

# Clinical and Biochemical Parameters of Hemodialysis Patients Before and During Islamic Month of Ramadan

Salman Imtiaz,<sup>1</sup> Beena Salman,<sup>2</sup> Murtaza Fakhruddin Dhrolia,<sup>1</sup>  
Kiran Nasir,<sup>1</sup> Hasan Nasir Abbas,<sup>1</sup> Aasim Ahmad<sup>1</sup>

<sup>1</sup>Department of Nephrology,  
Dorab Patel Post Graduate  
Training and Research Center,  
The Kidney Center Post  
Graduate Training Institute,  
Karachi, Pakistan

<sup>2</sup>Departments of Biostatistics  
and Research, Dow University  
of Health Sciences, OJHA  
Campus Karachi, Pakistan

**Keywords.** Ramadan fasting,  
hemodialysis, end-stage kidney  
disease, electrolyte imbalance,  
blood pressure

**Introduction.** Month of Ramadan bring many changes in life style, especially the diet of Muslims all over the world among both fasting and nonfasting individuals. Hemodialysis patients are kept on restricted diet because of fluid and electrolytes imbalance. The aim of this study was to compare changes in the clinical and biochemical parameters in fasting and nonfasting hemodialysis patients during the Ramadan.

**Materials and Methods.** In a longitudinal study, we recruited 282 patients who were on maintenance dialysis for more than 3 months. Measurements included body weight, blood pressure, serum potassium, serum albumin, and serum phosphorus at the beginning and during the last week of Ramadan.

**Results.** There were 252 patients who were not fasted while 34 patients were those who fasted during the Ramadan. In the nonfasting hemodialysis patients, serum albumin significantly increased at the end of Ramadan ( $P < .001$ ), while serum phosphorus levels ( $P = .004$ ) and diastolic blood pressure ( $P = .002$ ) showed a decrease as compared with the measurements before Ramadan. In the fasting group, only serum albumin had a significant increase ( $P < .001$ ) during Ramadan, while other parameters were not significantly different between the two measurements.

**Conclusions.** Changes in dietary pattern and content during the Ramadan is safe in terms of electrolyte balance and blood pressure changes for patients on hemodialysis. It is also safe for those patients who want to fast during this month.

IJKD 2016;10:75-8  
www.ijkd.org

## INTRODUCTION

Periodic fasting is one of the important recommendations of world's great religions. Islamic fasting is unique for its long duration and abstinence from eating and drinking, taking medications and injections between sunrise and sunset. Ramadan is the 9th lunar month of the Islamic Calendar. It is obligatory for the healthy Muslims to fast after the age of puberty. There are exception for children, menstruating women, severely ill patients, and travelers. The duration of fast may last from 12 to 14 hours depending

on the season and latitude, but it can last for 18 to 22 hours on extremes of southern or northern regions. There are significant changes observed in quality of food and pattern of eating during Ramadan; the consumption of carbohydrate and sweet food increases enormously.<sup>1,2</sup>

Hemodialysis patients are at increased risk of mortality and morbidity as compared with the general population. They are vulnerable to developing pulmonary edema and heart diseases. An inadvertent increase in the fluid intake and consumption of food containing potassium and

phosphorus may cause dangerous consequences for them.<sup>3,4</sup> On the other hand, prolong fasting which extends over a month causes a poor energy intake. This poor energy intake buildout predicament of malnutrition, which is also a predictor of high mortality in dialysis patients.<sup>5</sup> Fasting causes suppression of insulin, and there is also a diminished response to epinephrine; both of these mechanisms contribute to develop high potassium level in dialysis patients. Together with increased dietary potassium which has been observed in Ramadan, these mechanisms predispose the patients to have higher potassium levels.<sup>6</sup>

Interestingly, fasting which is supposed to reduce the weight of a person, is also evident to cause weight gain in the month of Ramadan, due to change in the type and quality of food consumption.<sup>7</sup> This weight gain might be a serious concern for increasing cardiovascular problems in normal population, but in the context of “reverse epidemiology” of cardiovascular disease in dialysis patients, this might be beneficial in terms of their mortality. In this perplexing background, there are reports which showed increases in body weight, potassium levels, and fluid overload between dialysis sessions. The impact of these changes is also bewildered by high mortality in some reports, while no effect in others.<sup>7,12</sup>

Ramadan brings profound changes in diet and drinks. These changes affect not only those who fast but also affect those who do not fast. The objective of the study is to establish whether these changes affect the clinical parameters such as blood pressure, body weight, and biochemical profiles like potassium, phosphorus, and albumin concentrations in fasting as well as nonfasting dialysis patients.

