



Risk Factors and Clinical Course of Patients with Acute Kidney Injury: A Systematic Literature Review

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ABSTRACT

Acute kidney injury (AKI) is a serious health problem and can be life-threatening if not treated quickly and appropriately. There are several risk factors that can increase a person's chances of experiencing AKI. This study aimed to carry out a systematic review to explore the risk factors for acute kidney injury and the clinical course of acute kidney injury. The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding risk factors and clinical overview of acute kidney injury. The search was performed using the terms: (1) "risk factors" OR "Clinical" OR "symptoms" OR "sign" AND (2) "acute kidney injury". There are several risk factors that can increase a person's chances of experiencing acute kidney injury (AKI). These factors can be intrinsic (inside the patient's body) or extrinsic (outside the patient's body). Patients with heart disease or other blood vessel diseases have a higher risk of developing AKI. Cardiovascular risk factors such as high blood pressure, coronary artery disease, heart failure, or chronic kidney disease can contribute to the development of AKI. In conclusion, acute kidney injury is caused by intrinsic and extrinsic risk factors. While the clinical course of patients with acute kidney injury begins with the prerenal, intrinsic, oliguric, diuretic, and recovery phases.

1. Introduction

Acute kidney injury (AKI) is a condition that occurs when kidney function suddenly decreases or is interrupted. This can result in a buildup of waste and fluids in the body, as well as serious electrolyte imbalances. AKI is a serious health problem and can be life-threatening if not treated quickly and appropriately. There are several risk factors that can increase a person's chances of experiencing AKI. These factors can be intrinsic (inside the patient's body) or extrinsic (outside the patient's body). Several intrinsic risk factors include advanced age, a history of chronic kidney disease, hypertension, diabetes mellitus, heart disease, and liver disease. In addition, the use of certain drugs such as NSAIDs (non-steroidal anti-inflammatory drugs), diuretics, or contrast

medications may also increase the risk of developing AKI.¹⁻⁴

The symptoms that appear in AKI patients can vary, depending on the severity and cause. Some of the common symptoms include decreased urine production, fluid retention leading to swelling, fatigue, confusion, nausea and vomiting, and disturbances in the cardiovascular system. The physical exam may also reveal signs such as high or low blood pressure, edema, and abnormal breath sounds. Accurate clinical judgment is essential in the diagnosis and treatment of AKI. Diagnosis is usually based on a physical examination, the patient's medical history, and the results of laboratory tests such as measurements of blood levels of creatinine and urea. Additional tests, such as a kidney ultrasound or kidney biopsy, may be

needed to determine the exact cause of AKI.⁵⁻⁸ This study aimed to carry out a systematic review for exploration factor risk of acute kidney injury and the clinical course of acute kidney injury.

2. Methods

The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding risk factors and clinical overview of acute kidney injury. The search was performed using the terms: (1) " risk factors " OR " Clinical " OR " symptoms " OR " sign " AND (2) " acute kidney injury ". The literature is limited to clinical studies and published

in English. The literature selection criteria are articles published in the form of original articles, an observational study about risk factors, and a clinical overview of acute kidney injury, the control group only received liquid without therapeutic effect or no treatment, and studies were conducted in a timeframe from 2000-2023, and the main outcome was risk factors and clinical overview of acute kidney injury. Meanwhile, the exclusion criteria were studies that were not related to risk factors and clinical overview of acute kidney injury, the absence of a control group, and duplication of publications. This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations.

