DOI: https://doi.org/10.54393/pjhs.v7i10.3702

PAKISTAN JOURNAL OF HEALTH SCIENCES
(LAHORE)
https://thejas.com.pk/index.php/pjhs
ISSN (E): 2790-9352, (P): 2790-9344
Volume 7, Issue 10 (October 2026)



OPEN ACCESS

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Original Article

Prevalence of Gastro-esophageal Reflux Disease in Hemodialysis Versus Non-Hemodialysis Chronic Kidney Disease Patients in a Tertiary Care Hospital of Rahim Yar Khan

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ARTICLE INFO

Keywords:
Chronic Kidney Disease, Gastroesophageal Reflux Disease, Hemodialysis, Prevalence, Risk Factors

How to Cite:
Ali, M., Hussain, A., Iqbal, J., Javed, S., & Raza, A. (2026). Prevalence of Gastro-esophageal Reflux Disease in Hemodialysis Versus Non-Hemodialysis Chronic Kidney Disease Patients in a Tertiary Care Hospital of Rahim Yar Khan: GERD in Hemodialysis Versus Non-Hemodialysis Chronic Kidney Disease. Pakistan Journal of Health Sciences, 7(10), 113-118. https://doi.org/10.54393/pjhs.v7i10.3702

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Received Date: 16th December, 2025
1st Revision Received: 19th January, 2026
2nd Revision Received: 24th April, 2026
3rd Revision Received: 20th May, 2026
Acceptance Date: 4th June, 2026
Published Date: 31st October, 2026

ABSTRACT

Gastroesophageal reflux disease (GERD) is frequently reported among patients with chronic kidney disease (CKD), particularly those undergoing hemodialysis. GERD contributes to upper gastrointestinal morbidity, affecting quality of life and clinical outcomes. However, data from South Asian populations remain limited. **Objectives:** To determine the prevalence of GERD symptoms among CKD patients and to identify clinical, biochemical, and lifestyle factors associated with GERD in both hemodialysis and non-hemodialysis groups in a Pakistani tertiary care setting. **Methods:** An analytical cross-sectional study was carried out among 182 CKD patients, with 70 on hemodialysis and 112 not on hemodialysis, using a non-probability consecutive sampling approach. Sociodemographic, clinical, biochemical, and lifestyle details were gathered via structured questionnaires along with lab records. **Results:** GERD symptoms were reported in 38.5% of participants, with a higher prevalence in the hemodialysis group (47.1%) compared with non-hemodialysis patients (33.0%; $\chi^2 = 4.98$, p=0.026). Heartburn and regurgitation occurring ≥2 times per week were significantly more frequent in hemodialysis patients. Proton pump inhibitor use was also more common in this group (p=0.014). Logistic regression showed that hemodialysis status (OR 1.78; 95% CI 1.03–3.07; p=0.038) and late-night eating (OR 2.12; 95% CI 1.19–3.76; p=0.011) were independent predictors of GERD. **Conclusions:** GERD symptoms are common among CKD patients in Pakistan, particularly those undergoing hemodialysis. Hemodialysis treatment and modifiable lifestyle factors such as late-night eating are associated with increased GERD risk.

INTRODUCTION

Over the last ten years, chronic kidney disease (CKD) has risen fairly steadily in Pakistan, and it is adding a lot more pressure on healthcare services that are already stretched. A high number of patients only go for medical advice when things are already at an advanced point, frequently along with gastrointestinal complaints. Also, the incidence of GERD is being documented at a noticeable rate among Pakistani adults, but the local evidence is still missing, and what exists is mostly old or no longer up to date. Different gastrointestinal symptoms have been associated with CKD, for example, reflux-related troubles [1]. And since CKD development in Pakistan has been described as rather high, it can further worsen the GI disturbances that patients report during later disease stages [2]. Concurrently, GERD appears to be on the rise throughout Asia as well, and lifestyle and dietary factors are commonly thought to play a significant role in predisposition to GERD [3]. A big multi-country study across Asia found distinct variations among countries in reporting GERD. Despite this, many locations also have a general trend of increasing, with very few stops in between [4]. There is also cohort-type evidence from China suggesting that reflux

