

Mortality Trend Among Hemodialysis Patients During the Islamic Month of *Ramadan*: A 24 Years Retrospective Study

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ABSTRACT

Objective: The effect of month of *Ramadan* on the mortality in hemodialysis patients, and to compare it with that in all other Islamic months.

Study Design: A descriptive study.

Place and Duration of Study: Hemodialysis Unit, The Kidney Center, Karachi, from January 1989 to December 2012.

Methodology: All those patients who were diagnosed to have end stage kidney disease and on maintenance hemodialysis for more than 3 months, regardless of underlying cause of kidney failure were included. Patients with acute kidney injury were excluded. Status of the patients was recorded at the end of the study period. The fasting status of the patients was not mentioned. The deaths of the patients were further evaluated and frequencies of death in all twelve Islamic months were calculated.

Results: A total of 1,841 patients were registered, out of whom 897 (48.7%) died, and 269 (14.6%) survived till the end of the study. One thousand and fifty six (57.3%) were males, 651 (35.4%) were diabetic. Total number of 143 (7.76%) events occurred in *Ramadan*, out of which 94 patients died which make nearly 11% of the total deaths distributed in 12 Islamic months. Frequency of death was higher in *Ramadan* when compared with other months.

Conclusion: *Ramadan* reflected a higher frequency of death. Therefore, there is a need to evaluate the risk factors in a prospective study so that the dialysis patients can be better managed during this period.

Key Words: *Fasting. Chronic kidney disease. Hemodialysis. Kidney function.*

INTRODUCTION

The incidence of end stage kidney disease is increasing, and despite a marked improvement in dialysis techniques and availability of better medical care, survival of the patients has not improved. The factors which play important role in the high mortality include adequacy of hemodialysis, gender, race and differences in the hemodialysis practice in different regions. The comorbidities which affect mortality include diabetes mellitus, cardiovascular disease, atherosclerosis and nutrition status of the patients.¹ Dialysis patients are on restricted diet and fluid intake, due to fear of acute complications in the form of electrolyte abnormalities and volume overload. Most of the deaths in the dialysis patients are due to cardiovascular instability.² The two most important determinants which lead to this situation are hyperkalemia and pulmonary edema. High serum potassium precipitate arrhythmias and death, on the

other hand pulmonary edema is exacerbated due to the excessive fluid intake in stable or already marginal myocardium.³

Ramadan is the 9th month of *Hijri* Calendar, occurring at different times of the seasonal year over a 33-year cycle. This is the reason people fast in all four seasons in the same country over 30 years. All adult men and women have to fast in *Ramadan* and strictly refrain from eating, drinking, smoking and sexual relationship from sunrise to sunset with some exceptions, like those who are ill to a certain degree that fasting may increase the severity of disease.⁴

There is worldwide change in the dietary habits and type of food consumption over the last 20 years; this change is more marked in developing countries.⁵ The month of the *Ramadan* brings many changes in life style and food intake all over the Muslim world. These dietary changes influence not only those, who fast but also those who do not. There are concerns about the water deprivation, reduced cognition function, headache during fasting,⁶ but there is also reportedly an increase in the consumption of meat, fruits⁷ and excessive eating and drinking in *Ramadan* causing weight gain.^{8,9} The major constituents of the food in *Ramadan* are carbohydrates in the form of fruits and their juices and lipids in the form of fried food which contains excessive oil and salt. These changes were addressed in couple of studies before.^{10,11} There is a long-standing observation and

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concern among the nephrologists that the mortality of hemodialysis patients is high in the month of *Ramadan*, even within those patients who do not fast. But whether these changes in *Ramadan* have any impact on hemodialysis patient's mortality needs further work-up.

The aim of this study was to evaluate the impact of the month of *Ramadan* on overall mortality of patients on regular hemodialysis in the last 24 years and compare it in all 12 months of the *Hijri* Calendar.

METHODOLOGY

The mortality among the hemodialysis patients during the Islamic month of *Ramadan* in last 24 years was retrospectively studied from 1989 to 2012 and then compared the mortality in *Ramadan* with the other months of the Islamic calendar year.

The study included all patients diagnosed to have End Stage Kidney Disease (ESKD) secondary to any underlying etiology and was on regular maintenance hemodialysis for more than 3 months. All patients who were on hemodialysis due to acute renal failure were excluded. Data was collected retrospectively from patients' records for all the patients who were registered between 1989 to 2012 at The Kidney Center Postgraduate Training Institute, Karachi. The status of the patients for example, alive at the end of study, transplanted, transferred, conservative (those who become dialysis free for some time after registration in dialysis unit), LAMA (left against medical advice), lost to follow-up (inactive) and death was recorded at the end of study. These events were observed in all 12 months of Islamic calendar and frequency of death was calculated. Fasting status of the patients was not available due to retrospective nature of the data. Presumably, most of the patients do not fast due to severity of their illness and schedule of their dialysis time. However, the substantial changes in the dietary pattern which fall in *Ramadan* might influence them as well. All patients were dialyzed thrice weekly for 4 hours and almost all are dialyzed through Arterovenous (AV) fistula and very few patients have either Permacath or synthetic grafts. Bicarbonate dialysis was started from 1998. All patients with hepatitis B and C positive status are segregated from the negative population.

