ISSN: 2306-6091

International Journal of Pharmaceuticals and Health Care Research (IJPHR)

IJPHR |Vol.14 | Issue 3 | Jul - Sep -2026

www.ijphr.com

DOI : https://doi.org/10.61096/ijphr.v14.iss3.2026.586.593

Prevalence and Predictors of Polypharmacy Among Patients with Chronic Kidney Disease Undergoing Dialysis or Dialysis-Related Procedures: A Retrospective Observational Study

Samira Banu S, Agalya S, Deepanmaharesh S, Deenadayalan R.M, Sambathkumar R, Kannan C and Thirugnanam T S*

Department of Pharmacy Practice, the Erode College of Pharmacy, Veppampalayam, Vallipurathampalayam (PO), Erode, Tamil Nadu, India

*Corresponding Author: **Dr. T. S. Thirugnanam**
E-mail: drtsthirugnanampharmd@gmail.com

Published on: 29.08.2026
Published by: Futuristic Publications

Abstract

Background: Patients with chronic kidney disease (CKD) undergoing maintenance dialysis typically require multiple concurrent medications to manage renal replacement therapy, its complications, and coexisting comorbidities. Polypharmacy, conventionally defined as concurrent use of five or more medications, increases the risk of drug interactions, adverse drug reactions, and non-adherence, yet locally-grounded data from Indian dialysis populations remain limited.

Objective: To determine the prevalence of polypharmacy and excessive polypharmacy, and to identify the demographic and clinical predictors of medication burden, among CKD patients undergoing maintenance dialysis.

Methods: A retrospective observational study was conducted at a tertiary-care nephrology hospital in Erode, Tamil Nadu, India. Case records of 151 patients with chronic kidney disease (CKD) who underwent maintenance dialysis or dialysis-related procedures were reviewed. Polypharmacy (≥5 drugs) and excessive polypharmacy (≥10 drugs) were assessed. Bivariate associations were tested using the chi-square test for categorical variables and the Mann-Whitney U test for continuous variables. Variables showing statistically significant bivariate associations were entered into a multivariable binary logistic regression model to identify independent associations.

Results: Polypharmacy was observed in 78.1% of patients (118/151) and excessive polypharmacy in 29.1% (44/151), with a mean of 7.58 ± 3.17 medications per patient. On bivariate analysis, age (p=0.013), serum albumin (p<0.001), and dialysis modality/access category — arteriovenous fistula (AVF)-only versus all other access (p<0.001) — were significantly associated with polypharmacy. On multivariable logistic regression, serum albumin (adjusted OR 0.015, 95% CI 0.001–0.21, p=0.002) and dialysis access category other than AVF-only (adjusted OR 11.61, 95% CI 3.69–36.54, p<0.001) remained independent predictors, while age lost significance after adjustment (p=0.196). Polypharmacy was associated with significantly longer hospital stay (3.52 vs 2.12 days, p<0.001).

Conclusion: Polypharmacy is highly prevalent among dialysis-dependent CKD patients at this centre. Lower serum albumin and dialysis access category other than stand-alone arteriovenous fistula were independently associated with higher

odds of polypharmacy, identifying a practical target for pharmacist-led medication review in routine dialysis care.

Keywords: Polypharmacy; Chronic Kidney Disease; Maintenance Dialysis; Serum Albumin; Medication Review

1. INTRODUCTION

Chronic kidney disease (CKD) is defined by the presence of markers of kidney damage or a glomerular filtration rate below 60 mL/min/1.73 m² persisting for three months or more, and is classified by cause, glomerular filtration rate category, and degree of albuminuria. (KDIGO CKD Work Group, 2024) India carries a substantial share of the global CKD burden, though community-based prevalence estimates vary widely by region and screening method. (Talukdar et al., 2025)

As renal function declines, patients accumulate medications to manage CKD-specific complications — anaemia, mineral-bone disorder, fluid overload — in addition to pre-existing comorbidities such as hypertension and diabetes. This cumulative drug burden, termed polypharmacy, is most commonly operationalised as concurrent use of five or more medications, with "excessive" or "hyper" polypharmacy denoting ten or more; no single definition is universally accepted.(Masnoon et al., 2017) Polypharmacy in CKD is associated with an increased risk of drug–drug interactions, adverse drug reactions, non-adherence, and hospitalisation.(Fraser et al., 2015)

