Incidence of mortality and the Impact of Malnutrition on Mortality in Chronic Kidney Disease Patients Undergoing Dialysis: a Systematic review and Meta-analysis

COLLEGE OF PHARMACY
UNIVERSITY OF UTAH
L. S. SKAGGS PHARMACY INSTITUTE

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Ishfaq Rashid[1], Gautam Sahu[2], Pramil Tiwari[2], Priyanka Ghule[1], Connor Willis[1], Carl Asche[1]

[1]Department of Pharmacotherapy, College of Pharmacy, University of Utah, Salt Lake City, UT, USA.
[2]Department of Pharmacy Practice, National Institute of Pharmaceutical Education and Research, Mohali, Punjab, India.

BACKGROUND

- Malnutrition is a significant problem in patients with chronic kidney disease (CKD), influencing morbidity, mortality, functional activity, and quality of life. However, the extent of its impact on mortality is poorly elucidated.
- This systematic review and meta-analysis aimed to explore the incidence of mortality in CKD patients independent of nutritional status, and also sought to determine the prognostic significance of malnutrition in chronic kidney disease (CKD) patients on dialysis.

RESULTS

- A total of 29 studies that comprised 11063 CKD patients on dialysis whose nutritional status was evaluated were eligible for quantitative analysis.
- Based on a comparison between the "malnutrition" category and the reference "normal nutrition status" category, the results showed that the overall pooled hazard risk (HR) for mortality was (HR 1.49, 95% CI: 1.36–1.64). According to the subgroup analysis, the hemodialysis subgroup had greater mortality hazards (HR 1.53; 95% CI 1.38–1.70), compared to the peritoneal dialysis subgroup (HR 1.26; 95% CI 1.15–1.37).
- Additionally, the results of included studies demonstrated that, irrespective of the dialysis category, the incidence of mortality among CKD patients independent of nutritional status was found to be relatively high, but due to the high amount of heterogeneity we were not able to aggregate results across studies to provide a point estimate.

Table 1: Subgroup analysis based on dialysis options, and nutritional measures

Subgroups	Studies (N)	HR 95% CI	Heterogeneity
Dialysis status			
Hemodialysis	24	1.53(1.38-1.70)	91%
Peritoneal Dialysis	5	1.26(1.15-1.37)	0%
Nutritional assessment criteria			
MIS (malnutrition vs well nourished)	2	2.61(1.35-4.45)	19%
ISRNM (malnutrition vs well nourished)	5	1.61(1.36-1.92)	10%
SGA (malnutrition vs well nourished)	5	2.28(1.71-3.03)	0%
GNRI (malnutrition vs well nourished)	5	1.97(1.61-2.42)	11%
MIS (per 1 unit increase)	5	1.20(1.13-1.27)	30%
GNRI (severe malnutrition Q vs rest Qs)	3	1.75(1.46-2.08)	0%
GNRI (per 1 unit increase)	2	0.96(0.94-0.98)	0%

MIS=Malnutrition-Inflammation Score; SGA=Subjective Global Assessment tool; GNRI= Geriatric Nutritional Risk Index tool; ISRNM= International Society of Renal Nutrition and Metabolism tool; Anthropometry=Body mass index, waist circumference, triceps skinfold thickness, mid-arm muscle circumference and handgrip strength; MNA= Mini Nutritional Assessment tool. Q: Quartile.

CONCLUSION

- The findings conclude that malnutrition is a strong predictor of mortality among CKD patients, with the hemodialysis subgroup having the highest mortality hazards compared to the peritoneal dialysis subgroup. The results of this study also advocate for early nutritional evaluation and timely dietary interventions to halt the progression of CKD and death.