## MATERIAL AND METHODS

This prospective cohort study was conducted at the Kidney Center Postgraduate Medical and Training Institute, Karachi, which is a tertiary care center for all nephrology and urology services and a state of art dialysis facility. Patients were recruited before Ramadan and the purpose of the study was explained. Informed consent was obtained from the participants. All of the patients who were on regular maintenance hemodialysis thrice weekly for more than 3 months were included in the study. Patients with acute kidney failure, those who were admitted due to some acute illness during the study

period, and patients who had started hemodialysis of shorter than 3 month duration were excluded.

One set of blood sample was collected 2 weeks before starting of the Ramadan and the 2nd sample was collected in the last week of Ramadan. Blood pressure and weight of the patients were monitored on each dialysis session; predialysis weight and blood pressure were included in the study. We conducted 2 separate analyses. In the 1st analysis, those patients who did not fast during the month of Ramadan and fulfilled the inclusion criteria were included. This group anticipated the effect of change in life style and dietary pattern in those who did not fast. In the 2nd analysis, we included only those patients who fasted during the Ramadan. This group were assessed for the effect of fasting along with change in diet and life style on dialysis patients.

Data were analyzed using the SPSS software (Statistical Package for the Social Sciences, version 13.0, SPSS Inc, Chicago, Ill, USA). The mean  $\pm$  standard deviation was computed for quantitative variable. Categorical variables were described in terms of frequencies and percentages. The data were tested for the normality of distribution, and if found normal, the paired *t* test was applied for obtaining the mean differences. For the skewed data, the nonparametric Wilcoxon sign rank test was applied. Two analyses were done; first we compared the mean differences of all hemodialysis patients. In the 2nd analysis, the mean differences of variables were observed for the patients who fasted. A *P* value less than .05 was considered significant.

## RESULTS

A total number of 282 patients were included in our study. Out of these, 252 were those who did not fast and 34 were those who fasted during the month of Ramadan. The mean age of the nonfasting population was  $51.6 \pm 14.7$  years. There were 130 men (51.6%) and 122 women (48.4%) in this group. The mean of serum phosphorus levels were lower at the end of the study as compared to the baseline (4.29 mg/dL versus 4.46 mg/dL; *P* = .004). A same trend was observed for diastolic blood pressure (78.25 mm Hg versus 80.73 mm Hg; *P* = .002). On the contrary, the mean of serum albumin levels was high at the end of the Ramadan period (3.76 g/dL versus 3.57 g/dL; *P* < .001) as compared to before Ramadan. Serum potassium, systolic

**Table 1.** Clinical and Laboratory Parameters of Nonfasting Hemodialysis Patients

Parameter	Before Ramadan	During Ramadan	P
Serum phosphorus, mg/dL	4.5 ± 1.4 (1.7 to 9.4)	4.3 ± 1.4 (1.6 to 13.8)	.004
Serum albumin, g/dL	3.6 ± 0.4 (2.3 to 4.4)	3.8 ± 0.4 (2.2 to 4.9)	< .001
Serum potassium, mg/dL	4.3 ± 0.7 (2.6 to 6.2)	4.4 ± 0.8 (2.6 to 7.3)	> .99
Diastolic blood pressure, mm Hg	80.7 ± 12.2 (40 to 127)	78.3 ± 12.7 (38 to 112)	.002
Systolic blood pressure, mm Hg	142.8 ± 20.9 (90 to 205)	142.2 ± 22.4 (77 to 227)	.12
Body weight, kg	61.0 ± 13.6 (16.2 to 104.5)	61.1 ± 13.6 (1.06 to 105.8)	.37

