadan.

3) Continuous subcutaneous insulin infusion: patients on continuous subcutaneous insulin infusions are advised to reduce their basal infusion rates whilst increasing bolus doses to cover morning and evening meals (42).

In all cases, regular home blood glucose monitoring is vital during Ramadan to enable insulin dose adjustment and prevent acute complications. It has been suggested that blood glucose should be measured 3 times a day as follows (11): before sunset meal, 3 hours after sunset meal, and before pre-dawn meal.

### *Drug regimens for NIDDM patients*

Various studies have shown that with proper changes in the dosage of hypoglycemic agents there will be a low risk of hypoglycemia and hyperglycemia. It has been suggested that short acting oral hypoglycaemic agents be used rather than long acting drugs that may increase the risk of hypoglycemia. Medication regimens during Ramadan need to be modified in timing and possibly dosing, and should be tailored for each individual patient.

Patients taking metformin alone are at no risk of hypoglycemia, however, pre-Ramadan doses should be reversed, so that the morning dose is taken with the sunset meal and the evening dose with the pre-dawn meal (42).

Belkhadir *et al.* (23), the investigators reporting on the largest series of patients treated with glibenclamide during Ramadan, recommend that diabetics switch the morning dose (together with any mid-day dose) of this drug with the dosage taken at sunset. Short acting sulphonylureas should be used in Ramadan and as for metformin the pre-Ramadan morning and evening doses should be reversed during the fasting period (42). Prandial glucose regulators such as repaglinide or nateglinide may be used. A study in 235 patients treated by either repaglinide or glibenclamide reports that repaglinide treated patients showed a trend towards better glycemic control and had a significantly lower risk and frequency of hypoglycemia than those on glibenclamide (43).

### CONCLUSION

Most type II diabetic patients on oral hypoglycaemic agents and a few type I diabetic patients on insulin who are adamant on fasting can fast if they are carefully managed and have been found to be suitable to fast by their doctors. For successful Ramadan fasting attention must be paid to diet control and glucose monitoring, daily activity and drug treatment adjustments. All diabetics must consult their doctors prior to fasting to ensure that their condition allows them to fast and to have the necessary advice and drug treatment adjustments.

Doctors must on their part prompt their diabetic patients who wish to fast to have reviews prior to fasting to ensure the patient is able to fast, has proper knowledge, and is treated so as to enable him to fast safely.

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