

PATIENTS WITH END-STAGE RENAL DISEASE ADMITTED TO THE INTENSIVE CARE UNIT: SYSTEMATIC REVIEW

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Abstract

Background: *The prevalence and incidence of Chronic Kidney Disease (CKD), especially End-Stage Renal Disease (ESRD), are rising globally, primarily due to aging populations, hypertension, diabetes, and obesity. The prevalence of chronic kidney disease (CKD) in critically ill patients is incompletely documented.*

Aim: *This study aims to determine the frequency of critical care unit visits among individuals with end-stage renal disease.*

Methods: *This study demonstrated compliance with all requirements of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 standards through self-comparison. The experts ensured the study's maximum contemporaneity. The search strategy involved examining publications published from 2013 to 2023. This was accomplished using various online reference databases, including Pubmed and SagePub. Only completed papers and publications were considered, while incomplete pieces and previously published works were excluded.*

Result: *1,662 and 1,212 articles were retrieved from PubMed and SagePub, respectively. In 2013, we collated 16 papers, including 11 from PubMed and 5 from SagePub, 4 of which met the research criteria.*

Conclusion: *ICU patients frequently exhibit advanced kidney disease and elevated mortality rates.*

Keywords: *Chronic kidney disease; End-stage renal disease; Intensive care unit*

INTRODUCTION

CKD progression can impact quality of life and premature mortality; medical treatment requires continuous surveillance and specialist referrals.^{1,2} Chronic kidney disease (CKD) is defined by the KDIGO foundation based on proteinuria, glomerular filtration rate (GFR) below 60 mL/min, persistent structural abnormalities, and albumin levels.³

A study in the United States revealed that half a million individuals suffer from end-stage renal disease (ESRD), and 124,411 new cases were diagnosed in 2015. The severity of ESRD was found to be influenced by race.⁴ End-stage renal disease (ESRD) incidence has increased among Native Americans and Asian Americans, while it has decreased by 21% among African Americans since 2006.⁵

End-stage renal disease (ESRD) incidence has increased among Native Americans and Asian Americans, while it has decreased by 21% among African Americans since 2006.⁶ The adaptive capacity of nephrons sustains the glomerular filtration rate (GFR). However, mild renal impairment may not elevate creatinine levels, which can harm the remaining glomeruli.⁷

ACE inhibitors and ARBs preserve renal function and prevent kidney disease progression by reducing GFR, preventing renal failure through hyperfiltration and residual nephron hypertrophy.⁸ Patients with end-stage renal disease and an estimated glomerular filtration rate (eGFR) below 15 exhibits increased mortality rates and medical comorbidities.

Renal dysfunction is associated with increased mortality, hospitalization rates, and cardiovascular events, primarily due to sepsis and cardiovascular disease. Patients with end-stage renal disease exhibit higher co-morbidity rates.⁹⁻¹¹

This study aims to demonstrate the incidence of end-stage renal disease patients admitted to the intensive care unit for treatment.

METHODS

The study followed the PRISMA 2020 guidelines to ensure precise and current findings. Individuals with end-stage renal disease were admitted to the ICU. Examining prior studies is essential for achieving prompt outcomes.

