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

Salman Imtiaz, Beena Salman, Murtaza Fakhruddin Dhrolia, Kiran Nasir, Hasan Nasir Abbas, Aasim Ahmad

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.
phosphorus may cause dangerous consequences for them. 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. 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.

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. 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.

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 ± 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 ± 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 = .001). 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
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.8-10 In another recently published retrospective study, we showed a relatively higher mortality in a cohort of dialysis patients during the month of Ramadan.11 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.12 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before Ramadan</th>
<th>During Ramadan</th>
<th>( P )</th>
</tr>
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<tbody>
<tr>
<td>Serum phosphorus, mg/dL</td>
<td>4.5 ± 1.4 (1.7 to 9.4)</td>
<td>4.3 ± 1.4 (1.6 to 13.8)</td>
<td>.004</td>
</tr>
<tr>
<td>Serum albumin, g/dL</td>
<td>3.6 ± 0.4 (2.3 to 4.4)</td>
<td>3.8 ± 0.4 (2.2 to 4.9)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Serum potassium, mg/dL</td>
<td>4.3 ± 0.7 (2.6 to 6.2)</td>
<td>4.4 ± 0.8 (2.6 to 7.3)</td>
<td>&gt; .99</td>
</tr>
<tr>
<td>Diastolic blood pressure, mm Hg</td>
<td>80.7 ± 12.2 (40 to 127)</td>
<td>78.3 ± 12.7 (38 to 112)</td>
<td>.002</td>
</tr>
<tr>
<td>Systolic blood pressure, mm Hg</td>
<td>142.8 ± 20.9 (90 to 205)</td>
<td>142.2 ± 22.4 (77 to 227)</td>
<td>.12</td>
</tr>
<tr>
<td>Body weight, kg</td>
<td>61.0 ± 13.6 (16.2 to 104.5)</td>
<td>61.1 ± 13.6 (106.0 to 105.8)</td>
<td>.37</td>
</tr>
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</table>

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

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

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