**Table 2.** Clinical and Laboratory Parameters of Fasting Hemodialysis Patients

Parameter	Before Ramadan	During Ramadan	P
Serum phosphorus, mg/dL	4.3 ± 1.3 (1.7 to 7.9)	4.2 ± 1.3 (2.1 to 7.8)	.67
Serum albumin, g/dL	3.6 ± 0.4 (2.4 to 4.3)	3.8 ± 0.4 (2.7 to 4.8)	< .001
Serum potassium, mg/dL	4.2 ± 0.7 (3.0 to 6.2)	4.2 ± 0.7 (2.7 to 5.6)	> .89
Diastolic blood pressure, mm Hg	83.3 ± 13.2 (51 to 122)	79.4 ± 10.9 (54 to 104)	.08
Systolic blood pressure, mm Hg	143.5 ± 21.0 (115 to 200)	141.4 ± 22.5 (110 to 190)	.57
Body weight, kg	59.3 ± 13.4 (38.6 to 89.9)	59.4 ± 13.7 (39.1 to 90.9)	.81

blood pressure, and body weight did not change significantly (Table 1).

There were 34 patients who fasted on the off days of dialysis at least for more than 10 days. They were 22 men (64.7%) and 12 women (35.3%) and their mean age was 47.7 ± 14.6 years. In this group of patients, a decreasing trend was observed in the mean values of phosphorus levels (4.16 mg/dL versus 4.25 mg/dL), systolic blood pressure (141.44 mm Hg versus 143.4 mm Hg), and diastolic blood pressure (79.41 mm Hg versus 83.26 mm Hg); however, none of these changes were significant. On the other hand, the mean of serum albumin levels had a significant increase after the study period (3.8 g/dL versus 3.6 g/dL;  $P < .001$ ). Serum potassium levels did not change (4.20 mg/dL versus 4.19 mg/dL). Body weights of the patients were almost same between these two periods, too (Table 2).

## DISCUSSION

Effect of fasting on health, especially for those who have heart, kidney and liver impairment or underlying diabetes mellitus is of great concern for physicians and as well as for patients.<sup>8-10</sup> In another recently published retrospective study, we showed a relatively higher mortality in a cohort of dialysis patients during the month of Ramadan.<sup>11</sup> They speculated that the higher deaths in the month of Ramadan as compared to other Islamic months could be due to changes in the diet and life style. The changes of diet affect the electrolyte and fluid imbalance of dialysis patient and put them on risk of death.

We measured the effect of changes which occurred in Ramadan in all our hemodialysis patients. We analyzed separately all clinical and biochemical variables in both fasting and nonfasting dialysis patients. The most significant feature of Ramadan, which emerged out from our analysis was the increase in serum albumin of both our fasting and nonfasting patients. This improvement in nutritious status directed us to look into constituents of diet consumed during Ramadan. The other important characteristic which came into view was that although there was an increase in the serum potassium levels during Ramadan in our fasting patients, the change was of not any significant value. The third important conclusion was that body weight and blood pressure in fasting individuals which were expected to be higher were the same in both the periods.

In a cohort of 32 hemodialysis patients who fasted during the month of Ramadan, Al Wakeel assessed clinical and metabolic profile before and during Ramadan. He found that the blood pressure and weight of the patients remained stable between the two periods while he found significantly high serum phosphorus and serum albumin levels during Ramadan. Although serum potassium was also high during Ramadan, it did not reach significant levels.<sup>12</sup> Our data is in concordance with Al Wakeel's data. Comparing our fasting patients with their fasting patients, we also found a stable weight and blood pressure control during Ramadan, serum potassium levels of our patients were higher during Ramadan, but did not reached a significant

level. Serum phosphorus in our population was normal as compared with higher serum phosphorus level in his study. The higher phosphorus levels in Al Wakeel's study might be due to significantly reduced mean duration of dialysis sessions length during Ramadan. The author mentioned that the dialysis sessions were reduced to 3 to 3.5 hours to accommodate more patients in the dialysis facility in the night during the feast time, who were fasted during the day time.

Bernieh and colleagues studied 45 patients with chronic kidney disease stages 3 to 5.<sup>13</sup> They evaluated the clinical and biochemical safety of fasting Ramadan in this population. They found a slight reduction in weight and increased potassium and cholesterol level, but none of these changes met the significant level. In our population, we did not find any change in weight of the patients. The reduction of weight is difficult to observe in dialysis patients in a short period of 1 month. Dialysis patient are kept on "dry weight." Therefore, a small increase or decrease of weight does not manifest in the short of period of time. The other parameters were not different between the two studies.