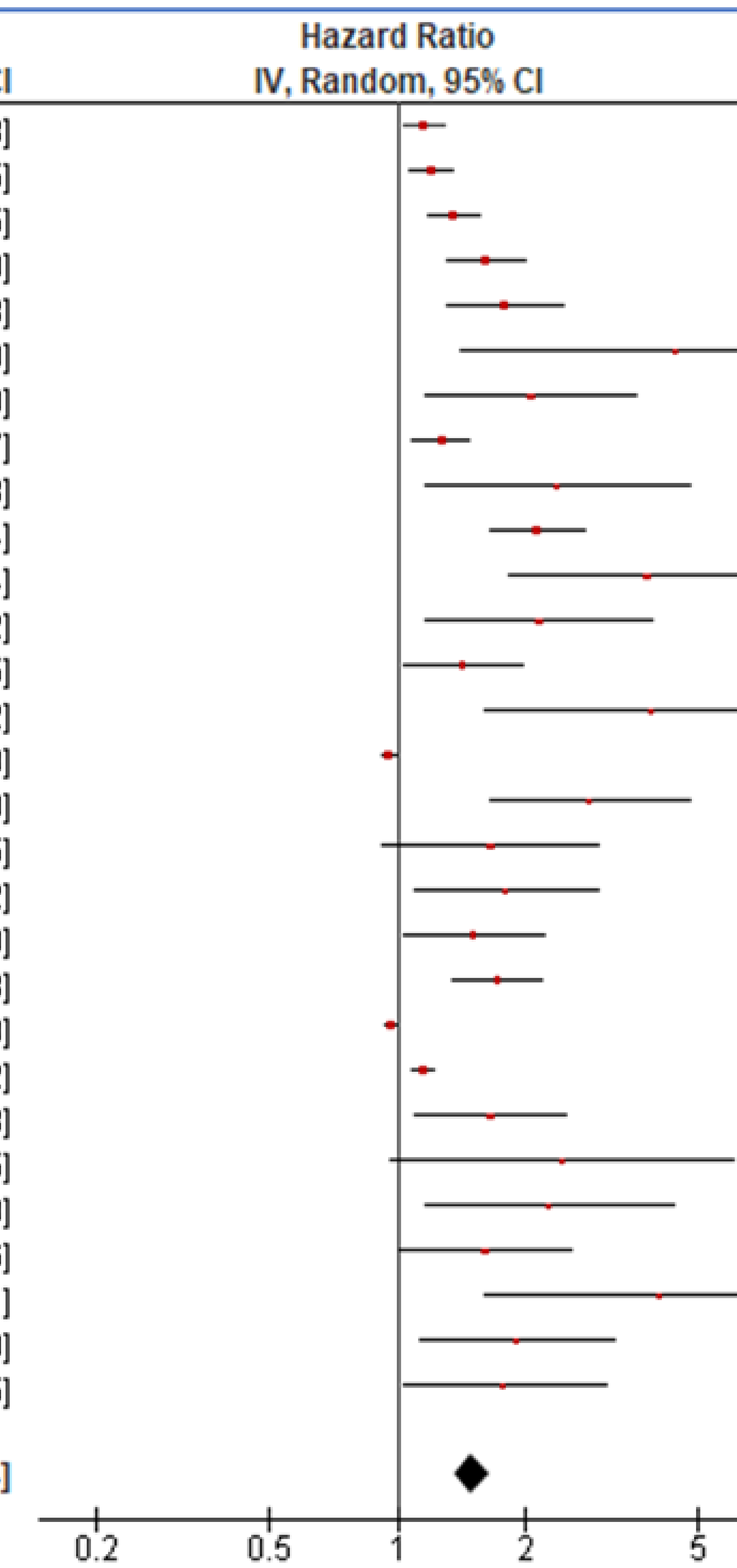
MATERIALS AND METHODS

- Design: This meta-analysis was designed and performed in accordance with the PRISMA guidelines. The protocol has been registered at PROSPERO (CRD42023394584). A systematic electronic literature search was conducted in PubMed, ScienceDirect, Embase, and the Cochrane Library to identify relevant cohort studies.
- Main outcome measures: The study explored the worldwide incidence of mortality, and the impact of malnutrition on mortality in CKD patients on dialysis. Additionally, the outcomes were assessed based on sub-groups such as dialysis options and nutritional assessment criteria.
- Statistical analysis: The generic inverse variance method was used to pool the hazard ratio effect estimates by employing a random effects model. The Newcastle-Ottawa scale was used for the quality assessment. The statistical analysis was performed by utilizing RevMan and CMA 2.0.

