

A Comprehensive Systematic Review of Risk Factor and Management Approach of Gout Arthritis in General Practice

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ABSTRACT

Background: Gout arthritis is a chronic inflammatory joint disease caused by the accumulation of monosodium urate (MSU) crystals. The main factor that triggers the formation of MSU crystals is high serum uric acid levels (hyperuricemia). This systematic review aims to identify and analyze the risk factors, management, and prevention of gout arthritis based on literature published in the last ten years. **Methods:** This study followed the PRISMA 2020 standard, examining English-language literature from 2015 to 2025. This study excluded editorials, reviews from the same journal, and submissions without DOI. PubMed, SagePub, SpringerLink, and Google Scholar were used as literature sources. **Results:** Initially obtaining 360 articles from online databases (PubMed, SagePub, SpringerLink, and Google Scholar), eight relevant papers were selected after three rounds of screening for full-text analysis. **Conclusions:** Treatment of gouty arthritis is done through a combination of pharmacological therapy and lifestyle changes. Prevention involves managing risk factors such as hypertension, obesity, and alcohol consumption. Education and appropriate long-term treatment can reduce attacks and improve the patient's quality of life.

Keywords: gout, inflammation, arthritis, urate crystals, hyperuricemia

INTRODUCTION

Gout arthritis is a chronic inflammatory joint disease caused by the accumulation of monosodium urate (MSU) crystals. The main factor that triggers the formation of MSU crystals is high serum uric acid levels (hyperuricemia). Uric acid itself is an intermediate product in purine metabolism, most of which is excreted through the kidneys and a small part through the digestive tract. An imbalance between uric acid production and excretion can cause hyperuricemia, which contributes to the development of gout. In addition, urate accumulation and activation of the NLRP3/NALP3 inflammasome by MSU crystals play a role in the pathogenesis of gout. However, only about 10% of individuals with high uric acid levels eventually develop gout, indicating that other factors also play a role in the development of this disease.^{1,2}

The prevalence of gout varies globally, ranging from less than 1% to 6.8%, with an incidence rate of 0.58 to 2.89 per 1000 people per year. This

figure continues to increase and varies between countries, regions, and ethnic groups. The burden of gout is greater in developed countries than in developing countries, not only in terms of incidence but also in economic terms. Medical costs increase with disease progression, while non-economic impacts include activity limitations, disability, and severe pain.^{3,4}

Several factors have been identified as the cause of gout, including diet, genetics, and the environment. High-purine diet, alcohol, and obesity are the major known risk factors. Genetics also play a role, with several genetic variants associated with impaired uric acid metabolism and increased risk of gout. In addition, environmental factors such as temperature, humidity, and air pollution have been increasingly associated with the development and recurrence of gout. Seasonal variations in the incidence of gout in different countries, as well as findings that air pollutants such as PM10 can trigger acute gout attacks, have been reported.^{5,6}

Treatment of gout focuses on controlling uric acid levels and managing acute inflammation. First-line treatment for acute gout attacks includes nonsteroidal anti-inflammatory drugs (NSAIDs), colchicine, and corticosteroids. Long-term therapy aims to lower uric acid levels with medications such as allopurinol and febuxostat. Treatment also includes lifestyle modifications, such as weight loss, a low-purine diet, and alcohol avoidance to reduce the risk of recurrence.^{7,8}

Gout prevention strategies include a multifactorial approach that targets key risk factors. Weight control, a healthy diet, and management of comorbidities such as hypertension and metabolic syndrome are important steps in preventing gout. In addition, regular monitoring of uric acid levels can help identify high-risk individuals so that intervention can be carried out earlier.^{9,10}

Further research is needed to understand the interactions between genetic, metabolic, and environmental factors in the pathogenesis of gout. A more in-

depth evaluation of the impact of environmental factors, such as climate change and air pollution, may provide new insights into gout prevention and treatment strategies.¹¹ This systematic review aims to identify and analyze risk factors, management, and prevention of gouty arthritis based on literature published over the past ten years.

