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Original Article

Effects of Fasting on Progression of Chronic Kidney Disease

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Abstract

Objective: This study aimed at examining the effects of fasting on rate of decline in renal function amongst patients with chronic kidney disease.

Methods: This observational study included patients with chronic kidney disease, having eGFR <60 ml/min/1.73m^2, who had remained under regular outdoor follow up from Jan to Jun 2023. Patients with hospitalization for more than 3 days during this period, on maintenance hemodialysis, or unwilling patients were excluded. Serum creatinine levels in January and June 2023 were noted down. Patients were also asked if they had fasted during Ramdan, and for how many days. Those who fasted for at least 3 consecutive days or 7 days in total were included in the fasting group. All others were included in non-fasting group.

Results: There were 83 patients, predominantly males (71; 85.54%). Median serum creatinine levels were 200 (135- 302) and 220 (153- 429) umol/L at the start and end of study period, corresponding to eGFR of 24.23 (15.55, 38.13) and 19.98 (10.76, 33.72) ml/min/1.73m^2 respectively, with a median decline of 2.18 (-1.03, 7.75) ml/min/1.73m^2. Mean duration of fasting amongst the 25 (30.12%) patients who fasted was 25.88± 6.05 days. The median decline in eGFR amongst patients who fasted and those who did not was and 5.08 (-0.59, 9.34) and 2.10 (-1.24, 7.50). This difference was insignificant (p=0.648).

Conclusion: Fasting did not affect the rate of decline in renal function amongst our patients.

Keywords: Chronic kidney failure, Chronic kidney insufficiency, Fasting, Hemodialysis

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Introduction

Chronic Kidney Disease (CKD) stands as a prevalent and debilitating health condition affecting millions globally.[1] Its pervasive nature presents a substantial public health concern, marked by an escalating incidence that places a significant burden on healthcare systems and the overall well-being of those afflicted. The journey of patients grappling with CKD is characterized by the gradual decline of kidney function, culminating in the compromised filtration and elimination of waste products, notably creatinine. This compound, originating from muscle tissue metabolism, serves as a pivotal indicator of renal function.[2] The meticulous monitoring of creatinine levels holds paramount importance in comprehending the trajectory of CKD progression, shaping treatment strategies, and forecasting patient prognoses.

In recent times, the scrutiny surrounding the influence of dietary patterns, particularly fasting, on creatinine levels in individuals grappling with CKD, has emerged as a focal point for both researchers and healthcare practitioners. The interplay between dietary practices and the intricate mechanisms governing kidney function has sparked profound interest and inquiry. Understanding how dietary modifications, specifically fasting, impact creatinine levels within the context of CKD has become a subject of intense investigation, underpinning a quest to enhance management strategies and refine patient care.[3]

Amidst the multifaceted landscape of CKD management, the role of dietary interventions in modulating creatinine levels has engendered a wave of research endeavors. Fasting, as a dietary regimen, encompasses diverse forms, ranging from intermittent fasting schedules to prolonged fasting durations, each potentially exerting varying effects on the body's metabolic processes and renal functions. The intricate dance between fasting and creatinine levels within the intricate framework of CKD remains an area of profound interest, poised at the crossroads of medical science and dietary practice.[4]

Emerging studies delve into the nuanced relationship between fasting and creatinine dynamics in CKD. These investigations aim to decipher the mechanisms through which fasting influences creatinine production, elimination, and overall renal function. They strive to discern whether fasting acts as a catalyst in altering creatinine levels, potentially affecting the trajectory of CKD progression. Moreover, researchers endeavor to unveil the temporal aspects of fasting, seeking to delineate optimal fasting durations and patterns that might offer therapeutic benefits without exacerbating renal impairment.[5]

A myriad of hypotheses burgeons from these inquiries, proposing various mechanisms by which fasting might intersect with creatinine regulation in CKD. Some postulate that fasting-induced alterations in metabolic pathways could transiently impact creatinine synthesis, thereby causing fluctuations in its serum levels. Others explore the potential role of fasting-induced autophagy, a cellular process that clears damaged components, in mitigating renal damage and influencing creatinine kinetics. These conjectures pave the way for meticulous experimentation, employing clinical trials and mechanistic studies to elucidate the intricate interplay between fasting and creatinine dynamics in CKD.[6]

The clinical implications stemming from the nexus of fasting and creatinine levels in CKD patients hold profound significance. A deeper comprehension of how dietary practices, including fasting, influence creatinine dynamics can potentially revolutionize the management paradigms for individuals navigating the complexities of CKD. It may pave the way for tailored dietary recommendations, personalized fasting regimens, and nuanced therapeutic approaches aimed at optimizing renal function, curbing disease progression, and augmenting patient outcomes.

