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Fasting outcomes in people with diabetes and chronic kidney disease in East London during Ramadan 2018: The East London diabetes in Ramadan survey

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ABSTRACT

Objectives: Fasting in summer months for Muslim people with diabetes during Ramadan is challenging, particularly in temperate climates, where duration of fasting is prolonged. Risk of fasting may be greater in people with diabetes and chronic kidney disease (CKD). We aimed to prospectively monitor the outcomes of patients with diabetes and CKD stage 3 during Ramadan 2018 in East London.

Methods: Patients with type 2 diabetes (T2D) and CKD stage 3 attending community diabetes clinics were approached prior to Ramadan 2018 to discuss fasting. Patients were risk categorised according to Diabetes and Ramadan Alliance guidelines. If they chose to fast, Ramadan education was given, and biomedical assessments were undertaken within one week prior to and one week after fasting. Outcomes between patients fasting and non-fasting groups were compared.

Results: Fasting (n = 68) and non-fasting groups (n = 71) were similar apart from slightly higher insulin use in the non-fasting group. Median days fasted was 21 (range 12–29). There were no significant changes in weight, blood pressure, creatinine, glycated haemoglobin, cholesterol and urinary PCR pre- and post-Ramadan, and no significant differences between the fasting and non-fasting groups. There was no difference in adverse events (acute kidney injury, hypoglycaemia or cardiovascular events) between the fasting and non-fasting groups.

Conclusions: No significant differences were seen in clinical or biochemical parameters, or adverse events between fasting and non-fasting patients. Patients with T2D and stable CKD stage 3 may be able to fast safely during Ramadan.

1. Introduction

Fasting during the month of Ramadan is a religious imperative for all adult Muslims who are physically and mentally well, and involves complete abstention from food and fluids from sunrise to sunset. As the Muslim calendar is lunar, the month comes earlier by approximately ten days per year, and during summer months, length of the fasts can be up to 20 h in the UK.

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Most Islamic clerics agree that significant health problems (such as diabetes or chronic kidney disease [CKD]) which are likely to worsen during fasting, allow exemption from fasting [1]. Guidelines are available to assist clinicians in advising Muslims on their risk of fasting [1,2]. In most guidelines, patients with CKD stage 3 are deemed high risk, and should be discouraged from fasting. In our experience, however, many patients decide to fast despite medical advice to the contrary [3].

Fasting for people with diabetes and CKD poses a significant clinical challenge, especially for those patients fasting for prolonged hours in temperate climates during summer months, when the duration of fasting is up to 20 h per day. Islam specifically exempts people with illness from the duty of fasting, and most religious authorities suggest that patients with diabetes or CKD who may encounter potential complications or deterioration of the condition from fasting are exempt [9]. Nevertheless, many Muslims with diabetes or CKD feel the spiritual need or social pressure to fast despite advice to the contrary.

Previous studies have examined outcomes of fasting in patients with CKD predominantly in tropical climates where the duration of fasting is generally stable at around 12–14 h [4–7]. In this study, we aimed to review the clinical experience of Muslim patients with diabetes and CKD stage 3 in East London, UK during summer 2018, a period when duration of fasting was over 18 h. We were specifically looking any sign of deterioration in renal function or acute kidney injury (AKI), episodes of hypoglycaemia requiring cessation of fast or third party assistance, cardiovascular events or hospital admission for any cause.

2. Methods

The London Borough of Tower Hamlets has a population of around 280,000 individuals, of whom around 17,000 have Type 2 diabetes (T2D). We undertook a prospective observational study of Muslim patients with T2D and CKD3 in Tower Hamlets during Ramadan 2018 (16th May – 14th June – length of fast approximately 18 h). Patients with T2D were identified from general practice registers. CKD was defined as the last two estimated glomerular filtration rates (eGFR) in the range of 30–59 mls/min/1.73 m^2 within six months. eGFR was measured using the 4-variable modification of diet in renal disease equation [8]. Patients with a recent episode of acute kidney injury (AKI), or renal transplantation were excluded. Patients were invited to attend a full clinical assessment as part of their routine care immediately prior to and post Ramadan.