METHODS

Protocol

The authors followed the guidelines set out in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 closely to ensure that the study met all established standards. The selection of this methodological approach aims to ensure the accuracy and reliability of the conclusions drawn from the research results.

Eligibility Criteria

This systematic review aims to identify and analyze the risk factors, management, and prevention of gouty arthritis based on literature published over the past ten years. This

study conducted a comprehensive analysis of data from the existing literature, with the hope of providing in-depth insights and improving patient management strategies. The main objective of this study is to highlight the collective significance of the key points that have been identified.

The inclusion criteria for this study include: 1) Articles must be written in English; and 2) Articles must be published between 2014 and 2024. Meanwhile, the exclusion criteria include: 1) Editorials; 2) Articles that do not have a DOI; 3) Previously published review articles; and 4) Duplicate entries in the journal.

Search Strategy

The keywords used in this study include gout, inflammation, arthritis, urate crystals, hyperuricemia. The use of Boolean MeSH keywords inputted into the database for this study is as follows: ("Gout" AND "Inflammation" AND "Arthritis" AND "Urate crystals" AND "Hyperuricemia") AND (y_10[Filter]).

Data retrieval

The authors assessed the studies by reviewing abstracts and titles to determine eligibility, and selecting relevant studies based on their suitability to the inclusion criteria and the research objectives. Consistent patterns across studies led to strong conclusions. Selected articles had to meet the eligibility criteria, namely being written in English and available in full text.

This systematic review only included literature that met all pre-determined inclusion criteria and was directly related to the topic under study. Studies that did not meet these criteria were systematically excluded, and their findings were not considered. Further analysis included details revealed during the research process, including title, authors, publication date, location, study methodology, and parameters used.

Data Quality Assessment and Synthesis

Each author independently evaluated the research contained in the publication titles and abstracts to determine which articles were worthy

of further exploration. The next stage involved assessing all articles that met the predetermined inclusion criteria for inclusion in the review. Decisions regarding inclusion of articles in the

review were based on the findings obtained during this evaluation process.

Table 1. Article Search Strategy

Database	Strategy Search	Hits
Pubmed	("Gout" AND "Inflammation" AND "Arthritis" AND "Urate crystals" AND "Hyperuricemia")	100
Science Direct	("Gout" AND "Inflammation" AND "Arthritis" AND "Urate crystals" AND "Hyperuricemia")	150
Sagepub	("Gout" AND "Inflammation" AND "Arthritis" AND "Urate crystals" AND "Hyperuricemia")	50
Google Scholar	("Gout" AND "Inflammation" AND "Arthritis" AND "Urate crystals" AND "Hyperuricemia")	160

Table 2. JBI *Critical appraisal of study*

Parameter	Janssens (2017)	Liu (2022)	McCormick (2020)	Zhang (2022)	Sapphire (2020)	Landgren (2021)	Shekelie (2017)	The Last Supper (2018)
1. Related bias order time Whether in study This clear what is the “ cause ” and what is the “ effect ” (i.e. , not There is confusion about which variables appear moreover formerly)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Related bias selection and allocation Whether there is group control ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Related bias factor confounding Whether participants involved in comparison own similar characteristics ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Related bias giving intervention / exposure Whether participants involved in comparison accept similar care / action , other than exposure or intervention that becomes focus study ?	No	No	No	No	No	No	No	No
5. Related bias assessment , detection , and measurement results Whether there is several measurements results , good before and also after intervention / exposure ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Whether results from participants involved in comparison measured with the same way ?	No	No	No	No	No	No	No	No
Whether results measured with reliable way ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Related bias retention participant Whether act carry on done in a way complete and, if no , is it difference between group in matter act carry on explained and analyzed with adequate ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Validity conclusion statistics Whether analysis statistics used Already in accordance ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