Reported prevalence varies considerably by population and dialysis modality. A hemodialysis-specific Saudi Arabian cohort reported polypharmacy in 97.6% of patients, with comorbidity count, ischaemic heart disease, and respiratory disease as the principal predictors.(Alshamrani et al., 2018) a systematic review and meta-analysis across the broader CKD spectrum found a pooled prevalence of 69%, higher in North America and Europe than in Asia. (Naseralallah et al., 2023) A more recent meta-analysis restricted to CKD populations reported a pooled prevalence exceeding 80%, highest among patients on dialysis and those with a kidney transplant. (Oosting et al., 2024) An Indian drug-utilisation study from a Gujarat hemodialysis unit similarly documented a substantial medication and comorbidity burden using WHO core prescribing indicators.(Kanjariya et al., 2025)

Despite this evidence base, prevalence and predictor data specific to Indian maintenance-dialysis populations remain scarce, and most published predictors have not been examined using a multivariable approach that accounts for confounding between candidate risk factors. This study was undertaken to determine the prevalence of polypharmacy and excessive polypharmacy, and to identify independent demographic and clinical predictors of medication burden, among patients with CKD undergoing maintenance dialysis or dialysis-related procedures at a tertiary-care centre in Tamil Nadu, India.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

This was a retrospective, record-based observational study conducted at RANM Malathy Vijayakumar Hospital, Erode, Tamil Nadu, a tertiary-care nephrology centre providing inpatient and outpatient dialysis services. Case records dated between January 2025 and July 2026 were reviewed.

2.2 Study Population and Sample

All patients aged 14 years and above with CKD who underwent maintenance dialysis (hemodialysis or peritoneal dialysis/CAPD) or a dialysis-related procedure during the study period and whose records contained the required demographic, clinical, and medication data were eligible. As this was a retrospective study using total enumeration of eligible records, no separate a priori sample size calculation was performed; all 151 records meeting the eligibility criteria were included. Patients with acute kidney injury without underlying CKD, incomplete records, and those who underwent transplantation during the study period were excluded.

2.3 Data Collection

Data were abstracted from case sheets into a structured proforma covering demographics, clinical characteristics (aetiology, CKD stage, dialysis modality), comorbidities, laboratory parameters, medication details (brand/generic name, drug class, dose, frequency, route, duration), and hospital outcomes. CKD stage was assigned using KDIGO criteria where documented. (KDIGO CKD Work Group, 2024) Polypharmacy was defined as concurrent use of ≥5 medications and excessive polypharmacy as ≥10 medications at the time of the recorded encounter.

2.4 Statistical Analysis

Continuous variables are presented as mean ± SD; categorical variables as frequency and percentage. Bivariate associations between polypharmacy status and candidate predictors were tested using the chi-square test for categorical variables and the Mann-Whitney U test for continuous variables because of non-normal distributions. Variables showing statistically significant associations in bivariate analysis ($p<0.05$) were entered into a multivariable binary logistic regression model to identify independent associations. Age, serum albumin, and dialysis access category were included in the final model. Of the 151 participants, 115 had complete data for all variables included in the regression model and were included in the multivariable analysis. A p-value <0.05 was considered statistically significant throughout. Analyses were performed using IBM SPSS Statistics version 25.0.

3. RESULTS

3.1 Baseline Characteristics

A total of 151 patients were included (Table 1). The cohort was predominantly older (mean age 55.6 ± 13.7 years; range 14–85) and male (76.2%; male: female ratio ≈ 3.2:1). Among the 104 patients with a documented CKD stage, 95.2% were Stage 5. Dialysis access was heterogeneous, ranging from stand-alone arteriovenous fistula (AVF) access to catheter-, IJV-, or cannula-based access; access documentation was incomplete for 36 patients (23.8%).