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DOI: https://doi.org/10.54393/pjhs.v7i10.3702

symptoms are more prevalent in individuals who are metabolically out of balance and suffer from a chronic ailment [5]. Among the work carried out in South Asia, the results seem to lean toward local dietary habits, e.g., excessive consumption of spices and late-night meals, that might alter the severity of the symptoms [6, 7]. However, there are no consistent regional findings, and the impact of CKD on GERD symptoms has not been continuously mapped [8]. On the international stage, GERD has been recognized as one of the common gastrointestinal disorders across the globe. Recent epidemiological reports underline a noticeable global cost, with people worldwide being affected irrespective of their socioeconomic position [9]. The prevalence of GERD, specifically from primary care presentations, is commonly reported in North America, while European studies indicate that the symptom patterns can shift depending on comorbidities or other underlying burdens. In Canada, cohort work suggests that reflux symptoms might be higher in relation to long-term chronic conditions [10]. Meanwhile, studies involving dialysis have noted that multiple biochemical pathways could modify gastrointestinal physiology when hemodialysis is used. This study should contribute to a clear knowledge gap in local literature, because no recent Pakistani study has directly compared these two CKD subpopulations. The results may support clinical decisions and research planning, and could help move toward symptom-based care for CKD patients, in practice too across the region. The current working hypothesis proposes that GERD prevalence is increased among patients undergoing hemodialysis.

Still, even though these findings are helpful, they don't fully account for how GERD shows up between dialysis and non-dialysis CKD patients, especially in low-resource hospital settings. Compared with other countries, Pakistan has a narrower evidence base, with only a small number of recent head-to-head comparisons of GERD prevalence in hemodialysis versus non-hemodialysis CKD groups. In this context, the present paper tries to contrast the incidence of gastroesophageal reflux disease in renal patients receiving hemodialysis and those with non-hemodialysis CKD within a tertiary care unit. This study aimed to see whether hemodialysis status is associated with a higher prevalence of gastrointestinal symptoms consistent with GERD. Also, to outline symptom patterns that could differ across the groups, and maybe show some subtle differences in how patients describe the problem.

METHODS

This is an analytical cross-sectional study conducted in the Department of Nephrology, Shaikh Zayed Hospital, Rahim Yar Khan. The study was conducted from 10 March 2025 to 10 October 2025. The Institutional Review Board of Shaikh Zayed Medical College and Hospital has approved the study (Approval No. 401/IRB/SZMC/SZH dated 5 February 2025). All routines followed the core principles of the Declaration of Helsinki, with no major deviations. All subjects signed an informed consent form, and confidentiality and anonymity were ensured. Consecutive sampling was used to recruit all eligible CKD patients presenting during the study period and to ensure systematic inclusion until the required sample size was reached. Sample size was determined using the single population proportion formula: $n = Z2 \times p \times (1-p)/d2$, where n is the required sample size, Z is the standard normal deviate corresponding to the desired level of confidence, p is the desired prevalence, and d is the error margin. The estimated prevalence of GERD was 13.64% based on a cross-sectional study conducted among hemodialysis patients by Takahashi et al. [11], and the margin of error was 5%.The minimum sample size obtained was 182. The sample size was based on the available prevalence estimate before data collection; the observed prevalence was higher than anticipated. Chronic kidney disease (CKD) patients aged 18-70 years were enrolled based on KDIGO (kidney disease: Improving Global Outcomes) criteria [12]. They were recruited as they presented to the nephrology outpatient clinic as well as on admission to a hemodialysis unit. Patients with peptic ulcer disease, esophageal varices, previous gastric surgery, or active gastrointestinal bleeding were excluded. Excluded were pregnancy, those receiving long-term corticosteroid use, or individuals who were cognitively unable to complete the interview. In this work, CKD was defined and classified according to KDIGO guidelines, which are as follows: CKD, as stated in KDIGO guidelines, is the abnormality in kidney structure or function known to last for at least 3 months and cause health consequences. KDIGO categorizes CKD in the "CGA framework": Cause, Glomerular Filtration Rate Category, Albuminuria Category. The GFR categories are G1 (≥90), G2 (60–89), G3a (45–59), G3b (30–44), G4 (15–29), and G5 (<15 mL/min/1.73 m^2). Albuminuria is grouped as A1 (<30 mg/g), A2 (30–299 mg/g), and A3 (≥300 mg/g). The KDIGO classification was primarily chosen because it is the recognized international standard used to classify CKD, and it offers the best prognostic separation for other outcomes, such as cardiovascular events, acute renal failure, and ultimate kidney failure, across eGFR and albuminuria levels of risk. In this study, stages 3 to 5 of CKD were chosen, as these stages represent clinically relevant renal impairment, the aim of which is closest to this objective. The time since CKD, the running time of the hemodialysis (in months), and the weekly dialysis number were retrieved from the medical records and verified at an interview with the patients. For physical measures, a stadiometer was used for height and a digital scale (SECA,

