

second study, are shown in the *Table*. The total daily energy intake increased during Ramadan and the energy from each of the three dietary components was significantly increased. As a result there were no real changes in the distribution of daily calorie intake apart from a slight increase in lipid from 35.7% to 36.9% during Ramadan. Body weight did not change significantly (before Ramadan 71.3 ± 11.2 kg, after Ramadan 71.7 ± 11.5 kg) in spite of increased daily calorie intake and reduced or non-existing physical activity.

DISCUSSION

The metabolic control of the fasting patients in this study was not satisfactory but fasting did not significantly alter it, although there was a tendency for deterioration. Medical advice is often not followed and there is determination among the patients to follow fasting even in those who have degenerative complications. There are a limited number of studies that have examined this subject and the majority have involved patients with

unacceptable metabolic control. Most studies have examined patients treated with oral hypoglycaemic agents, while there are no large clinical studies with patients treated with insulin. Very few studies address changes in dietary content which is an important part of diabetes treatment. The present results show significant changes, which indicate that physicians should focus on educating patients on the importance of a balanced diet during Ramadan.

QUESTIONS FROM THE FLOOR

Question 1

It would appear from your results that the measurement of HbA_{1c} is not adequate for monitoring glucose control during Ramadan and that blood glucose monitoring is necessary. Do you think that fructosamine determination may provide a better method?

changes, but not HbA_{1c}. However, because HbA_{1c} varies over a period of time we should perhaps have seen some change. We would suggest that this should be studied in a larger population with blood glucose monitoring and to correlate this with fructosamine measurements.

if the normal range was comparable to others. What was the normal range used and did the results indicate that the patients had poor diabetic control?

Dr Kadiri

We noted that blood glucose showed

Question 2

The HbA_{1c} levels reported were rather high

Dr Kadiri

The study reported examined a very poorly controlled patient population. Whether results from this poorly controlled population can be extrapolated to a well controlled population remains an open question.

DIETARY CHANGES AMONG DIABETES PATIENTS DURING RAMADAN IN SAUDI ARABIA

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INTRODUCTION

Ramadan is a holy month for Muslims worldwide, when Muslims abstain from food and drink from sunrise to sunset. At the start and end of Ramadan there are sudden changes in dietary practice which involve meal-timing, total calorie intake and food composition¹, in addition to food habits and preparation². The change in diet is coupled with changes in daily activity, and this could be associated with problems for patients with diabetes and their physicians³.

Diabetes mellitus is a chronic disease with a high incidence in Muslim countries, especially Saudi Arabia where there is a prevalence rate of 13.4%⁴. Although studies have shown that Ramadan fasting does not have any clinically deleterious effect on diabetics or non-diabetics⁵, managing patients with diabetes during Ramadan is a real challenge for diabetologists⁵. Patients are subjected to sudden changes in both dietary practice and daily activity during Ramadan, requiring sudden changes in treatment regimen^{5,6,7}. The following study examined dietary changes during Ramadan in Saudi patients with Type 2 diabetes.

METHODOLOGY

The study was performed in 100 patients

who were not contraindicated from fasting. In the month prior to Ramadan they were instructed in the study and the completing of food lists, to include meal-timing, composition and an estimate of quantity. The form consisted of food tables for the three meals before Ramadan (breakfast, lunch, supper) and the two meals during Ramadan (iftar and sahur) in addition to snacks. Patients were educated in the different food composition, and methods of food assessment⁸ through a training programme conducted by a nutritionist.

The patients were followed prior to and during Ramadan for their clinical status including weight, diabetes control and dietary changes. Patients completed the forms on a daily basis for two weeks prior to, and during the month of Ramadan. The data were entered weekly using a programme which adjusted for quantity, total calories and food composition (carbohydrate, protein, fat)⁹.

RESULTS

Ninety-one subjects (63 females, 28 males), mean age 46 ± 9 years (± 1 SD), completed this study and the average daily fasting duration was 12.1 hours. The early morning meal (sahur) was at 05:07 and sunset meal

(iftar) was at 17:20, a shift of four hours earlier for breakfast to sahur and a delay of four hours for lunch to iftar, with supper eliminated during Ramadan. Mean daily glucose was 9.8mmol/l prior to Ramadan, decreasing to 8.5mmol/l in the first week then increasing to 11.2mmol/l during the third and fourth week. The mean glucose level two hours after iftar was 12.9mmol/l and prior to sahur was 6.8mmol/l.

The *Table* shows the total daily energy intake was 2779kcal before Ramadan and the main meal was lunch (1032kcal) while the total daily intake for snacks was 228kcal. Some patients reported omitting sahur, especially during weekends. During the four weeks of Ramadan the average total daily intake was 2950kcal. It was lower in the first week, increasing gradually to the highest value in the fourth week. The main meal was iftar, accounting for an average 1388kcal, followed by snacks totalling 806kcal. Some patients reported omitting Sahur or taking Sahur at midnight.