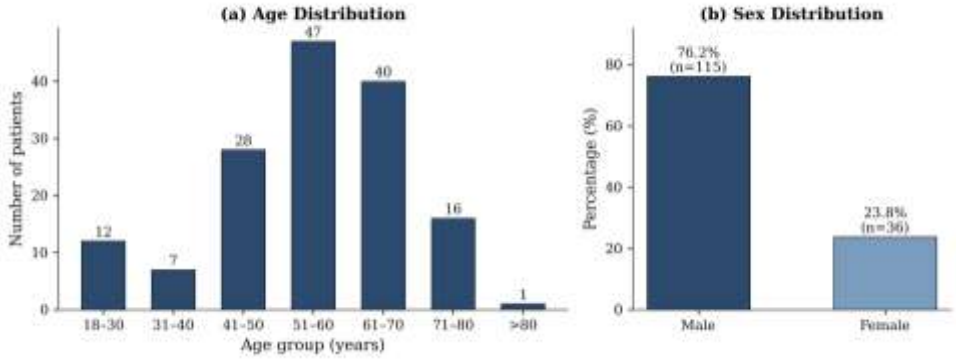

Fig 1: Demographic profile of study patients — (a) age distribution, (b) sex distribution (n=151).

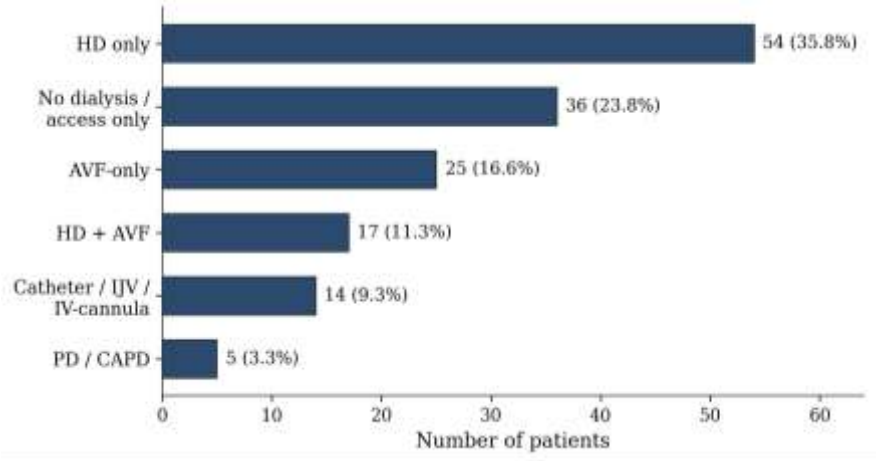

Fig 2: Distribution of dialysis modality/access category among study patients (n=151).

3.2 Comorbidity and Biochemical Profile

Hypertension (74.8%) and diabetes mellitus (55.0%) were the dominant comorbidities (Table 2); heart failure, dyslipidaemia, stroke, and hypothyroidism were each recorded in 0% of the cohort. Biochemical parameters reflected advanced renal impairment: mean eGFR 10.9 ± 9.5 mL/min/1.73 m², haemoglobin 9.27 ± 1.22 g/dL, and serum albumin 3.22 ± 0.26 g/dL.

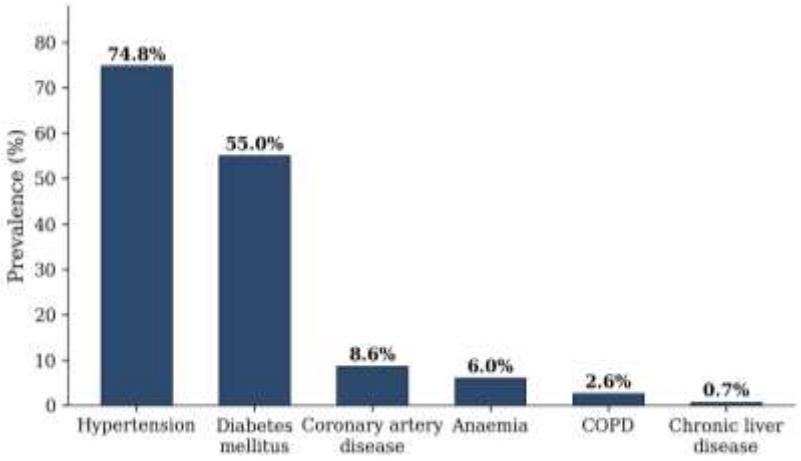

Fig 3: Comorbidity profile of study patients (n=151).