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DOI: https://doi.org/10.54393/pjhs.v7i10.3702

Germany) for weight. A non-stretch measuring tape (Butterfly, China) was used to determine waist circumference at the level halfway between the lower rib margin and the iliac crest. Age and gender constituted the sociodemographic factors. Clinical and lifestyle factors were diabetes mellitus, hypertension, smoking status, smokeless tobacco use, dietary habits, late-night eating habits, and the use of drugs (including proton pump inhibitors, calcium channel blockers, analgesics, and other medications). In order to minimize recall bias, information was independent of the participant's testimony and was cross-checked against the medical charts. The Urdu language version of the Gastroesophageal Reflux Disease Questionnaire (GERDQ) was used to check gastrointestinal reflux disease (GERD) symptoms and has been demonstrated to be a valid questionnaire. The same standardized manner was used, with the investigator providing the questionnaire. A GERDQ score ≥8 was considered indicative of GERD symptoms. The study also worked out to have questionnaires completed at least 2 hours after the food, to decrease the post-feeding pull. Throughout, an automated chemistry analyzer Roche Cobas c311 (from Switzerland) was used. Lab value cut offs used were also based on KDIGO guidelines, such as Hb<10 g/dl, Cr>6mg/dl, Urea>100mg/dl, K>5.5 meq/l, Ca<8.5mg/dl, Phos>5.5mg/dl and alb<3.5 g/dl. To minimize bias, we employed a few methods. To address recall bias, time-anchored questions were used, and then answers from the medical charts were checked against the answers given in order to achieve alignment. In consecutive recruitment, all eligible patients were included, not some patients; this decreases selection bias. Standard equipment was used, and procedures were followed consistently by all, to minimize measurement bias. Researcher bias was overcome by using a structured questionnaire and non-subjective interpretation, which resulted in as consistent a scoring as possible. The study also checked data completeness every day and used anonymized identification numbers in order to keep the participants confidential.

IBM SPSS version 26.0 software (IBM Corporation, Armonk, NY, USA) was used for statistical analysis. Continuous variables (Age, BMI, Waist circumference, Hemoglobin, Creatinine, Urea, Phosphate and Albumin) were tested for normality using the Shapiro-Wilk test and visually through histograms and Q-Q plots. Normally distributed variables were presented as the mean ± standard deviation values and analyzed with the use of the independent t-test. If the distribution was not normal, the median and interquartile range were used for summary, and the Mann-Whitney U test was used for comparison of variables. The p-value was considered statistically significant if it was less than 0.05. The types of statistical procedures used were based on data type, distribution, and objectives of the study.