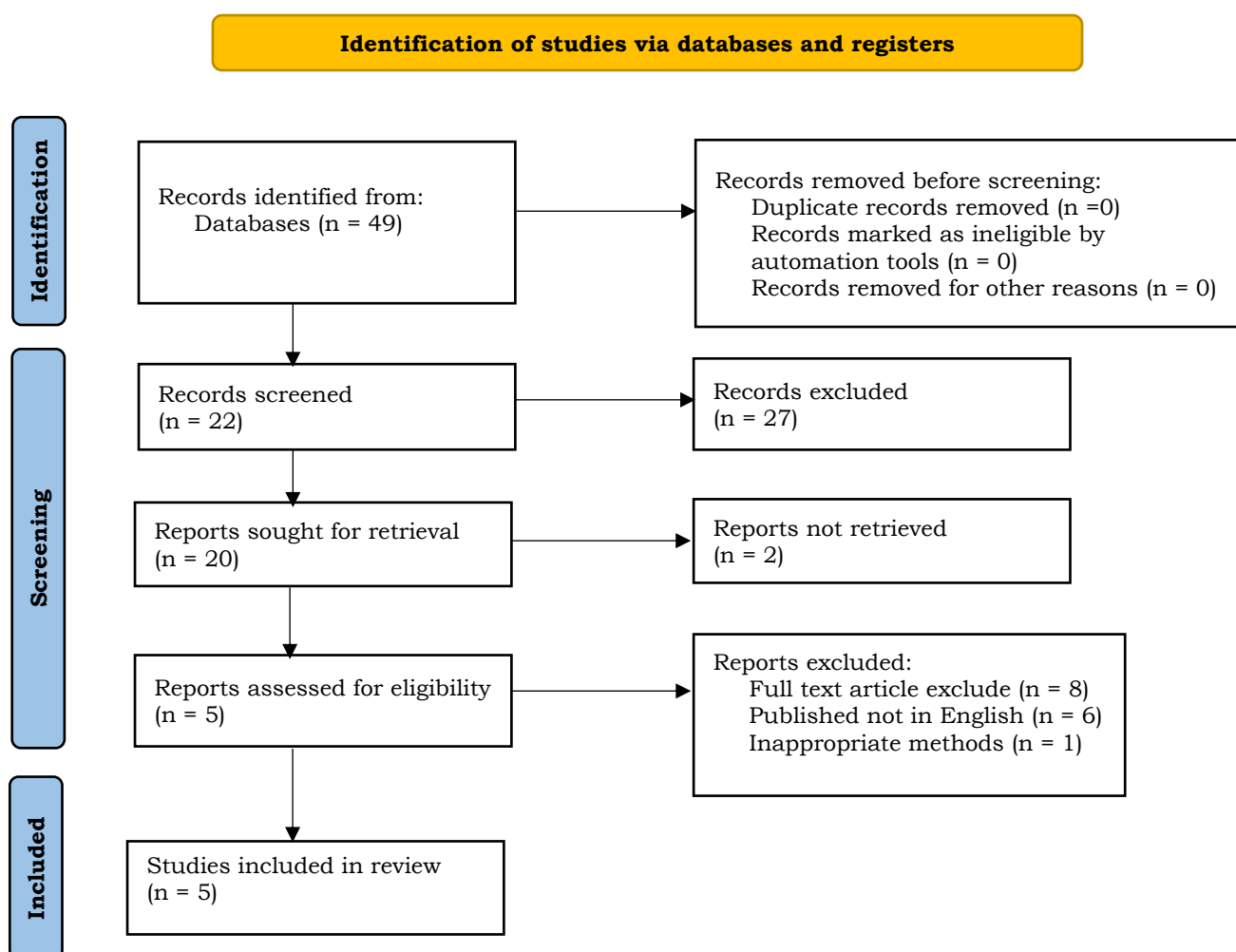


Figure 1. Research PRISMA diagram.

3. Results and Discussion

Risk factors for acute kidney injury

There are several risk factors that can increase a person's chances of experiencing acute kidney injury (AKI). These factors can be intrinsic (inside the patient's body) or extrinsic (outside the patient's body). Patients with heart disease or other blood vessel diseases have a higher risk of developing AKI. Cardiovascular risk factors such as high blood pressure, coronary artery disease, heart failure, or chronic kidney disease can contribute to the development of AKI.^{9,10}

Diabetes mellitus is a significant risk factor for AKI. High blood sugar levels in the long term can cause damage to the small blood vessels in the kidneys and affect kidney function. Uncontrolled high blood pressure can damage the blood vessels in the kidneys and cause AKI. Severe infections, especially urinary tract infections or systemic infections causing sepsis, can cause kidney damage and AKI. Sepsis is the body's exaggerated response to infection and can impair blood flow to the kidneys.¹¹⁻¹³

Significant loss of body fluids, whether due to disease, excessive fluid loss, or not drinking enough, can cause decreased blood flow to the kidneys and, eventually, AKI. Several drugs can contribute to the risk of AKI. Examples are non-steroidal anti-inflammatory drugs (NSAIDs), aminoglycosides (antibiotics), diuretics, contrast drugs used in imaging procedures, and some chemotherapy drugs. The risk of AKI increases with age. Kidney function can decline with aging, and elderly patients tend to have more risk factors such as heart disease, diabetes, or hypertension. Severe physical injuries, such as injury to the kidneys or significant blood loss, can cause AKI.¹⁴⁻¹⁶

The clinical course of acute kidney injury

The clinical course of acute kidney injury (AKI) can vary depending on the cause, severity, and response to treatment. The prerenal phase occurs when blood flow to the kidneys is disrupted, for example, due to dehydration, blood loss, or a drop in blood pressure.

The kidneys do not receive enough blood supply, so kidney function is impaired. At this stage, the kidneys still have the ability to recover if normal blood flow is restored. The intrinsic phase is a condition where the kidney is directly damaged, either due to toxins, infection, obstruction, or damage to the structure of the kidney. The damage impairs the ability of the kidneys to filter and remove waste from the blood. At this stage, the patient may experience increased blood creatinine levels and decreased urine output.^{17,18}

The oliguric phase is a condition in which the patient experiences a significant decrease in urine production. The volume of urine produced is usually less than 400 ml per day. This condition can cause a buildup of waste and fluids in the body, which can result in swelling (edema), high blood pressure, electrolyte disturbances, and metabolic acidosis. The diuretic phase is a condition where the patient begins to produce urine in larger quantities compared to the oliguric phase. Despite the increased urine volume, the kidneys are still not fully recovered, and kidney function is still impaired. The patient may still need intensive medical care and supervision. The recovery phase is where kidney function begins to improve gradually. Urine production increases, and blood levels of creatinine and urea begin to decrease. This recovery process can take varying amounts of time, depending on the degree of kidney damage and the cause of AKI. It is important to remember that not all patients follow these stages in a linear fashion, and the clinical course of AKI may vary between individuals.^{19,20}

4. Conclusion

Acute kidney injury is caused by intrinsic and extrinsic risk factors. While the clinical course of patients with acute kidney injury begins with the prerenal, intrinsic, oliguric, diuretic, and recovery phases.

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