All patients were counselled on their risk of fasting, based on the Diabetes and Ramadan (DAR) Alliance criteria for low, intermediate, high or very high risk [1]. According to these criteria, patients with CKD stage 3 are at high risk for fasting, and should be counselled to avoid fasting. All patients were therefore discouraged from fasting, but many decided to undertake fasting against medical advice. Patients were therefore divided into a fasting group and non-fasting group.

All patients underwent a full clinical assessment within one week of the commencement of fasting, (blood pressure, body mass index, glycated haemoglobin, urea and electrolytes, total cholesterol and urine protein creatinine ratio [PCR]), and within one week after cessation of fasting. Patients who decided to fast were encouraged to attend Ramadan focussed education classes, and were also given advice on increasing fluid intake, and adjusting diabetes medication as per DAR guidelines.

At the post Ramadan assessment, patients were asked about how many days they had fasted, and their recollection of any adverse events during the month. Specifically episodes of hypoglycaemia requiring breaking of the fast, hypoglycaemia requiring third party assistance, cardiovascular events or hospital admission for any reason were inquired about. Where available, we reviewed readings on the patients' glucose meter.

2.1. *Statistical analysis*

Statistical package for social sciences (SPSS) was used (SPSS Inc, Chicago, IL, USA). Data are presented as means ± standard deviation or medians (range). Chi-squared test was used for non-parametric data, and Mann-Whitney *U* test for parametric data. Changes in the clinical and biochemical indices before and after Ramadan were compared within patients using a student *t*-test. A P value of $\leq$0.05 was considered significant.

3. Results

Demographic characteristics of the two groups are shown in Table 1. The fasting group (n = 68) and non-fasting group (n = 71) were well matched, although the non-fasting group had more patients on insulin. All patients who fasted attended the Ramadan focussed education sessions. Median days fasted was 21 (12–29).

Comparison of clinical and biochemical assessments in the fasting group and non-fasting groups prior to and at the end of Ramadan are shown in Table 2. In both groups, there were no significant changes in weight, blood pressure, creatinine, glycated haemoglobin, total cholesterol and urinary PCR pre- and post-Ramadan. Furthermore, there were no significant differences in the above assessments between the fasting and non-fasting groups.

In both cohorts there were few adverse events. Mild hypoglycaemia occurred in four (8.3%) of patients who fasted, three of which necessitated cessation of fasting, and four (5.6%) patients who did not fast. Hypoglycaemia in both groups occurred exclusively in patients on insulin and not in patients on oral hypoglycaemics alone (including sulfonylureas). No hypoglycaemic episodes requiring third party assistance occurred in either group. One patient in the non-fasting group was admitted with an acute coronary syndrome. There were no admissions in the fasting group. No episodes of acute kidney injury occurred in either group.

4. Discussion

The results of this study suggests that patients with diabetes and moderate CKD had no significant deterioration in renal

Table 1 – Demographic characteristics of patients who fasted compared to patients who did not fast.

	Fasting Group	Non-fasting Group	P value
Number (%)	68	71	–
Female n (%)	33 (48.5)	36 (50.7)	p = 0.76
Age median (range) yrs	58.7 (31.2–83.4)	60.1 (34.1–82.4)	p = 0.24
Diabetes duration median (range) yrs	14.8 (0.5–43)	15.2 (1–39)	p = 0.55
Weight mean (SD) (kg)	73.5 (15.1)	72.9 (16.2)	p = 0.48
BMI mean (SD) (kg/m^2)	25.6 (0.9)	25.4 (1.2)	p = 0.81
HbA1c median (range) (mmol/mol)	58.3 (42.1–87.7)	57.6 (40.1–87.8)	p = 0.41
Systolic BP mean (SD) (mmHg)	137.6 (28.6)	135.4 (27.5)	p = 0.62
Diastolic BP mean (SD) (mmHg)	78.1 (8.9)	80.1 (9.6)	p = 0.35
Treatment regimen n (%)			
Diet only treated	4 (5.9)	4 (5.6)	p = 0.82
Oral hypoglycaemic only treated	41 (60.1)	38 (53.5)	p = 0.11
Insulin alone or with orals	23 (33.8)	29 (40.8)	p = 0.048