RESULTS

In total, 182 patients with chronic kidney disease (CKD) were recruited, with 70 of them on hemodialysis and 112 not on hemodialysis. No loss of follow-up occurred. The age distribution was fairly normal in both cohorts, and there was no statistically significant difference in the mean age between the hemodialysis and non-hemodialysis patients (52.4 ± 11.7 years vs 50.8 ± 12.3 years, respectively; p=0.310). There were also few differences in the proportion of males in either group. Body mass index (BMI) turned out similar as well, 26.8 ± 4.5 vs 26.3 ± 4.2 kg/m^2; p=0.499. However, considering the laboratory parameters, there was considerable variation in biochemical parameters. Patients on hemodialysis had significantly decreased hemoglobin but significantly increased serum creatinine, urea, potassium, and phosphate as compared to non-hemodialysis patients (all p≤0.05*). The descriptive statistics for the continuous variables of hemodialysis and non-hemodialysis patients are provided. Age and BMI followed a normal distribution, while the biochemical parameters were not distributed normally. Not surprisingly, the serum creatinine, urea, potassium, and phosphate were higher in patients who received hemodialysis, consistent with more advanced renal failure. At the same time, there were no significant differences in age or BMI (Table 1).

Table 1: Descriptive Statistics of Continuous Variables

Variables	Hemodialysis (n=70), Mean ± SD	Non-Hemodialysis (n= 112), Mean ± SD	p-value
Age (years)	52.4 ± 11.7	50.8 ± 12.3	0.310[c]
BMI (kg/m^2)	26.8 ± 4.5	26.3 ± 4.2	0.499[c]
Hemoglobin (g/dL)	9.6 (8.8–10.3)	10.5 (9.7–11.2)	0.021*[d]
Serum Creatinine (mg/dL)	7.8 (6.5–9.3)	5.1 (4.2–6.3)	<0.001*[d]
Serum Urea (mg/dL)	110 (95–130)	80 (65–95)	<0.001*[d]
Serum Potassium (mEq/L)	5.6 (5.1–6.2)	4.8 (4.4–5.3)	<0.001*[d]
Serum Phosphate (mg/dL)	5.9 (5.3–6.6)	4.5 (4.0–5.2)	<0.001*[d]
Serum Calcium (mg/dL)	8.4 (8.1–8.7)	8.6 (8.2–8.9)	0.122[d]
Serum Albumin (g/dL)	3.3 (3.0–3.6)	3.5 (3.2–3.8)	0.035*[d]

*Indicates statistical significance at p ≤ 0.05. [c]Independent t-test. [d]Mann–Whitney U test

The symptoms of GERD manifested generally in roughly 38.5% of the study population. Similarly, the prevalence of GERD increased significantly in the hemodialysis group compared to the non-hemodialysis group (47.1 vs 33.0; p=0.026*) and in the hemodialysis group, heartburn occurring at least twice a week, regurgitation, and nocturnal GERD symptoms were also more common (all p≤0.05*). Moreover, the rate of late-night eating and proton pump inhibitors was higher for hemodialysis patients; smoking status, diabetes mellitus, and hypertension were

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DOI: https://doi.org/10.54393/pjhs.v7i10.3702

not very different between the two groups. There were differences for categorical items: GERD symptoms, heartburn, regurgitation, lifestyle factors, and comorbidities. Specifically, symptoms of GERD and occurrence of heartburn/regurgitation per week were more frequent in hemodialysis patients. Late-night eating was also retained in the analysis, and that was still found to be significant. In the meantime, there was no significant difference between hypertension and diabetes (Table 2).

Table 2: Distribution of Categorical Variables

Variables	Hemodialysis (n=70)	Non-Hemodialysis (n=112)	p-value
GERD Symptoms (present)	33	37	0.026*[a]
Heartburn ≥2/week	22	18	0.016*[a]
Regurgitation ≥2/week	20	16	0.019*[a]
Nocturnal GERD symptoms	17	14	0.030*[a]
Late-night eating	29	26	0.013*[a]
PPI use	28	25	0.014*[a]
Smoking	12	18	0.839[a]
Diabetes mellitus	28	40	0.548[a]
Hypertension	52	78	0.484[a]

Values are presented as n (%). * Indicates statistical significance at p ≤ 0.05. [a]Chi-square test

