

Effect of Ramaḍān Fast on Urinary and Blood Osmolality and Electrolytes

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Abstract

This study was conducted on ten healthy individuals working at the College of Medicine of King Saud University. The results showed that Ramaḍān fasting was associated with a statistically significant increase in the urinary concentration of both sodium and potassium. The increase in serum sodium and potassium was quite significant, while the blood osmolality increased but barely reached statistical significance. However, all these increases fall well within the normal range.

Key words: *Fasting, Ramaḍān, osmolality, sodium, potassium.*

Ramaḍān fast entails abstinence from food, drink and sex from dawn to sunset, averaging about 15 hours daily for one lunar month. In spite of the scarcity of literature about Ramaḍān fasting, the biochemical and hormonal effects of fasting have been reviewed.¹

In two studies by Mustafa et al,² and Hazmi et al,³ the changes that occur in urinary and blood osmolalities and electrolytes were reported during the Holy month of Ramaḍān. In this study we attempted to verify these findings and suggest clinical implication for these findings in Muslims observing the fast.

Materials and methods

Ten healthy volunteers working at the College of Medicine of King Saud University in Riyadh par-

ticipated in the study. A brief questionnaire covering dietary practices and medical illnesses was taken before urine and blood specimen collection.

Sampling was done between 1-2 p.m. to ensure the impact of fasting. Measurements were made of urinary and plasma osmolality (measured by an osmometer by Knauer Company of West Germany). Sodium and potassium levels were measured by a flame photometer (Corning Company, England). The data were analysed by Student 't' test.

Results

Table 1 reports the values of osmolalities, sodium and potassium concentrations in the urine and plasma respectively.

Discussion

Fasting in Ramaḍān is theoretically expected to produce a significant change in body homeostasis. However, previous reports^{2,3} have shown insignificant fluctuations in plasma osmolality during the middle of Ramaḍān.

In this study the change in plasma osmolality barely attained statistical significance. This confirms previous reports, that serum osmolality is not greatly affected by Ramaḍān fasting.⁴

The increased urinary osmolality as well as the in-

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Table 1. Urinary and serum osmolality, sodium and potassium concentrations in 10 healthy volunteers before and during Ramaḍān fast.

| | Pre-fasting | Fasting | P Value** |
|-----------------------------|----------------|---------------|-----------|
| Urine Osmolality (mOsmol/L) | 570.0 ± 279.0* | 782.0 ± 247.0 | NS |
| Urine Sodium (mMol/L) | 110.0 ± 38.0 | 157.0 ± 47.0 | <.05 |
| Urine Potassium (mMol/L) | 61.4 ± 22.0 | 87.3 ± 33.0 | <.05 |
| Serum Osmolality (mOsmol/L) | 285.5 ± 8.7 | 290.0 ± 5.4 | NS |
| Serum Sodium (mMol/L) | 127.0 ± 2.0 | 137.5 ± 3.5 | <.0005 |
| Serum Potassium (mMol/L) | 3.8 ± 0.3 | 4.5 ± 0.5 | <.01 |

* mean ± S.D.

** Student "t" test

creased sodium and potassium concentrations can be explained on the basis of an increased ability of the kidney to concentrate the urine, mediated by the increased action of antidiuretic hormone, and the counter current mechanism or both.^{2, 5-7} The increase in urine osmolality did not reach statistical significance because of the large standard deviation.

The significant increase in serum potassium is worth special attention. It has been found that the level of insulin is lower during the day when Muslims are fasting.⁸ Insulin helps in the uptake of potassium by the tissues.⁹ A brisk rise of insulin takes place post prandially after breaking the fast in the evening. This rise in potassium may cope with the brisk increment of insulin. It would be of clinical interest to study Muslims observing Ramadan fasting while on medications which affect potassium levels or those whose renal concentrating capacity is abnormal e.g. those suffering from nephrogenic diabetes insipidus.

In conclusion, it is well to remember that while there were changes in electrolytes and osmolality due to fasting, these changes are within the normal range.

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