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# A Meta-Analysis on Artificial Intelligence in the Field of Nephrology

Sangeetha G[1], Swathi G[2], Umapathy P[3], Dinesh Kumar J[4], Uma Serma[5]

[1-5]Department of Pediatrics, SRIHER, Chennai, Tamil Nadu

*Background:* The emergence of artificial intelligence (AI) in the medical field has been groundbreaking and has provided novel strategies for accurate diagnosis enabling more personalised treatment for patients in various domains of nephrology. This meta-analysis aims to ascertain the methodology of studies on patients with acute kidney injury (AKI) and chronic kidney disease (CKD), and to quantify the research output in the application of AI to kidney diseases.

*Methods:* A systematic literature review was conducted to evaluate the performance of AI algorithm in the prediction and outcome of AKI and CKD. Based on PRISMA guidelines, the electronic databases Cochrane, PUBMED, EMBASE, Web of science and Scopus were screened for relevant articles from August 2014 to July 2024. Meta-analysis involved risk of bias analysis, heterogeneity assessment, and comparison of area under curve (AUC) by forest plot analysis using MetaXL 5.3 to assess the efficacy of the AI model. Out of 43 studies, 28 met the inclusion criteria for the meta-analysis.

*Results:* Of 43 articles, 20 studies were pertaining to AKI and 23 to CKD. Fourteen studies with 34,408 AKI patients and fourteen studies with 22,929 CKD patients were included in this meta-analysis. A total of 4 AI models were included: logistic regression (LR), random forest plot (RF), XGBoost and support vector machine (SVM). The pooled values of AUC in AKI and CKD groups were 0.803 and 0.857, respectively. The pooled (95% CI) AUC did not differ significantly from other models.

In the AKI category, XGBoost demonstrated highest AUC in the prediction of AKI (AUC=0.853). Similarly, in CKD category, XGBoost was superior to other methods in the prediction of end-stage renal disease and morbidity in CKD patients with an AUC of 0.873.

## Conclusions

Our results reveal that XGBoost is the best of all AI models in both AKI and CKD categories. AI is a potential technique in the diagnosis and prognosis of renal diseases, and will greatly enhance clinicians' capacity in their clinical decision-making. Future research with more diverse machine learning models and larger population datasets is imperative to assess the robustness and generalizability.

**Keywords:** Artificial Intelligence, Nephrology, Acute kidney Injury, Chronic Kidney Disease

## References

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