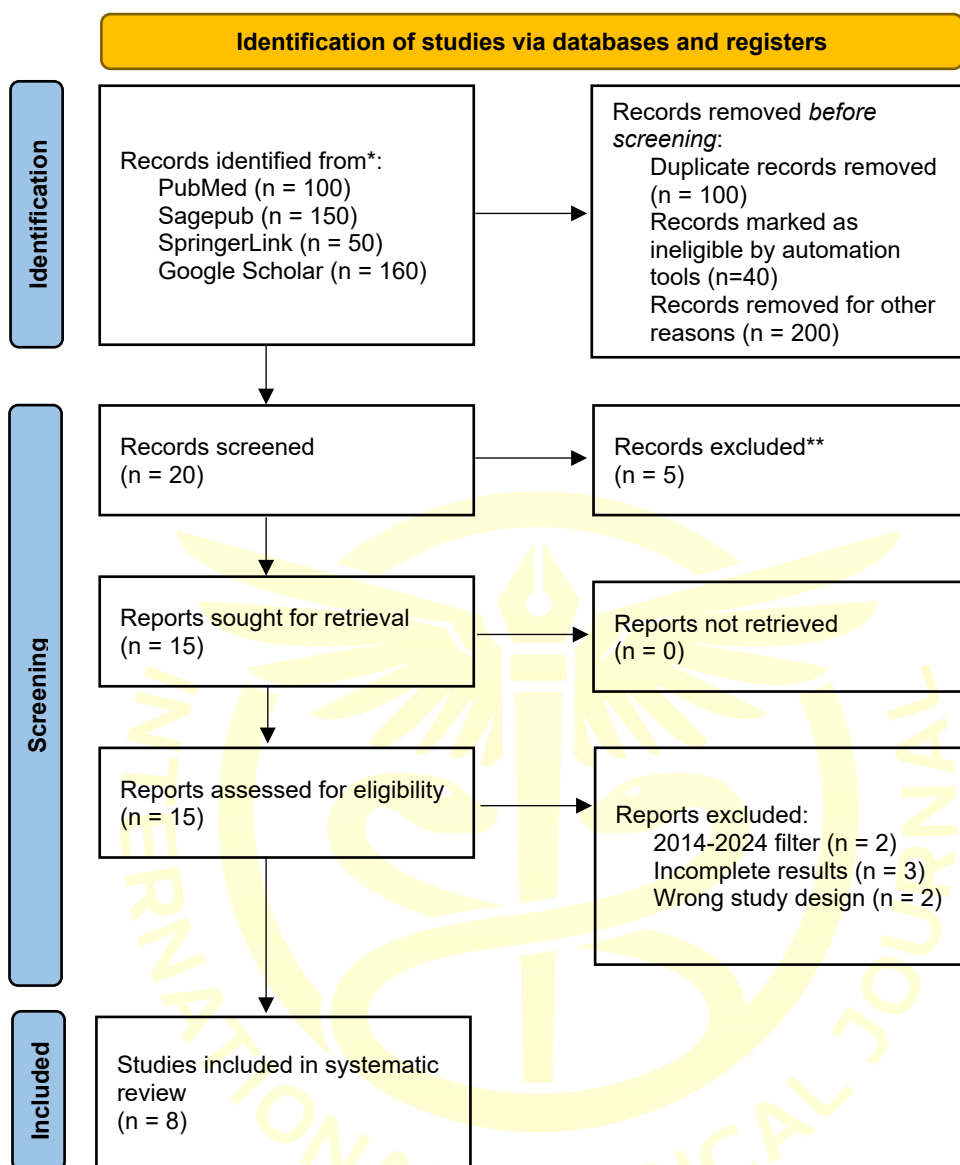


Figure 1. Article search flow (PRISMA 2020)

RESULT

The initial number of articles obtained from online databases (PubMed, SagePub, SpringerLink, and Google Scholar) was 360 articles. After three-stage screening, eight articles directly related to this systematic review were selected for further assessment through full-text reading and analysis. Table 1 presents the selected literature included in this analysis.