The results for food composition (*Figure*) showed that before Ramadan carbohydrate was the major constituent (43%) although it was very similar to fat (42%), while protein comprised the remaining 15%. The composition changed during Ramadan to increased

fat (50%) at the expense of protein (10%), with a minor reduction in carbohydrate (40%).

DISCUSSION

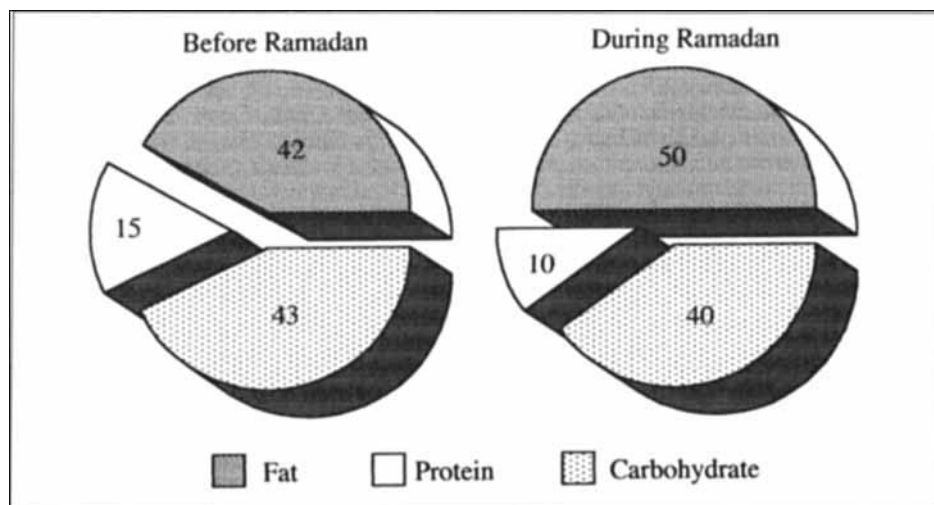
Although the data for this study relied on patient reporting, the training programme was the only way to provide good and accurate data recording. The increase during Ramadan in total daily calorie intake for these Saudi patients with diabetes is similar to previous observations in the general Saudi population⁹. Before Ramadan the main calories (37.1% of total) were taken at lunch time and snacks accounted for 8.3% of the total daily calorie intake. During Ramadan the data showed a 6.2% increase in the total daily intake from the month preceding and 47.1% was consumed during the first meal (eftar) with snacks providing 27.3%, which is similar to previous results⁸.

The gradual increase may be explained on the basis of initial decreased appetite associated with the change in meal time. The results indicate that managing diabetes during and after Ramadan should be undertaken with caution and planning. A low daily intake in the first week with a subsequent increase suggests that hypoglycaemia could occur more frequently in the first week and symptoms of hyperglycaemia could dominate towards the end of Ramadan.

Table. Daily energy intake before and during Ramadan

	Daily calories	Percent of total
Before Ramadan		
Breakfast	643	23.1
Lunch	1032	37.1
Supper	876	31.5
Snacks	228	8.3
Total	2779	100.0
During Ramadan		
Eftar	1388	47.1
Sahur	756	25.6
Snacks	806	27.3
Total	2950	100.0

Figure. Change in percentage composition of diet during Ramadan



The increased daily intake during Ramadan was mainly due to an increase in the fat content of the special Ramadan dishes, where fried dishes are the usual Saudi custom. The fat content increased from 42 to 50% at the expense of protein and carbohydrates. This would increase the risk for ischaemic heart disease and vascular complications. Similar conclusions have been reached in other Islamic countries¹⁰.

In conclusion, the average Saudi diabetes patient already consumes a high calorie intake with high fat, and this is worse during Ramadan. This change will affect diabetes control and management and subject the patient to a high risk of vascular complications.

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QUESTIONS FROM THE FLOOR

Question 1

Your study clearly indicated that your people are consuming a high fat, high caloric diet during, and also before, Ramadan. What is your recommendation on steps to combat this problem?

Dr Al-Rubeaan

Our results showed that before Ramadan there was already a change in food habits towards high fat and this was made even worse during Ramadan; 50% of daily calories from fat during Ramadan is really a tremendous amount. The only way we can prevent this is by education; we need

to launch a low cholesterol diet. Recent data from the United States showed that a program of low fat diets for only 5 years was able to decrease the mean cholesterol level from 5.2 to 4.2mmol/l. We need to educate the people, and those in governmental sectors who really can dictate what should be done.

Question 2

When a patient asks when to fast and when to break the fast, do we have consensus or even guidelines to provide advice to the patient?

Dr Al-Rubeaan

This is a very complicated issue but we need to try to really teach people. One problem we faced during our study was doing blood tests during Ramadan. Patients did not want to do it and we were only able to do so when we managed to get a special fatwa to persuade them that drawing blood would not affect their fasting. If this is a small issue, then it will be much more difficult to persuade the general population to change. However, there is a need for a recommendation about fasting and Ramadan which should reach the media and the people.