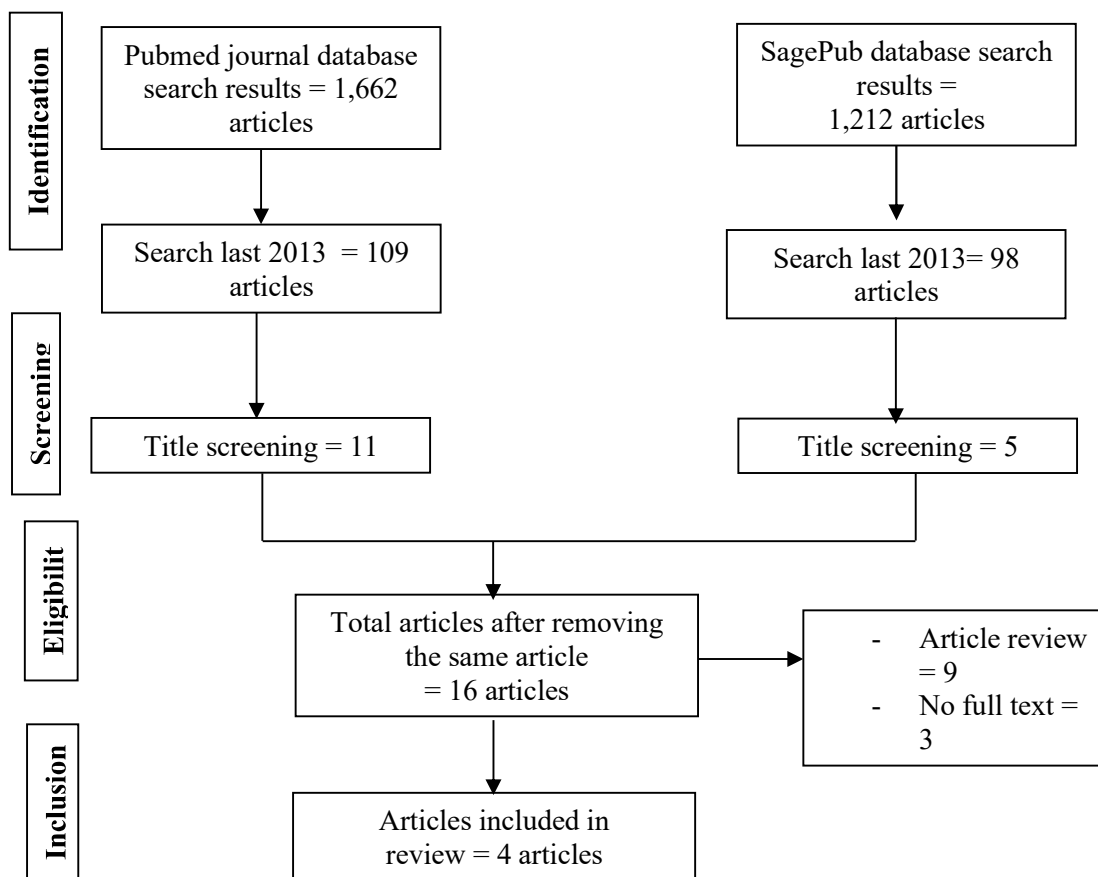


Figure 1. Article search flowchart

Publication criteria require English manuscripts focusing on end-stage renal disease incidents in intensive care units published after 2013. Ineligible research includes non-public materials such as editorials, DOI-less applications, and duplicate submissions.

Conduct a literature search on the correlation between the intensive care unit and end-stage renal disease using PubMed and SagePub databases: ("intensive care units"[MeSH Terms] OR ("intensive"[All Fields] AND "care"[All Fields] AND "units"[All Fields]) OR "intensive care units"[All Fields] OR ("intensive"[All Fields] AND "care"[All Fields] AND "unit"[All Fields]) OR "intensive care unit"[All Fields]) AND ("kidney failure, chronic"[MeSH Terms] OR ("kidney"[All Fields] AND "failure"[All Fields] AND "chronic"[All Fields]) OR "chronic kidney failure"[All Fields] OR ("end"[All Fields] AND "stage"[All Fields] AND "renal"[All Fields] AND "disease"[All Fields]) OR "end stage renal disease"[All Fields]) used in searching the literature.

The study's credibility was evaluated via historical records analysis, and a systematic review revealed restricted search results. The justices reviewed GWAS publications and health-related literature, selecting papers that satisfied the inclusion criteria and establishing review topics.

RESULT

The search identified 1,662 articles in PubMed and 1,212 articles in SagePub. An investigation conducted in 2013 identified 109 articles in PubMed and 98 articles in SagePub. We extracted 16 papers, with 11 from PubMed and 5 from SagePub. 4 research studies reaching the criteria were included.

AKI was detected in 57.3% of ICU patients by Hoste et al (2015)¹². The study revealed a positive correlation between the severity of AKI and hospital mortality rates. Globally, AKI and mortality rates were comparable; however, AKI patients exhibited a more significant proportion of glomerular filtration rate upon hospital discharge.

In their study, Kim et al. (2015)¹³ observed AKI in 57.3% of ICU patients and noted a correlation with increased hospital mortality rates. AKI severity was positively correlated with increased mortality rates across all stages, including Stage 1, Stage 2, and Stage 3. AKI patients exhibited elevated glomerular filtration rates upon hospital discharge.

Table 1. The literature included in this study

Author	Origin	Method	Sample	Result
Hoste, 2015 ¹²	97 centers	Cross-sectional study	1,032 patients	ICU This study examines the epidemiology of AKI in ICU patients by applying KDIGO criteria. The study's findings indicate that more than 50% of patients experienced AKI, and there was a positive association between the severity of AKI and the likelihood of mortality. AKI patients exhibited renal dysfunction at discharge. The adjusted risks of acute kidney injury (AKI) and mortality were similar among all continents and regions examined.
Kim, 2015 ¹³	Republic of Korea	Retrospective study	335 patients	The APACHE score can be used to predict CA-AKI's association with increased inpatient hospital mortality accurately.
Srisawat, 2015 ¹⁴	United States of America (USA)	Retrospective cohort study	15,132 critically ill patients	The study revealed differences in unadjusted and adjusted rates of acute kidney injury (AKI) and hospital mortality among the various medical facilities. Further research is needed to determine if these variations are attributable to clinical practices, care procedures, or residual confounding caused by unexamined factors.
Neyra, 2018 ¹⁵	USA	Retrospective cohort study	2,632 adult patients admitted to the ICU with severe sepsis or septic shock	In critically ill and septic patients with CKD, stage 1 AKI did not confer an increased risk of adverse outcomes. AKI stage 2 in CKD patients and any level of AKI in non-CKD patients were significantly and autonomously associated with adverse effects. Sepsis-associated stage 1 acute kidney injury (AKI) in chronic kidney disease (CKD) may have a distinct pathophysiology characterized by a higher incidence of prerenal causes and less severe intrinsic damage. Further research is required.