Table 3. Literature analyzed in the study

No .	Author	Origin	Method	Sample	Results
1.	Janssens, et al. ¹² (2017)	Dutch	Retrospective cohort	2655	Gout patients were more likely to have hypertension, diabetes, hypercholesterolemia, and a history of cardiovascular disease compared to controls ($P < 0.01$), while rheumatoid arthritis patients showed no significant difference ($P > 0.05$). After adjustment, the risk of cardiovascular disease was increased in gout (HR 1.44) and rheumatoid arthritis (HR 2.06) patients. Gout and rheumatoid arthritis are independent risk factors for cardiovascular disease. Gout patients have a high risk from the initial diagnosis, so these two diseases need to be included in cardiovascular risk management guidelines in primary care.
2.	Liu, et al. ¹³ (2022)	US	Retrospective cohort	652881	Hypertension increases the risk of gout (RR 2.12), with every 5-unit increase in BMI increasing the risk 1.48-fold, and every additional 10 g/day of alcohol increasing the risk 1.21-fold. BMI, hypertension, and alcohol contributed 53.58%, 13.85%, and 12.66% of gout cases,

					respectively, with a total combined contribution of 65.05%. Hypertension, excess BMI, and high alcohol consumption were responsible for approximately 65% of gout cases in the US in 2019. Reducing these factors can significantly reduce the incidence of gout.
3.	McCormick, et al. ¹⁴ (2020)	US	Prospective cohort	44654	Of 44,654 men (mean age 54 years) without a history of gout, 3.9% developed gout during the 26-year follow-up. Overall, 77% of gout cases could have been prevented by managing BMI, diet, alcohol consumption, and diuretic use. In normal-weight and overweight men, the combination of the DASH diet, no alcohol, and no diuretics prevented 69% and 59% of gout cases, respectively. However, in obese men, prevention was only 5% and not significant. Reducing adiposity and other risk factors could prevent most cases of gout in men. However, obese men may not benefit without weight loss.
4.	Zhang, et al. ¹⁵ (2022)	China	Retrospective cohort	416,481	A healthy lifestyle is associated with a reduced risk of gout and may reduce the impact of genetic factors on the disease by up to one-third. During follow-up (median 12.1 years), 6206 participants developed gout. The risk of gout increased with genetic factors: compared with low genetic risk, participants with intermediate genetic risk had a hazard ratio (HR) of 1.44 (95% CI, 1.35–1.54) and high genetic risk had an HR of 1.77

					(95% CI, 1.66–1.89). Conversely, a healthy lifestyle decreased the risk of gout, with HRs of 0.63 (95% CI, 0.59–0.67) for a favorable lifestyle and 0.79 (95% CI, 0.75–0.85) for an intermediate lifestyle compared with an unfavorable lifestyle. Pooled effects analysis showed that the highest risk of gout was found in participants with both high genetic predisposition and an unhealthy lifestyle (HR 3.12; 95% CI, 2.79–3.52). However, even in individuals at high genetic risk, adoption of a healthy lifestyle reduced the risk of gout to HR 1.98 (95% CI, 1.75–2.24).
5.	Safiri, et al. ¹⁶ (2020)	Multicenter	Retrospective cohort	41.2 m	In 2017, there were an estimated 41.2 million cases of gout worldwide, with 7.4 million new cases per year and nearly 1.3 million years lived with disability (YLD). The global prevalence and annual incidence of gout were 510.6 and 91.8 cases per 100,000 population, respectively, increasing by 7.2% and 5.5% since 1990. The burden of gout is higher in men and increases with age. Gout is more common in developed countries, with the highest prevalence in New Zealand, Australia, and the US. The largest increases in cases between 1990 and 2017 occurred in the US (34.7%), Canada (28.5%), and Oman (28.0%). The main risk factors for gout are high body mass index (BMI) and impaired kidney function, which