Data was collected in Microsoft Excel 2007 and analyzed by SPSS version 17.0. All categorical variables were described as frequency and percentage and all continuous variables were reported as mean with standard deviation.

RESULTS

A total of 1,841 patients were registered between this duration, among the total samples, 1056 (57.3%) were males and 785 (42.6%) were females, diabetic patients were 651 (35.4%) and non-diabetic were 1190 (64.6%,

Table I). Eight hundred and ninety seven patients (48.75%) died, remaining 944 (51.3%) were either transferred (n=190, 10.3%), transplanted (n=106, 5.8%), conservative (n = 21, 1.1%). LAMA (n=294, 16%) or were lost to follow-up (n=64, 3.5%). Two hundred and sixty-nine (14.6%) were on maintenance hemodialysis at the end of study period. When the patients were distributed according to the season occurred in this duration in Islamic calendar, majority of the cases were observed in winter season (n=691, 37.5%) followed by summer (n=403, 21.9%), fall (n=384, 20.9%) and spring (n=363, 19.7%).

Out of the 897 deaths in this duration, 94 patients died in *Ramadan*, which make nearly 11% of the total deaths distributed in 12 Islamic months. Patients that died during the *Ramadan* had mean age of 60 years, 44 were males and 39 were diabetic (Table II). Furthermore, when the pattern of death during *Hijri* and Gregorian calendar months was compared, it was observed that majority of the patients died in *Ramadan*, followed by *Moharram* and *Shaban* (Table III). On the other hand,

Table I: Demography of the patients enrolled in the study.

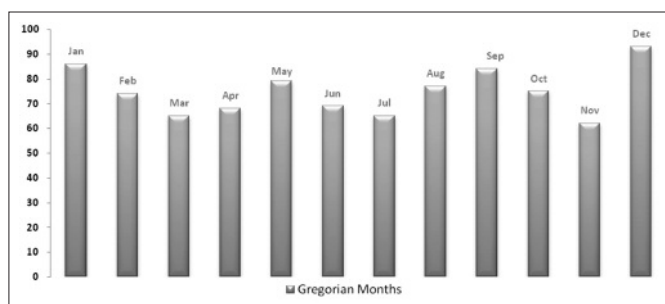
Status of patients	
Active	269 (14.6)
Conservative	21 (1.1)
Expired	897 (48.75)
In-active	64 (3.5)
L.A.M.A.	294 (16)
Transferred	190 (10.3)
Transplant	106 (5.8)
Gender of patients	
Female	785 (42.6)
Male	1056 (57.4)
Ramadan	
Other than Ramadan	1698 (92.2)
Ramadan	143 (7.8)
Diabetes	
Non-Diabetic	1190 (64.6)
Diabetic	651 (35.4)
Season	
Summer	403 (21.9)
Fall	384 (20.9)
Winter	691 (37.5)
Spring	363 (19.7)

Table II: Demography of patients who died in Ramadan.

Age in years		
Mean	60.001330	
Median	60.609722	
Mode	72.0000	
Gender		
Female	50	53.2%
Male	44	46.8%
Total	94	100%
Diabetic status		
No	55	58.5%
Yes	39	41.5%
Total	94	100%

Table III: Status of patients in *Hijri* months.

	Status of patients		Total
	Death (%)	Other than death (%)	
Moharram	85 (9.5)	94 (10.0)	179 (9.7)
Safar	71 (7.9)	84 (8.9)	155 (8.4)
Rabi-ul-Awal	65 (7.2)	86 (9.1)	151 (8.2)
Rabi-us-Sani	73 (8.1)	76 (8.1)	149 (8.1)
Jamad-ul-Awal	79 (8.8)	76 (8.1)	155 (8.4)
Jamad-us-Sani	62 (6.9)	74 (7.8)	136 (7.4)
Rajab	68 (7.6)	102 (10.8)	170 (9.2)
Shaban	82 (9.1)	65 (6.9)	147 (8.0)
Ramadan	94 (10.5)	71 (7.5)	165 (9.0)
Shawal	72 (8.0)	64 (6.8)	136 (7.4)
Zilqad	76 (8.5)	84 (8.9)	160 (8.7)
Zilhaj	70 (7.8)	68 (7.2)	138 (7.5)
Total	897 (100.0)	944 (100.0)	1841 (100.0)

**Figure 1:** Frequency distribution of death in Gregorian months.

highest number of deaths were recorded in the months of December and January (Figure 1). Most of the deaths occurred in cold climate and *Ramadan* most of the years fell in winter season, but this effect was not observed in two adjacent months i.e. *Shaban* and *Shawal*.