BMI – body mass index; BP – blood pressure; Chol – total cholesterol; ACR – albumin creatinine ratio; HbA1c – glycated haemoglobin.

Table 2 – Changes in clinical and biochemical parameters before and after Ramadan in the two groups.

	Fasting Group (n = 68)		P	Non-fasting group (n = 71)		P
	Pre-Ramadan	Post-Ramadan		Pre-Ramadan	Post-Ramadan	
Weight mean (SD) (kg)	73.5 (15.1)	72.1 (14.7)	p = 0.77	72.9 (16.2)	73.1 (15.7)	p = 0.39
BMI mean (SD) (kg/m^2)	25.6 (0.9)	25.2 (0.9)	p = 0.89	25.4 (1.2)	25.5 (1.1)	p = 0.59
Systolic BP mean (SD) mmHg	137.6 (28.6)	137.2 (27.6)	p = 0.82	135.4 (27.5)	136.6 (26.9)	p = 0.30
Diastolic BP mean (SD) mmHg	78.1 (8.9)	77.4 (9.0)	p = 0.56	80.1 (9.6)	81.2 (10.1)	p = 0.48
HbA1c median (range) (mmol/mol)	58.3 (42.1–87.7)	56.5 (42.3–89.9)	p = 0.13	57.6 (40.1–87.8)	58.9 (40.5–89.7)	p = 0.49
Creatinine median (range) (umol/L)	143 (115–201)	145 (110–198)	p = 0.36	138 (112–205)	135 (109–201)	p = 0.47
eGFR median (range) (ml/min)	46.7 (30–59)	46.2 (28–61)	p = 0.47	47.7 (30–59)	48.7 (28–63)	p = 0.38
Chol median (range) (mmol/L)	4.3 (1.7–6.9)	4.2 (1.7–6.8)	p = 0.79	4.2 (2.1–7.1)	4.4 (2.1–6.8)	p = 0.72
Urine PCR median (range)mg/mmol/l	45.6 (10.3–330.7)	43.7 (9.5–320.6)	p = 0.81	46.2 (9.2–420.6)	42.4 (8.9–401.1)	p = 0.11

BMI – body mass index; BP – blood pressure; Chol – total cholesterol; ACR – albumin creatinine ratio; HbA1c – glycated haemoglobin.

function, no increase in mild or moderate hypoglycaemia and no increase in cardiovascular events or hospital admissions compared to patients with diabetes and moderate CKD who did not fast. One weakness of our study is that we did not ask patients to undertake regular glucose monitoring, which may have missed milder episodes of hypoglycaemia. Nevertheless, our study suggests that European Muslim patients with diabetes and moderate CKD are able to fast safely during Ramadan with low risk of adverse events.