3.3 Prevalence of Polypharmacy and Drug-Class Utilisation

Polypharmacy (≥5 drugs) was present in 118 patients (78.1%) and excessive polypharmacy (≥10 drugs) in 44 patients (29.1%); the mean number of medications per patient was 7.58 ± 3.17 (Table 3, Figure 4). Antiplatelet/statin combinations (58.9%), antibiotics (54.3%), and antihypertensives (51.7%) were the most frequently prescribed drug classes (Figure 5).

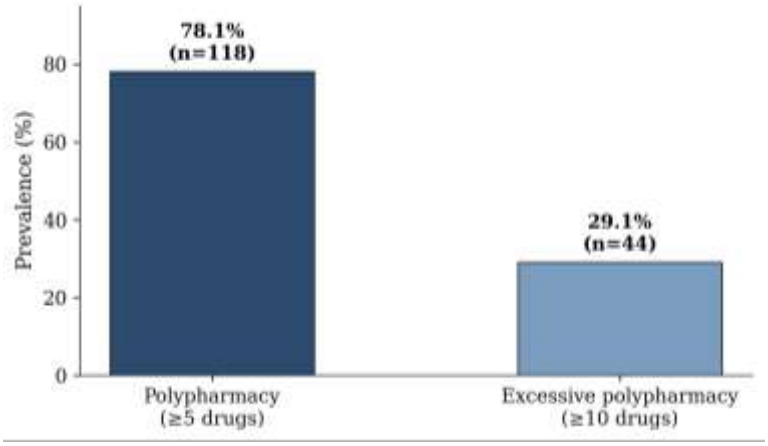

Fig 4: Prevalence of polypharmacy (≥5 drugs) and excessive polypharmacy (≥10 drugs) among study patients (n=151).

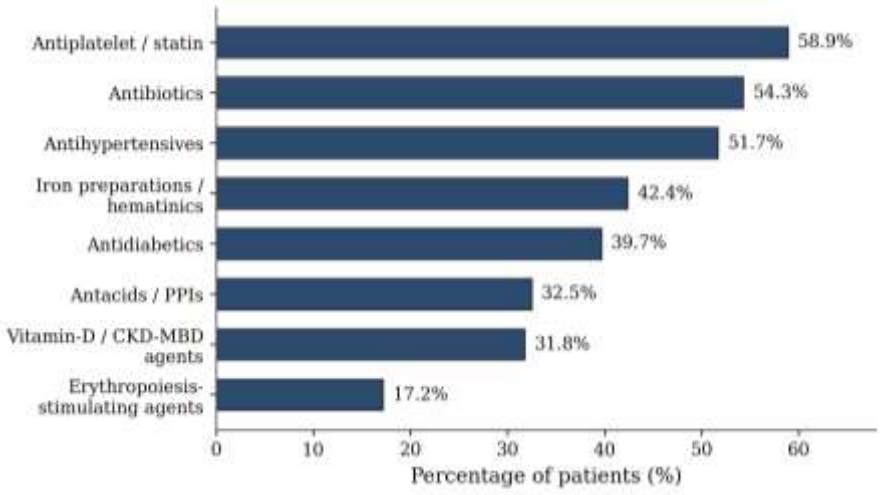

Fig 5: Drug class utilization pattern among study patients (n=151).

3.4 Predictors of Polypharmacy

On bivariate analysis (Table 4), age (Mann-Whitney U, p=0.013), serum albumin (Mann-Whitney U, p<0.001), and dialysis modality/access category — regrouped as AVF-only versus all other access — (χ^2 = 16.56, p<0.001) were significantly associated with polypharmacy; this access-type association was not detected when access was grouped simply as hemodialysis versus non-hemodialysis, since that grouping combines AVF-only patients (lowest polypharmacy rate) with catheter/PD-based patients (highest rate). No significant association was found for sex, individual comorbidities, comorbidity count, CKD stage, eGFR, creatinine, or haemoglobin.