Nonetheless, amidst the burgeoning interest and potential implications, a note of caution resonates within the scientific discourse. The exploration of fasting in the context of CKD necessitates meticulous consideration of individual patient characteristics, disease stages, and concurrent treatment modalities. The intricate balance between the potential benefits and risks associated with fasting interventions in CKD mandates a prudent approach, emphasizing the need for rigorous clinical scrutiny, tailored guidance, and vigilant monitoring.[7]

In essence, the landscape of CKD management stands amidst a transformative phase, where the intricate relationship between dietary practices, such as fasting, and creatinine dynamics unfolds as a compelling avenue of exploration. The convergence of medical science, dietary intervention, and patient-centered care beckons a comprehensive understanding of how fasting influences creatinine levels in the realm of CKD, holding promise for refined therapeutic strategies and enhanced patient well-being. As research endeavors persist and knowledge evolves, the quest to unravel the mysteries entwining fasting and creatinine in CKD continues, illuminating pathways toward optimized care and improved outcomes for those grappling with this challenging medical condition.

Fasting, defined as the voluntary abstinence from food and drink for a specified duration, has been practiced for centuries for various reasons, including religious, cultural, and therapeutic purposes. It can take several forms, ranging from intermittent fasting, where individuals alternate between periods of eating and fasting, to extended fasts lasting several days or even weeks. In recent years, fasting has gained popularity as a potential intervention to improve health and well-being, with claims of benefits such as weight loss, improved metabolic health, and potential effects on kidney function.[8,9] Given that CKD patients are at a heightened risk of metabolic and nutritional disturbances, exploring the effects of fasting on creatinine levels in this population is of great interest.[10]

This research article aims to provide a comprehensive overview of the effects of fasting on creatinine levels in patients with Chronic Kidney Disease. We will examine the underlying mechanisms, potential benefits, and risks of fasting in this patient group, while also considering the implications for clinical practice. As CKD continues to be a significant global health concern, understanding the influence of fasting on creatinine levels and kidney function is crucial for optimizing the care and outcomes of these patients.

Methods

This cross-sectional study was carried out at Department of Nephrology, Pak Emirates Military Hospital Rawalpindi between January and July 2023. The Ethics Review Committee of the hospital approved the research protocol beforehand vide letter number A/28/2023. We calculated a sample size requirement for 83 patients. We selected patients with chronic kidney disease stage 3– and above (glomerular filtration rate [GFR] <60 ml/min), as estimated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula who fasted during Ramadan. These patients were on regular follow up in outdoor nephrology clinic before and after the month of Ramadan. In Pakistan, Ramadan came in the month of March-April with a fasting time of 15 hours. All patients were enrolled with their consent. Exclusion criteria included patients on dialysis, patients with transplant kidneys, poor glycemic control (HbA1c>9%), uncontrolled blood pressure (systolic BP >160mmHg and diastolic BP>100mmHg and unwillingness.

We collected data of study participants including their gender, age, number of days fasted, cause of chronic kidney disease and creatinine levels in the months of January/February (before Ramadan) and May, June and July(after Ramadan).

Data was analyzed in Statistical Package for Social Sciences(SPSS) version 20. The Kolmogorov-Smirnov test was used to determine the normal distribution. The categorical variables were compared based on the groups using the chi-square test. Two paired-sample t-test was employed for normally distributed data and the Wilcoxon test for non-normally distributed data to examine changes over time. Proportions of patients who fasted during the month of Ramadan and those who did not fast, were compared using Fisher's Exact test.

Results

This study involved 83 patients with a mean age of 57.45± 15.12 years. These were predominantly males (71; 85.54%). Median serum creatinine were 200.00 (135- 302) umol/L and 220 (153- 429) umol/L at the start and end of study period. Median eGFR was 24.23 (15.55, 38.13) ml/min and 19.98 (10.76, 33.72) ml/min at the start and end of study period respectively, with a median decline of 2.18 (-1.03, 7.75) ml/min. Mean duration of fasting amongst the 25 (30.12%) patients who fasted was 25.88± 6.05 days. The median decline in eGFR amongst patients who fasted and those who did not was and 5.08 (-0.59, 9.34) and 2.10 (-1.24, 7.50). There was no difference between the two groups (p=0.648).

Table 1: *Fall iin Creatinine Levels and eGFR over time*

Parameter	Start of Study mean (IQ)	End of Study mean (IQ)
Median serum creatinine (umol/L)	200.00 (135-302)	220 (153- 429)
Median eGFR	24.23 (15.55, 38.13) ml/min	19.98 (10.76, 33.72) ml/min

Table 2: *Median decline in eGFR*

Patient Category	Median decline in eGFR
Fasting Patients	5.08 (-0.59, 9.34)
Non-fasting patients	2.10 (-1.24, 7.50).