DISCUSSION

Islam is the second largest religion, and with the population of 1.6 billion, Muslims make-up 23% of world population, settled in all parts of the world. Although the exact prevalence of chronic kidney disease is not known in Pakistan, it is presumably high as it is observed in all parts of the world. This study resolves the increasing death trend during *Ramadan* in hemodialysis patients. In fact, it is difficult for dialysis patients to fast as they are already devitalized by exhausted dialysis regimen, and trade-off health status. Despite not fasting, conscientious changes of *Ramadan* have an impact on them. The study showed that more patients died in the month of *Ramadan* when compared with other months and this effect is due to the independent climate. There are many studies conducted on diabetic patients to see the effect of changing lifestyle during *Ramadan* but data on Chronic Kidney Disease (CKD) patients is sparse. Braggazi performed a systemic review of *Ramadan* fasting in a mix of CKD, kidney transplant and renal colic patients and found 25 studies, out of which only 5 studies were conducted on CKD patients.¹²

Weather and climate presumably plays a part particularly in hot climate due to excessive thirst and increased consumption of water. On the contrary, most of the deaths were observed in winter season in this study. This effect of climate in dialysis patients was observed in many other studies. Argiles and Lorho¹³ prospectively observed the seasonal variations on blood pressure and interdialytic weight in 99 dialysis patients. They concluded that it increased from the autumn months towards winter, and decreased towards the spring and warmer months. They were not able to find the exact underlying mechanism, but they hypothesized that the effect of seasonal variations on vascular tone and water perspiration might play a role. Usvyat *et al.* observed in a cohort of 15000 hemodialysis patients a remarkable seasonal variations in clinical and laboratory parameters.¹⁴ They found that both overall and cardiovascular mortality were significantly higher in winter compared with other seasons and these variations were consistent in different climatic regions.

The same trend was observed in our population in winter season which buttressed this observation that higher number of patients died in January and December during the span of 24 years (Figure 1). The Islamic calendar moves 11 days forward in each Gregorian year and it takes 33 years to complete the cycle. This is the reason *Ramadan* fasting does not always fall on the same month, but it changes from season to season every year. In this analysis of 24 years, *Ramadan* fell in winter, therefore, most frequently; there are chances that more events happened in those Islamic months which fell in winter season. On the contrary higher deaths were observed in *Ramadan* but not in the month of *Shaban* and *Shawal* which are preceding and following *Ramadan* and fell in the same winter season (Table III). This observation revealed two important denouement. Firstly, *Ramadan* had an independent effect on mortality; secondly, the assumption that warm climate increases the thirst which causes increased events of pulmonary edema and deaths is not well grounded.

Another factor which could be the reason for increased mortality is the dietary changes during *Ramadan*, because there are significant changes in dietary pattern and life style during *Ramadan* that are totally different and unique to other months. Most of the diet in *Ramadan* comprises of fried stuff, snacks and fruits which have high content of sodium and potassium and both of them have significant role in mortality. Wakeel in a prospective study of CKD and dialysis patients showed the effect of fasting;³ there was a significant increase in erythrocyte count, serum creatinine, blood urea, serum phosphorus, serum albumin, and serum uric acid levels during the fasting period. He found hyperkalemia in 25.0% and 15.6% of the hemodialysis patients during and after the fasting period and hyponatremia in 15.6% and 28.0%, respectively. Forty six percent of the patients

developed hypertension and 36.7% fluid overload. They did not find any adverse event leading to increased hospitalization, this might be due to the prospective nature of the study, which causes greater surveillance and stringent follow-up and precludes any adverse event, which is customarily associated with hyperkalemia and volume overload. NasrAllah and Osman compared 131 fasting CKD patients with non-fasting CKD group in a prospective study.¹⁵ They observed deterioration in kidney function and cardiovascular events in two groups. They found more cardiovascular events along with deterioration in kidney function in fasting group, the cause of which was obscure. They hypothesized the possibility of dehydration and hyperviscosity for these higher events in fasting patients, unfortunately serum potassium and volume status of the patients was not recorded, so a definite conclusion could not be made. Both the studies done by Wakeel³ and NasrAllah,¹⁵ highlight a very important fact that hypertension and hyperkalemia is more prevalent in CKD patients who fast and they suffer more cardiovascular events. The authors hypothesized the same possibility of higher cardiovascular events due to change in dietary pattern.

There is an impact of the dietary changes manifested on patients clinical and biochemical parameters.^{9,10} In a post-hoc analysis of HEMO study, Mc Causland and Waiker¹⁶ reinforced this finding that higher reported dietary sodium was associated with greater ultrafiltration requirement, sodium: calorie ratio and sodium: potassium ratio were independently associated with greater all-cause mortality.

Since the study is based on retrospective data it has limitations for making a strong conclusion, but it emphasizes the need of prospectively evaluating this interesting observation. There is a need to counsel this hemodialysis patients from now, regarding the restriction of diet, and a more stringent dry weight and serum electrolyte monitoring during the whole month till there is a strong evidence for the discussed factor.

CONCLUSION

High mortality was observed in *Ramadan* as compared to other *Hijri* month, the reasons of which are still unclear and obscure. It may be due to the dietary and life style changes, in fasting and non-fasting individuals.

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