On multivariable logistic regression (Table 5, Figure 6, n=115 with complete data on all three variables), serum albumin (adjusted OR 0.015, 95% CI 0.001–0.21, p=0.002) and dialysis access category other than AVF-only (adjusted OR 11.61, 95% CI 3.69–36.54, p<0.001) remained independently associated with polypharmacy. Age lost significance after adjustment (adjusted OR 1.03, 95% CI 0.99–1.06, p=0.196), indicating that the unadjusted association was attenuated after adjustment for albumin and access type.

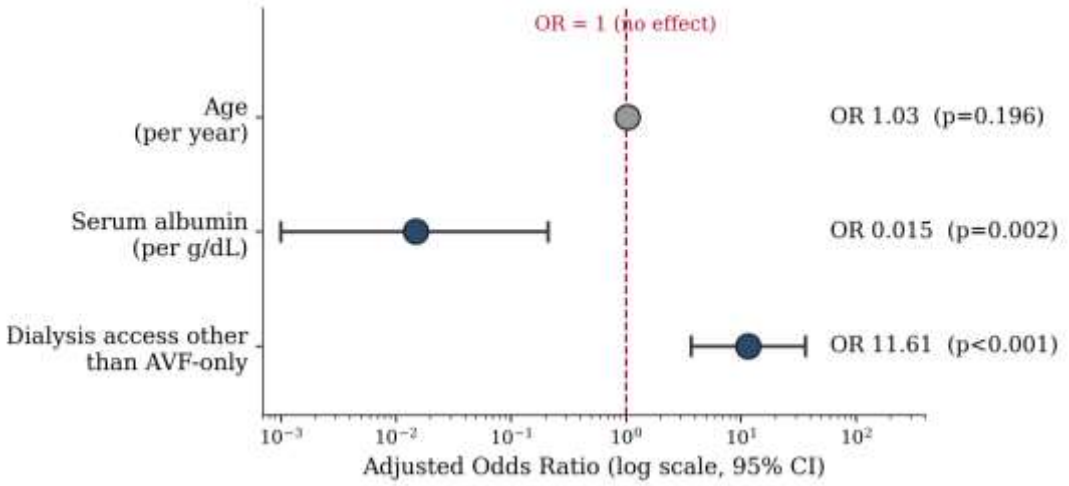

Fig 6: Adjusted odds ratios (95% CI) for independent predictors of polypharmacy on multivariable logistic regression (n=115). Dashed line marks OR=1 (no effect).

3.5 Hospital Outcomes

Patients with polypharmacy had a significantly longer mean hospital stay than those without (3.52 ± 1.41 vs 2.12 ± 0.96 days, p<0.001). All ten ICU admissions recorded in the cohort (8.5% of the polypharmacy group) occurred among patients with polypharmacy, though this difference was not statistically significant (p=0.182). No deaths or readmissions were recorded during the study period.

Table 1. Baseline Demographic and Clinical Characteristics (n=151)

Parameter	Value
Age, years, mean ± SD (range)	55.6 ± 13.7 (14–85)
Male, n (%)	115 (76.2)
Female, n (%)	36 (23.8)
CKD Stage 5 (of 104 documented), n (%)	99 (95.2)
Dialysis modality/access category — HD only, n (%)	54 (35.8)
Dialysis modality/access category — AVF only, n (%)	25 (16.6)
Dialysis modality/access category — HD + AVF, n (%)	17 (11.3)
Dialysis modality/access category — Catheter/IJV/IV-cannula, n (%)	14 (9.3)
Dialysis modality/access category — PD/CAPD, n (%)	5 (3.3)
Dialysis modality/access category — not documented, n (%)	36 (23.8)

Table 2. Comorbidity and Biochemical Profile (n=151)