Discussion

Shahzaib et. al, conducted a literature review of fasting in patients with CKD and suggested that all patients with CKD should be deemed high risk or very high risk for fasting. They concluded that patients with stable mild/moderate CKD (stage 1–3) may be able to fast provided they are carefully monitored and counselled. They also suggested that patients with stable renal transplants may also be able to fast, provided they are monitored carefully by their transplant team. They further suggested that patients on haemodialysis or peritoneal dialysis should not be encouraged to fast, but if they do so, they will need careful weekly monitoring.[11] Similar findings were suggested by our study in which there was no significant difference in renal functions among fasting and non fasting patients. Aisha et al in a study done in London on CKD patients with diabetes, did not find any significant difference among fasting and non-fasting patients in terms of their pre- and post-Ramadan weight, blood pressure, creatinine levels, glycated haemoglobin, cholesterol, and urine protein creatinine ratios.[12] These findings are in coherence in findings of our study.

Mohamed et al, observed significant rise in creatinine levels in 60% of fasting patients as compared to non-fasting patients within first six days of Ramadan in patients taking aldosterone receptor antagonists.[13] These findings are not in coherence with findings of our study in which no significant rise of creatinine levels was observed among fasting patients with CKD. Al Wakeel et al studied effects of fasting on chronic kidney disease patients with and without hemodialysis.[14] They found increased rate of biochemical changes in patients on hemodialysis as compared to patients not yet on hemodialysis. Bernieh et al demonstrated better tolerance and safety of fasting in CKD patients, with a better lipid profile, serum sodium and reduction of proteinuria, incongruous to the findings of our study.[15] Ahmet et al

in their study concluded that fasting was associated substantial decrease in creatinine levels. They also advised fasting in CKD3-4 patients.[16] These findings in contradiction to findings in our study where no significant difference was found among creatinine levels in fasting and non-fasting patients.

Bakhit et al in a study done in Riyadh, Saudia Arabia concluded that fasting was associated with an increase of 0.3 mg/dL (26.5 µmol/l) in CKD patients over a period of months after fasting. They attributed higher systolic blood pressure and younger age to be independent variables of worsening renal function in CKD patients.[17] These findings were not in accordance with findings of our study in which no worsening of renal function was found among fasting and non-fasting patients with CKD.

Malik et al in their literature review on effects of fasting in CKD patients gave some recommendations. The International Federation for Diabetes and the Diabetes and Ramadan International Alliance have defined risk levels, namely extremely high risk, high risk, and low-moderate risk, upon which recommendations have been built. Individuals who fall into the low- to moderate-risk category may be able to safely fast with their clinician's assistance, but patients in the very high risk and high risk categories should be encouraged to consider other choices. Before Ramadan begins, all patients must be informed about the most recent sick-day policies and guidelines, including when to break their fast or not.[18]

Ansari et al concluded that stable CKD patients can safely fast, showing that 16% of their patients developed worsened renal function. These findings are not in agreement with findings of our study in which no significant worsening of renal functions was observed in fasting patients with CKD.[19] Elmukhtar et al in their review proposed that CKD patients in hot regions with long fasting hours might expose themselves to danger secondary to dehydration.[20] Tarabeih et al found favorable outcomes of hydration overnight in fasting patients with CKD as compared to patients who did not hydrate overnight.[21]

Dogan et al in their study, found no statistically significant difference in creatinine levels compared to pre-Ramadan levels the first week following Ramadan among fasting and non-fasting patient. The parameters indicating declining renal function—a 25% decrease in GFR and a 30% rise in serum creatinine levels—were used to compare the groups. Based on these two criteria, there were no statistically significant differences between the two groups. Diabetes mellitus and proteinuria were determined to be independent risk factors for renal impairment.[22] These findings are in coherence with findings of our study in which no statistical difference in creatinine levels was found between fasting and non-fasting groups.

In a sytematic review done by Bragazzi et al, no recommendations were found in the literature on this subject to help doctors counsel patients about the potential effects of Ramadan fasting on kidney function.[23]

Conclusion

The potential risks and considerations underline the importance of medical supervision and tailored fasting strategies for CKD patients, ensuring that the benefits outweigh the risks and that any adverse effects are minimized.

Limitations: As it was a single center study with less number of patients. So, larger multi center studies are recommended for generalization of data.

Ethical Approval: The IRB/EC approved this study via letter no A/28/2023 dated January 15, 2023.

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Authors' Contribution

AS, ARA: Conception

ARA: Design of the work

UZ, MA: Data acquisition, analysis, or interpretation

ARA, UZ, MA: Draft the work

AS, ARA: Review critically for important intellectual content

All authors approve the version to be published

All authors agree to be accountable for all aspects of the work

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