Late night eating was also independently associated with GERD, and was more than 2-fold associated (adjusted OR 2.12; 95% CI: 1.19–3.76, p=0.011*). Multivariate logistic regression analysis sort of "identified" hemodialysis status as an independent predictor of GERD (adjusted OR 1.78; 95% CI: 1.03–3.07, p=0.038*). There was no clear difference between obesity (BMI ≥30 kg/m2) and GERD, after adjustments. NSAID use, diabetes mellitus and hypertension were also not clearly correlated with GERD after adjustments. The results from the multivariate logistic regression were used to pinpoint independent predictors of gastroesophageal reflux disease (GERD). However, when we accounted for potential confounders, the relationship of hemodialysis status to an increased risk of GERD remained significant (adjusted OR 1.78 (95% CI, 1.03–3.07), p=0.038). Late-night eating also remained an independent predictor and was indicative of over two-fold increased odds for GERD (adjusted OR = 2.12; 95% CI: 1.19-3.76; p=0.011)(Table 3).

Table 3: Multivariate Logistic Regression for Predictors of GERD

Predictors	Adjusted OR (95% CI)	p-value
Hemodialysis Status	1.78 (1.03–3.07)	0.038*
Late-Night Eating	2.12 (1.19–3.76)	0.011*
BMI ≥30 kg/m^2	1.34 (0.76–2.36)	0.308
Nocturnal Symptoms	1.48 (0.79–2.76)	0.217
NSAID Use	1.11 (0.63–1.96)	0.699
Diabetes Mellitus	1.05 (0.59–1.87)	0.856
Hypertension	1.09 (0.62–1.93)	0.761

* Indicates statistical significance at p ≤ 0.05

Aymptomatic positive correlation was noticed between Serum Creatinine and serum urea level with a strong Pearson correlation coefficient (r = 0.72 p<0.001*) and also for BMI and waist circumference (Pearson correlation coefficient (r = 0.65 p<0.001*). Within the subgroup, no change occurred, with the hemodialysis group having significantly higher serum urea and phosphate levels in comparison with the non-hemodialysis group. Male participants had a significantly higher mean BMI than females (p=0.043)(Table 4).

Table 4: Correlation and Subgroup Analyses

Variable Pair / Comparison	Statistic	Test Used	p-value
Serum Creatinine vs Urea	r = 0.72	Spearman	<0.001*
BMI vs Waist Circumference	r = 0.65	Pearson	<0.001*
Hemodialysis vs Serum Urea	Median 110 vs 80	Mann-Whitney U	<0.001*
Hemodialysis vs Phosphate	Median 5.9 vs 4.5	Mann-Whitney U	<0.001*
Male vs Female BMI	27.1 ± 4.3 vs 25.9 ± 4.4	Independent t-test	0.043*

* Indicates statistical significance at p ≤ 0.05

Overall, the results indicate that GERD symptoms are significantly more prevalent in hemodialysis patients and are associated with hemodialysis treatment and modifiable lifestyle factors, alongside more pronounced biochemical disturbances.

DISCUSSION

In this study, GERD symptoms were identified in 38.5% of all CKD patients and were significantly more common in the hemodialysis group than in the non-hemodialysis group (47.1% vs 33.0%, p=0.026). Hemodialysis also remained an independent predictor of GERD even after adjustment (adjusted OR 1.78; 95% CI 1.03-3.07; p=0.038), and late-night eating actually had an even stronger independent link (adjusted OR 2.12; 95% CI 1.19-3.76; p=0.011). When we compare our findings to Pakistani symptom-based estimates in general adult populations, where GERD prevalence has been described at roughly 22% to 24% [12-14], the prevalence in our whole CKD group was higher by around 14 to 16 percentage points. In hemodialysis patients, GERD was almost double versus those local background numbers [12-15]. Altogether, this seems to indicate that the burden we saw here isn't merely a mirror of the already common GERD rate in Pakistan but could rather point to an extra impact tied to CKD severity, and dialysis exposure [16]. Regional and international comparisons also support this interpretation, although the magnitude in our cohort appears greater. A South Asian CKD study reported GERD-like symptoms in about 16% of patients [17], which is less than half the 38.5% prevalence observed in our overall sample and far below the 47.1% seen in hemodialysis