El-Wakil and coworkers, in a prospective control study, included 15 patients with chronic kidney disease and 6 healthy controls.<sup>14</sup> They found a significantly high potassium in the chronic kidney disease patients as compared with controls. The other parameters were not different between the two groups. In comparison to their study, we also found to have a high potassium level in our fasting patients, but of no significant difference between the two periods.

## CONCLUSIONS

This study showed that month of Ramadan does not portend any momentous or calamitous effect to the patients who are on hemodialysis, whether they fast or not. Fasting does not change their blood pressure, weight, and biochemical parameters such as serum potassium and phosphorus, which would have deleterious effect on their health. We recommend that with stringent surveillance of weight and serum potassium hemodialysis can practice fasting during Ramadan.

## CONFLICT OF INTERESTS

None declared

## REFERENCES

1. Azizi F. Islamic Fasting and Health. *Ann Nutr Metab.* 2010;56:273-82.
2. Shalaei N, Larijani AM, Mohajeri SAR, et al. Changes in dietary intake during Ramadan in North East of Iran population. *J Fasting Health.* 2013;1:1-4.
3. Jager KJ, Lindholm B, Goldsmith D, et al. Cardiovascular and non-cardiovascular mortality in dialysis patients: where is the link? *Kidney Intl Suppl.* 2011;1:21-3.
4. Bleyer AJ, Russell GB, Satko SG. Sudden and cardiac death rates in hemodialysis patients. *Kidney Intl.* 1999;66:1553-9.
5. Bradbury BD, Fissell RB, Albert JM, et al. Predictors of Early Mortality among Incidents US Hemodialysis Patients in the Dialysis Outcomes and Practice Patterns Study (DOPPS). *Clin J Am Soc Nephrol.* 2007;2:89-9.
6. Gifford JD, Rutsky EA, Kirk KA, McDaniel HG. Control of serum potassium during fasting in patient with end stage renal disease. *Kidney Int.* 1989;35:90-4.
7. Bakholmah BA. The puzzle of self reported weight gain in a month of fasting (Ramadan) among a cohort of Saudi families in Jeddah, western Saudi Arabia. *Nutr J.* 2011;10:84.
8. Al-Khader AA, Al-Hasani M, Dhar JM, Al-Sulaiman M. Effect of diet during Ramadan on patients on chronic hemodialysis. *Saudi Med J.* 1991;22:30-1.
9. Barber SG, Fairweather S, Wright AD, FitzGerald MG, Malins JM. Muslims, Ramadan and diabetes mellitus. *Br Med J.* 1979;2:46-7.
10. Bragazzi NL. Ramadan fasting and chronic kidney disease: A systematic review. *J Res Med Sci.* 2014;19:665-76.
11. Imtiaz S, Nasir K, Dhrolia MF, Hussain M, Abbas HN, Ahmad A. Mortality Trend Among Hemodialysis Patients During the Islamic Month of Ramadan: A 24 Years Retrospective Study. *J Coll Physicians Surg Pak.* 2015;25:189-92.
12. Al Wakeel JS. Kidney Function and Metabolic Profile of Chronic Kidney Disease and Hemodialysis Patients during Ramadan Fasting. *Iran J Kidney Dis.* 2014;8:321-8.
13. Bernieh B, Al Hakim MR, Boobes Y, Abu Zaidan FM. Fasting Ramadan in Chronic Kidney Disease Patients: Clinical and Biochemical Effects. *Saudi J Kidney Dis Transpl.* 2010;21:898-902.
14. El-Wakil HS, Desoky I, Lotfy N, Adam AG. Fasting the month of Ramadan by Muslims: Could it be injurious to their kidneys? *Saudi J Kidney Dis Transpl.* 2007;18:349-54.

Correspondence to:

Salman Imtiaz, MD

The Kidney Center Post Graduate Training Institute, 197/9, Rafiqi Shaheed Rd, Karachi, Pakistan

Tel: +92 21 3566 1000-10 (ext 254 and 253)

Fax: +92 21 3566 1050

E-mail: salman\_imtiaz@hotmail.com

Received July 2015

Accepted September 2015