International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

Meta-analysis of berberine (Berberine) in an animal model of kidney injury

INPLASY202530043

doi: 10.37766/inplasy2025.3.0043

Received: 11 March 2025

Published: 11 March 2025

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ADMINISTRATIVE INFORMATION

Support - No.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202530043

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 11 March 2025 and was last updated on 11 March 2025.

INTRODUCTION

Review question / Objective In comparison to control treatments alone, what impact does berberine have on kidney injury in animal models? Specifically, we aim to evaluate the efficacy of berberine in improving renal function and reducing injury markers compared to untreated or placebo groups in various animal studies.

Condition being studied Kidney injury is a significant health concern globally, often resulting from various factors such as diabetes, hypertension, and toxins. Current interventions include pharmacological treatments and lifestyle modifications; however, they may not fully restore renal function or prevent progression. Berberine, a natural compound derived from several plants, has shown promise in preclinical studies for its nephroprotective effects. This meta-analysis aims to synthesize existing animal studies to evaluate the efficacy of berberine as a potential therapeutic agent for kidney injury.

METHODS

Participant or population Inclusion: Animal models of kidney injury induced by various methods, including chemical agents, ischemia, or diabetes. Exclusion: Studies using non-animal models, such as in vitro studies or human clinical trials.

Intervention Berberine administration defined as different dosages and routes of administration (oral, intraperitoneal, etc.) in animal models. Inclusion criteria will focus on studies evaluating the effects of berberine on renal function, injury markers, and histopathological changes. Exclusion criteria will include studies that do not provide specific dosage details or lack relevant outcome measures related to kidney injury.

Comparator The control group will consist of untreated animal models of kidney injury, or those receiving a placebo treatment. Inclusion criteria will include studies that utilize a control group for

comparison, while exclusion criteria will include studies without a control group or those focusing solely on observational data without any treatment comparison.

Study designs to be included We will include randomized controlled trials (RCTs) and observational studies (including cohort and case-control studies) that evaluate the effects of berberine on kidney injury in animal models. Exclusion criteria will encompass studies that do not utilize animal models, studies without a comparator group, and studies published before 2000 or not in English.

Eligibility criteria We will include randomized controlled trials (RCTs) and observational studies (including cohort and case-control studies) that evaluate the effects of berberine on kidney injury in animal models. Exclusion criteria will encompass studies that do not utilize animal models, studies without a comparator group, and studies published before 2000 or not in English.

Information sources In order to facilitate the retrieval and replication of this study by international researchers and to produce objective and accurate results, only English databases of overall high quality articles were searched. The databases PubMed, Web of Science, Cochranelibrary, Ovid and Embase were used to search for relevant studies from the time the databases were created until December 2024. Diseases and intervening drugs were identified using a combination of web and free text terms: 'Acute KiAKIey Injury', 'Acute KiAKIey Injuries', “KiAKIey Injury, Acute”, ‘Berberine’, ‘Umbellatine’.

Main outcome(s) The primary outcome of this review will be the assessment of renal function in animal models of kidney injury, measured through serum creatinine levels and histological evaluation of renal tissues. These measurements will be taken at baseline and at the conclusion of the treatment period. Measures of effect will include mean differences in serum creatinine levels and histopathological scores between the berberine-treated and control groups.

Quality assessment / Risk of bias analysis Two review authors will independently assess the risk of bias in included studies using the Cochrane Risk of Bias tool. The assessment will include evaluations of randomization, blinding, and completeness of outcome data. Disagreements between the review authors regarding the risk of bias in specific studies will be resolved by discussion, with a third review author involved when necessary. The level of risk of bias in each of these domains will be presented separately for each study in tables in the final review publication.

Strategy of data synthesis The titles and abstracts of studies retrieved using the search strategy and those from additional sources will be screened independently by two review authors to identify studies that potentially meet the inclusion criteria outlined above. The full text of these potentially eligible studies will be retrieved and independently assessed for eligibility by the two review authors, who will be blinded to each other's decisions. Any disagreement between the two review authors over the eligibility of particular studies will be resolved through discussion with a third review author.We will use RevMan software to merge and analyze the extracted data. First, we will assess the heterogeneity of the studies using the I^2 statistic. If the I^2 is greater than 50%, we will opt for a random-effects model; otherwise, we will use a fixed-effects model. We will also conduct sensitivity analyses to explore the robustness of our findings. Additionally, we will assess publication bias using funnel plots and Egger's test. Data will be synthesized to provide a comprehensive overview of the effects of berberine on kidney injury across the included studies.

Subgroup analysis No.

Sensitivity analysis We will use a fixed-effects model. We will also conduct sensitivity analyses to explore the robustness of our findings. Additionally, we will assess publication bias using funnel plots and Egger's test. Data will be synthesized to provide a comprehensive overview of the effects of berberine on kidney injury across the included studies.

Country(ies) involved China.

Keywords Berberine; Acute kidney injury; Renal function;Meta-analysis.

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