Srisawat et al. (2015)¹⁴ reported that 32% of critically ill patients fulfilled the serum creatinine criteria for AKI. The AKI odds ratio exhibited variability among centers, accompanied by a crude hospital mortality rate of 27%. AKI severity was linked to higher center-specific mortality risk.

Neyra et al. (2018)¹⁵ reported a 46% prevalence of CKD and a 57% incidence of AKI. The adjusted hazard ratios for 90-day mortality were higher in individuals with no-CKD/AKI stages ≥ 2 (2.4) and CKD/AKI stages ≥ 2 (2.2) compared to those with no-CKD/AKI stage 1 (1.5). A comparable pattern was noted for incident/progressive CKD over a median follow-up period of 15.3 months.

DISCUSSION

Patients with severe chronic kidney disease (CKD) encounter distinctive management challenges, and providing optimal care in intensive care units (ICUs) is uncertain, necessitating fair and impartial consideration.^{16,17}

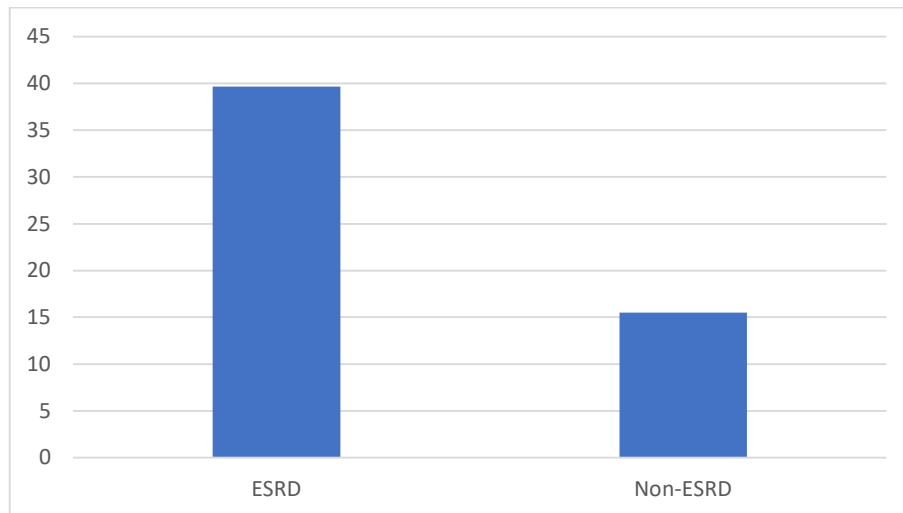


Figure 2. ESRD treatment rates in patients admitted to the ICU

Cardiogenic pulmonary edema is a leading cause of ICU admission among patients with end-stage renal disease, resulting in heightened cardiac arrhythmias.^{13,18}

This article examines non-conventional risk factors associated with cardiovascular disease, such as left ventricular hypertrophy, electrolyte imbalances, QT prolongation, and heightened sympathetic activity. Sepsis significantly contributes to ICU admissions, and ESRD patients exhibit increased mortality rates. Nephrology services are essential for managing end-stage renal disease (ESRD) in the intensive care unit (ICU).^{17,19}

Renal disease may result in respiratory complications, necessitating mechanical ventilation assistance due to the interplay between the kidneys and lungs. Chronic and end-stage renal disease is frequently associated with respiratory conditions such as restrictive or obstructive abnormalities, pleural disease, lung calcification, sleep apnea, and hypoxemia. Nonadherence to diet, wrong prescription, and skipped dialysis sessions heighten the likelihood of acute cardiorenal syndrome and pulmonary edema.²⁰

Acute kidney injury may result in inflammation and lung pathophysiology. Mechanical ventilation can modify alveoli permeability and aquaporin expression, which may lead to lung complications.^{17,19}

Hemodynamic, neurological, and hormonal factors can adversely affect renal perfusion and excretory function. This results in reversible oliguria and exacerbation of edema.²¹ Finally, mechanical ventilation has been linked to ventilator-induced lung injury (VILI), which can produce a systemic inflammatory cascade that ultimately harms the kidneys.^{17,19}

Mechanical ventilation weaning delays may result from acute kidney injury, chronic kidney disease (CKD), or end-stage renal disease (ESRD). Additionally, acute respiratory distress syndrome (ARDS) is a critical type of respiratory failure.^{18,22}

CONCLUSION

Research shows that patients treated in the ICU mostly have a higher stage of kidney disease. It is also associated with patient mortality.

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