Prolonged fasting may cause significant problems in patients with CKD. Dehydration and fall in blood pressure may predispose to acute kidney injury, hyperviscosity, thrombosis or other complications. There are no robust guidelines on management of CKD in patients planning to fast, due to a lack of large scale studies. The few studies which have examined the effect of fasting in patients with CKD have shown conflicting results. In one study of 94 patients from Turkey with stage 3,4 or 5 CKD, no significant progression in CKD or deterioration in renal function was seen [6]. In a study from Egypt, DTPA estimated GFR was undertaken before and after Ramadan in patients with CKD were compared to six patients with normal GFR, and no significant difference in GFR change was seen [5]. There was, however, a rise in N-acetyl-B-D-glucosaminidase (NAG), a measure of tubular function, seen in the CKD patients, especially those with diabetes. In this study, the authors noted a significant 17% rise in serum creatinine in the first week of fasting, which became non-significant by the end of fasting. In contrast, a further study of 31 patients from Al-Ain in United Arab Emirates with CVD stage 3,4 or 5 (mean eGFR 29 ± 16 ml/min) showed that fasting duration of approximately 12 h led to an improvement in eGFR during and for the month after Ramadan [10]. In a study from Saudi Arabia, 39 patients with CKD who fasted for 14 h (35% with diabetes) showed no significant difference in all biochemical parameters during Ramadan, and no adverse events were seen in any patient [11]. The most recently published study in this area included 65 adults with CKS stage 3 of less (including 13 with diabetes) from Saudi Arabia who fasted during Ramadan 2015. 33.8% of patients had worsened renal function (defined as creatinine increasing by 0.3 mg/dl or 26.5 μmol/L), of whom 14 had persistent worsened renal function three months later [4]. The author concluded that Ramadan fasting was high risk for patients with CKD. A prospective cohort study of BNP levels in 31 CKD patients showed a rise in urea at the last week of fasting, which returned to baseline one week after the end of fasting and BNP levels fell during fasting but returned to normal post fasting [12]. The authors stated that patients with CKD2-4

could fast safely during Ramadan. Fasting in early stage CKD in 23 adults with adult polycystic kidney disease has also been noted to be safe [13].

Patients with CKD on renal replacement therapy who fast have also been studied. In one study of 32 haemodialysis patients in Saudi Arabia, renal biochemistry showed significant changes during Ramadan, but no serious adverse events occurred [11]. A prospective cross sectional study from Malaysia recruited 35 patients who fasted for any number of days whilst on haemodialysis, 17 of whom had diabetes. They showed a significant decrease in pre- and post-dialysis weight before and after Ramadan, with improvements in serum albumin and reductions in phosphate [14]. There were no adverse events. Furthermore, one study of 31 patients on peritoneal dialysis (PD) showed that PD patient did not experience any significant morbidity or deterioration in renal function, and biochemical indices remained stable [15]. A number of studies of renal transplant recipients also suggest that stable patients are able to fast without any significant adverse effects [16–19].

In a systematic review studies of Ramadan fasting and CKD was conducted in 2014 and found that amongst 140 subjects with CKD reported in the literature, no severe adverse effects of fasting on renal function were found [20]. A subsequent meta-analysis of six studies examining over 200 patients with CKD who fasted over Ramadan showed no statistically significant difference in change of GFR before and after Ramadan fasting, indicating that stable patients with CKD appear to be able to fast safely [21].

A number of guidelines have been published which suggest that as part of a pre-Ramadan assessment, it is useful to stratify patients according to their risks of adverse events during Ramadan [1,2]. The Diabetes and Ramadan International Alliance (DAR) provide clear guidance for health professionals and patients on safety of fasting, and changes in medication recommended for patients planning to fast [1]. The guidance states that patients at very high risk or high risk should be discouraged from fasting, but that if they insist, they should receive structured education and careful monitoring by the diabetes specialist team, monitor blood glucose regularly, adjust medication as per recommendations and be prepared to stop the fast if hypoglycaemia (glucose less than 3.9 mmol/L) or hyperglycaemia (glucose above 16.7 mmol/L) occurs. These guidelines suggest that patients with diabetes and CKD stage 3 should be deemed high risk for fasting, and discouraged from doing so. Our survey suggests that, despite advice, many Muslim patients with diabetes and CKD opt to fast, and appear to be able to do so safely, without any significant adverse events.

Authors contributions

TAC proposed the study, HK, AC, SSL and TAC all undertook patient reviews. TAC wrote the manuscript and others commented and revised the drafted manuscript. All authors approved the final version of the manuscript.

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Fully compliant.

Availability of data

Anonymised patient data available

Declaration of Competing Interest

None

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.diabres.2019.05.022.

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