Figure 1: Overall Impact of malnutrition on mortality in CKD patients

Study or Subgroup	log[Hazard Ratio]	SE	Weight	Hazard Ratio IV, Random, 95% CI
Beberashvili, 2013	0.1382	0.0554	6.6%	1.15 [1.03, 1.28]
Brzosko, 2013	0.1792	0.0617	6.5%	1.20 [1.06, 1.35]
Chen, 2019	0.3019	0.0696	6.3%	1.35 [1.18, 1.55]
de Mutsert, 2008	0.4778	0.1099	5.2%	1.61 [1.30, 2.00]
de Roij van Zuijdewijn, 2015	0.5751	0.1596	3.9%	1.78 [1.30, 2.43]
Fuhr, 2014	1.4984	0.5892	0.6%	4.47 [1.41, 14.20]
Fujioka, 2022	0.719	0.2867	2.0%	2.05 [1.17, 3.60]
He, 2013	0.2357	0.0763	6.1%	1.27 [1.09, 1.47]
Horner, 2020	0.8564	0.3612	1.4%	2.35 [1.16, 4.78]
Ishii, 2017	0.7513	0.1309	4.6%	2.12 [1.64, 2.74]
Kalantar-Zadeh, 2004	1.3416	0.379	1.3%	3.83 [1.82, 8.04]
Kang, 2017	0.7615	0.3084	1.8%	2.14 [1.17, 3.92]
Kittiskulnam, 2021	0.3535	0.1604	3.9%	1.42 [1.04, 1.95]
kiuchi, 2016	1.3638	0.4592	0.9%	3.91 [1.59, 9.62]
Kobayashi, 2010	-0.0413	0.0159	7.2%	0.96 [0.93, 0.99]
Kwon, 2016	1.0347	0.2724	2.1%	2.81 [1.65, 4.80]
Leinig, 2011	0.5046	0.2945	1.9%	1.66 [0.93, 2.95]
Lin, 2019	0.5834	0.2491	2.4%	1.79 [1.10, 2.92]
Naito, 2022	0.409	0.1936	3.2%	1.51 [1.03, 2.20]
Panichi, 2014	0.5397	0.1223	4.9%	1.72 [1.35, 2.18]
Park, 2012	-0.036	0.0132	7.2%	0.96 [0.94, 0.99]
Perez Vogt, 2016	0.1379	0.0311	7.1%	1.15 [1.08, 1.22]
Rosenberger, 2014	0.5018	0.2074	3.0%	1.65 [1.10, 2.48]
Sa Macedo, 2021	0.8848	0.467	0.9%	2.42 [0.97, 6.05]
Segall, 2014	0.8139	0.3395	1.5%	2.26 [1.16, 4.39]
Takahashi, 2017	0.475	0.2373	2.5%	1.61 [1.01, 2.56]
Toledo, 2013	1.4047	0.4737	0.9%	4.07 [1.61, 10.31]
Tsai, 2014	0.6427	0.2655	2.2%	1.90 [1.13, 3.20]
Yun, 2017	0.5724	0.2769	2.1%	1.77 [1.03, 3.05]
Total (95% CI)			**100.0%**	**1.49 [1.36, 1.64]**

Heterogeneity: Tau² = 0.03; Chi² = 271.70, df = 28 (P < 0.00001); I² = 90%
Test for overall effect: Z = 8.57 (P < 0.00001)



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