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DOI: https://doi.org/10.54393/pjhs.v7i10.3702

patients. This difference probably captures variation in disease stage, dialysis exposure, and the way diagnosis is done, more than a real contradiction [18, 19]. Likewise, a big meta-analysis found an overall GERD prevalence around 18% in CKD patients [20], and that is roughly 20 points lower than what we saw in our own group. By contrast, papers that focused on endoscopy, or leaned on dialysis-specific samples, have described GERD rates nearing 50% [21]. That number ends up very close to the rate we measured in our hemodialysis subgroup. Put together, these comparisons suggest our findings sit higher than general-population results and pooled CKD estimates, but still they fit inside the higher end that has been reported for more advanced, or dialysis-based cohorts. The pattern of associated findings in our study also strengthens the clinical relevance of this association. Heartburn occurring at least twice weekly, regurgitation, and nocturnal GERD symptoms were all significantly more frequent in hemodialysis patients, despite the dialysis group being smaller in size (70 vs 112 patients). In a biochemical sense, that same group sort of had more severe abnormalities, with higher median serum urea (110 vs 80 mg/dL, $p<0.001$) and phosphate (5.9 vs 4.5 mg/dL, $p<0.001$), plus lower hemoglobin and albumin, which points to more advanced metabolic disturbance. Now, these results are not meant to prove causation, but they do line up with the mechanisms that have been suggested that tie CKD to GERD: uremia-associated dysmotility, changed esophageal clearance, and fluid shifts connected to dialysis [20, 21]. It is also worth noting that late-night eating had a stronger adjusted odds ratio than hemodialysis alone (2.12 vs 1.78), and that's important because it hints that at least some of the GERD excess might be modifiable. Taken together, our data suggest GERD in CKD is not spread evenly, and that people receiving hemodialysis make up a clinically higher-risk subgroup.

Specific drawbacks should be mentioned. Using a single-center design only limits the ability to generalize the results to other cohorts in Pakistan or even other countries. In this study, endoscopic evaluation was not performed, so

This study has several limitations. First, the single-center design and non-probability consecutive sampling may introduce selection bias and limit the generalizability of the findings to other CKD populations and healthcare settings. Second, GERD was assessed using the GERD Questionnaire (GERDQ) without endoscopic or objective reflux testing; therefore, symptom-based misclassification cannot be excluded, and the observed prevalence may not represent objectively confirmed GERD. Third, patients with pre-existing upper gastrointestinal conditions or symptoms were excluded, which may have resulted in the exclusion of some patients with more severe reflux-related disease and potentially underestimated the overall burden of GERD symptoms. Fourth, the sample size was calculated using a previously reported prevalence estimate that was lower than the prevalence observed in the present study; although the achieved sample was adequate for the planned analysis, this difference should be considered when interpreting the findings. Finally, the cross-sectional design does not establish temporal or causal relationships between hemodialysis, late-night eating, and GERD symptoms. In particular, the association with late-night eating should not be interpreted as evidence that modifying this behavior would reduce GERD symptoms. Multicenter prospective studies incorporating objective diagnostic assessment and longer follow-up are warranted to confirm these associations and clarify their temporal and causal relationships.

CONCLUSIONS

GERD symptoms were common among CKD patients in this tertiary-care setting and were more frequently reported among those receiving hemodialysis than among non-hemodialysis patients. Hemodialysis status and late-night eating were independently associated with GERD symptoms after adjustment for selected demographic and clinical factors. However, given the cross-sectional design and symptom-based assessment, these findings should be interpreted as associations rather than evidence of causation. The temporal relationship between initiation of hemodialysis, lifestyle behaviors, and development of GERD symptoms cannot be established.

Authors' Contribution

Conceptualization: MA
Methodology: MA, JI
Formal analysis: MA, SJ
Writing and Drafting: MA, AH, AR
Review and Editing: MA, AH, JI, SJ, AR

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflict of Interest

All the authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

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