Parameter	Value
Hypertension, n (%)	113 (74.8)
Diabetes mellitus, n (%)	83 (55.0)
Coronary artery disease, n (%)	13 (8.6)
Anaemia (as comorbidity), n (%)	9 (6.0)
COPD, n (%)	4 (2.6)
Chronic liver disease, n (%)	1 (0.7)
Serum creatinine, mg/dL, mean ± SD	7.39 ± 3.19
eGFR, mL/min/1.73m², mean ± SD	10.9 ± 9.5
Haemoglobin, g/dL, mean ± SD	9.27 ± 1.22
Serum albumin, g/dL, mean ± SD	3.22 ± 0.26

Table 3. Prevalence of Polypharmacy and Leading Drug Classes (n=151)

Category	n (%)
Polypharmacy (≥5 drugs)	118 (78.1)
Excessive polypharmacy (≥10 drugs)	44 (29.1)
Mean drugs/patient (± SD)	7.58 ± 3.17
Antiplatelet / statin	89 (58.9)
Antibiotics	82 (54.3)
Antihypertensives	78 (51.7)
Iron preparations / hematinics	64 (42.4)
Antidiabetics	60 (39.7)
Antacids / PPIs	49 (32.5)
Vitamin-D / CKD-MBD agents	48 (31.8)
Erythropoiesis-stimulating agents	26 (17.2)

Table 4. Bivariate Predictors of Polypharmacy

Variable	p-value	Result
Age	0.013	Significant
Serum albumin	<0.001	Significant
Dialysis modality/access category (AVF-only vs. other)	<0.001	Significant
Sex, DM, HTN, CAD, COPD, anaemia	>0.05	Not significant
Comorbidity count, eGFR, creatinine, Hb	>0.05	Not significant

Table 5. Multivariable Logistic Regression — Independent Predictors of Polypharmacy (n=115)

Variable	Adj. OR	95% CI	p-value	Sig.
Age	1.03	0.99–1.06	0.196	No
Serum albumin	0.015	0.001–0.21	0.002	Yes
Access other than AVF-only	11.61	3.69–36.54	<0.001	Yes

4. DISCUSSION

Polypharmacy was highly prevalent in this dialysis-dependent CKD cohort, affecting more than three-quarters of patients, with nearly one in three meeting criteria for excessive polypharmacy. This prevalence (78.1%) was lower than the 97.6% reported in a hemodialysis-specific Saudi cohort,(Alshamrani et al., 2018) but higher than the 69% pooled estimate across the broader CKD spectrum reported by Naseralallah et al.,(Naseralallah et al., 2023) and consistent with the 78–82% range reported by a more recent CKD-wide meta-analysis in which prevalence was highest specifically among dialysis and transplant

subgroups.(Oosting et al., 2024) This gradient is consistent with a greater medication burden among patients receiving dialysis, and situates the present findings plausibly between a CKD-wide estimate and a dialysis-specific estimate drawn from a different health system.

The predictor analysis yielded a clinically important, and somewhat unexpected, finding: dialysis modality/access category — not comorbidity count, diabetes, or hypertension — was the strongest independent predictor of polypharmacy, with patients accessing dialysis via any modality other than a stand-alone arteriovenous fistula carrying roughly twelve-fold higher odds of polypharmacy. This association was not detectable using a simple hemodialysis-versus-non-hemodialysis grouping, since that approach combines AVF-only patients (the lowest-burden subgroup) with catheter- and peritoneal-dialysis-based patients (the highest-burden subgroup), cancelling out a genuine effect. This association may reflect differences in clinical complexity, access-related complications, treatment intensity, or dialysis modality; however, these mechanisms were not directly evaluated in the present study. The access category may therefore serve as a practical marker for prioritising medication-review resources.

Serum albumin was the second independent predictor, with lower albumin associated with substantially higher odds of polypharmacy. Hypoalbuminemia in dialysis patients is a well-recognised marker of the malnutrition-inflammation complex common in this population, and its association with medication burden is biologically plausible: lower albumin may therefore serve as a marker of greater clinical complexity and medication burden. Age, by contrast, was significant only on unadjusted analysis and lost significance after accounting for albumin and access type — indicating that age had been acting as a proxy for these two more clinically specific factors rather than an independent driver in its own right.

