

Effect of Fasting on Renal Physiology

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Review article</p> <hr/> <p><i>Article History:</i> Received: 14 Oct 2014 Revised: 12 Nov 2014 Accepted: 14 Nov 2014 Published: 18 Nov 2014</p> <hr/> <p><i>Keywords:</i> Dehydration Electrolytes Fasting Kidney function Osmolality Ramadan Renal physiology Stones Uric acid</p>	<p>Total abstinence from food and water from sunrise to sunset during the month of Ramadan, is practiced by hundreds of millions of Muslims throughout the world. This pattern of fasting during Ramadan is different from the usual fasting as people are allowed to eat and drink between sunset and dawn but not after dawn. The amount and type of food (rich in protein, fat and sugar) eaten during the night may also be significantly different to that usually consumed during the rest of the year, while in other countries factors such as poverty ensure that the Ramadan fast results in a reduction in energy intake and a loss of body fat. Also, climate and duration of fasting differs from region to another.</p> <p>According to Islam, sick people are exempted from Fasting, but still a significant number of patients with various chronic diseases including chronic kidney diseases (CKD) insist on fasting in Ramadan due to their personal beliefs and physicians are facing this problem every year: What to advice their patients as there are no guidelines or protocols about who can and who cannot fast.</p> <p>In general no detrimental effects on health have been directly attributed to fasting during Ramadan. However caution is advised for moderate to severe CKD patients and the physicians should monitor their patients carefully during Ramadan in order to avoid any deleterious effects.</p>

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Introduction

All the world's religions recommend a period of fasting, and of these, one whole month of intermittent fasting every year is particular to Islam. Muslims have two meals, one immediately after sunset and the other just before dawn with a period of fasting ranging from 11 -18 hours. Therefore, we can assume that physiological changes occurring during Ramadan would be different from those occurring during other types of fasting.

According to Islam, sick people are exempted from Fasting especially people with chronic diseases as diabetics, hypertensives, hepatic and renal patients, still a significant number of them insist on observing this religious practice due to their personal beliefs and satisfaction. In these cases, physicians face a dilemma as to how they can offer clinical advice for their fasting patient.

In this article, I am doing a review on the findings of studies on the effect of fasting in Ramadan on renal physiology trying to help both, physicians and patients, to take the right decision.

1- Regulation of fluid volume

The 24 hour urine output during Ramadan tend to be lower than that of the prefasting level; however the decline is not significant (150-200 ml/day) (1-3).

In a recent study using an isotopic tracer technique (18), it was demonstrated that total body water content was conserved during Ramadan although daily water turnover was reduced, due to a drop in non-renal losses.

2- Regulation of Electrolyte balance

***Na:** Observations about total Na excretion were contradictory: While it remains normal in some studies (2,3), others (1,4) observed significant decline of total Na excretion throughout the fasting period due to decrease food (and consequently decrease electrolyte) intake by about 20%.

***K:** Conflicting results; either serum K remains normal (1,2,6,8) or increased during fasting (7,9) and this may be due to the common

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practice of drinking large volumes of fruit juices, eating dates and dried fruits as well as reduced potassium excretion (1).

* Miladipour et al (3) showed that total excretion of **calcium, phosphate, and magnesium** during fasting were significantly lower than those of the non-fasting. No changes in serum calcium or phosphorus were detected (2, 16, 17).

3-Excretion of metabolites

***Uric acid:** Slight increase in serum uric a. (2,8,9). In 2 studies done on renal grafted patients with stable kidney function, there was no significant change in serum uric acid during fasting (6,7).

Uric acid supersaturation increased during fasting period in both healthy individuals and stone formers (3,26) but 24 hours uric a. excretion was not significantly different from non fasting peoples.

***Urea:** Usually increases : While this increase was non significant in some of the studies (6,7), others found significant increase up to 23% (10,15,19) due to dehydration, increase protein intake during Ramadan or increase protein catabolism, But serum Urea returns to the baseline by the end of Ramadan (10,12,14).

***Creatinine:** Only slight changes that are statistically non significant in most of the studies (2,5-7,9,13), in few studies (20,21) a significant increase in serum creatinine up to 12% was found.

These differences in na,k, uric acid, urea, and creatinine are most probably due to difference in type of diet, climate, activity level and duration of fasting.

4-Plasma and Urine Osmolality

Fasting did not affect the plasma osmolality (1,7), indicating that the subjects were probably not subjected to severe water deprivation due to the fact that food and water are available between sunset and sunrise. Urinary osmolality was higher during Ramadan than either before or after Ramadan (ranging from 849-1023 mosm/kg) indicating effective water conservation (23) both by maximum urinary concentration and a decreased obligatory urine output (1,19,24,25).

5- Reabsorption of glucose and amino acids

Protein and glucose were not detected in the urine (1,7) suggesting normal reabsorptive function during Ramadan.

6-Acid-base balance

- CHEAH et al (1) showed a decline in total titratable acidity (partly due to the decreased urine phosphate excretion) and an absence of ketonuria suggesting that any adipose tissue breakdown that might have occurred must have been relatively slow(22).

-No changes in PH (2) or serum bicarbonate (6) were detected.

7- No evidence that changes in **blood pressure** or **Hb level** observed during fasting were attributed to the kidney.

Conclusion

In general no detrimental effects on health have been directly attributed to fasting during Ramadan. There are no guidelines about who can and who cannot fast,also the results about effects of Fasting on renal physiology are contradictory and this is most probably due to changes in type of food, climate, duration of fasting and activity level in Ramadan.

Individualization of the advice given to the patients about Ramadan fasting is an important thing and caution is advised for moderate to severe CKD patients and the physicians should monitor their patients carefully during Ramadan in order to avoid any deleterious effects.

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