Notably, comorbidity count was not a significant predictor in this cohort, in contrast to a hemodialysis-specific study in which comorbidity count, ischaemic heart disease, and respiratory disease were the principal predictors of medication burden.(Alshamrani et al., 2018) This is best explained by the local comorbidity profile: heart failure, dyslipidaemia, stroke, and hypothyroidism were each recorded in 0% of this cohort, substantially limiting the variability available for a comorbidity-count variable to detect an association, rather than reflecting a true absence of effect.

Polypharmacy was also associated with a significantly longer hospital stay. Given the retrospective observational design, this association is best interpreted as polypharmacy marking greater underlying clinical complexity rather than as evidence of a direct causal effect of medication count on length of stay.

4.1 Clinical Implications

These findings support routine, structured pharmacist-led medication review in maintenance-dialysis care, and identify a practical targeting criterion: patients with hypoalbuminemia or dialysis access other than a stand-alone AVF represent a readily identifiable, high-yield subgroup for prioritised review, rather than requiring uniform review of all dialysis patients irrespective of risk profile.

4.2 Limitations

This study has several limitations. It is a single-centre, retrospective analysis, and findings may not generalise to other settings. CKD stage was undocumented for 31% of records and dialysis access for 24%, reflecting real-world documentation gaps in a record-based design. The retrospective observational nature of the drug-count data means that identified associations, including the predictors reported here, reflect statistical association rather than proven causation. Medications obtained outside the study hospital, including over-the-counter and herbal preparations, were not captured and may lead to underestimation of true polypharmacy.

5. CONCLUSION

Polypharmacy and excessive polypharmacy are highly prevalent among patients with dialysis-dependent CKD at this South Indian tertiary-care centre. Serum albumin and dialysis modality/access category other than a stand-alone arteriovenous fistula — rather than age or comorbidity count — were independently associated with polypharmacy. These findings provide a locally-grounded, actionable basis for targeted, pharmacist-led medication review in routine dialysis care.

REFERENCES

1. Alshamrani, M., Almalki, A., Qureshi, M., Yusuf, O. and Ismail, S. (2018) ‘Polypharmacy and medication-related problems in hemodialysis patients: a call for deprescribing’, Pharmacy, 6(3), 76.

2. Fraser, S.D.S., Roderick, P.J., May, C.R., McIntyre, N., McIntyre, C., Fluck, R.J., Shardlow, A. and Taal, M.W. (2015) 'The burden of comorbidity in people with chronic kidney disease stage 3: a cohort study', BMC Nephrology, 16, 193.
3. Kanjariya, D., Sinha, A., Vaniya, H., Rathva, T. and Makvana, A. (2025) 'Evaluation of pharmacotherapeutic patterns in patients with renal impairment undergoing hemodialysis: a drug utilization study', Cureus, 17(12), e99970.
4. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group (2024) 'KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease', Kidney International, 105(4S), pp. S117–S314.
5. Masnoon, N., Shakib, S., Kalisch-Ellett, L. and Caughey, G.E. (2017) 'What is polypharmacy? A systematic review of definitions', BMC Geriatrics, 17(1), 230.
6. Naseralallah, L., Khatib, M., Al-Khulaifi, A. and Danjuma, M. (2023) 'Prevalence and global trends of polypharmacy in patients with chronic kidney disease: a systematic review and meta-analysis', Frontiers in Pharmacology, 14, 1122898.
7. Oosting, I.J., Colombijn, J.M.T., Kaasenbrood, L., Liabeuf, S., Laville, S.M., Hooft, L. et al. (2024) 'Polypharmacy in patients with chronic kidney disease', Kidney360, 5(6), pp. 841–850.
8. Talukdar, R., Ajayan, R., Gupta, S., Biswas, S., Parveen, M., Sadhukhan, D., Sinha, A.P. and Parameswaran, S. (2025) 'Chronic kidney disease prevalence in India: a systematic review and meta-analysis from community-based representative evidence between 2011 to 2023', Nephrology, 30(1), e14420.