					contributed 32.4% and 15.3% of total YLDs, respectively, especially in men. Globally, the burden of gout continues to increase, highlighting the importance of prevention and health promotion. Public education about risk factors, disease impacts, and effective treatment options, particularly for high-risk groups such as middle-aged men, is an important step in reducing the global burden of this disease.
6.	Landgren, et al. ¹⁷ (2021)	Sweden	Case control study	138,678	Patients with gout had a 60% higher risk of nephrolithiasis (NL) compared to the control group (IRR: 1.60; 95% CI: 1.47–1.74). The incidence of NL in gout patients was 6.16 per 1000 person-years, higher than the control group (3.85 per 1000 person-years). Most predictive factors for NL were similar between the two groups, except losartan which increased the risk of NL only in controls (HR = 1.49; 95% CI: 1.03–2.14). Loop diuretics decreased the risk of NL by 30–34% in both groups. Significant risk factors for NL in gout patients included male sex, diabetes, and obesity, whereas in controls, the main risk factors were male sex and kidney disease.
7.	Shekelie, et al. ¹⁸ (2017)	US	RCT	28	Strong evidence from 28 trials (3 of which used placebo) suggests that colchicine, NSAIDs, and corticosteroids are effective in reducing pain in patients with

					acute gout. Moderate-strength evidence suggests that low-dose colchicine is as effective as high-dose colchicine but causes fewer gastrointestinal side effects. In addition, urate-lowering therapy (such as allopurinol or febuxostat) may reduce the risk of acute gout attacks in the long term after 1 year or more. Preventive treatment with daily colchicine or NSAIDs may reduce the risk of acute gout attacks by up to 50% in patients who start urate-lowering therapy, with prophylaxis preferably lasting longer than 8 weeks. Although lower urate levels reduce the risk of recurrent attacks, targeted therapy for specific urate levels has not been tested.
8.	Kanawal, et al. ¹⁹ (2018)	Pakistan	Retrospective cohort	2018	Strong evidence from 28 trials (3 of which used placebo) suggests that colchicine, NSAIDs, and corticosteroids are effective in reducing pain in patients with acute gout. Moderate-strength evidence suggests that low-dose colchicine is as effective as high-dose colchicine but causes fewer gastrointestinal side effects. In addition, urate-lowering therapy (such as allopurinol or febuxostat) may reduce the risk of acute gout attacks in the long term after 1 year or more. Preventive treatment with daily colchicine or NSAIDs may reduce the risk of acute gout attacks by up to 50% in patients starting urate-lowering therapy, with prophylaxis preferably lasting longer than 8 weeks.

DISCUSSION

Gout arthritis is a disease caused by high levels of uric acid in the blood that forms crystals in the joints. The main risk factors for gout include hypertension, obesity, alcohol consumption, and impaired kidney function. Research by Janssens, et al. (2017) revealed that gout patients often have hypertension, diabetes, hypercholesterolemia, and a history of cardiovascular disease higher than controls ($P < 0.01$).¹² Liu, et al. (2022) also found that hypertension increases the risk of gout with a risk ratio (RR) of 2.12, and high BMI and excessive alcohol consumption each contribute 53.58% and 12.66% to the incidence of gout.¹³ In addition, genetic factors also play a role, with individuals who have high genetic risk and unhealthy lifestyles having a higher risk of gout.

¹⁵

Gout arthritis occurs when uric acid crystals deposit in the joints, causing painful inflammation. This condition is often triggered by high levels of uric acid in the blood, which can come from consuming foods rich in purines, such as red meat and

alcohol, as well as impaired kidney function that reduces the excretion of uric acid. The pathogenesis begins when monosodium urate crystals form and deposit in the joints, triggering an inflammatory reaction involving leukocytes and the release of inflammatory cytokines. This process ultimately causes severe pain, redness, and swelling in the affected joints.¹³

Pharmacological management for gouty arthritis consists of therapy to reduce acute pain and prevent gout attacks. To overcome acute pain, drugs such as colchicine, NSAIDs, and corticosteroids are very effective. Research by Shekelie, et al. (2017) showed that colchicine, NSAIDs, and corticosteroids can reduce pain in patients with acute gout. In addition, urate-lowering therapy such as allopurinol or febuxostat is used to lower uric acid levels and prevent future gout attacks. Evidence also shows that low-dose colchicine is as effective as high-dose, but with fewer gastrointestinal side effects.¹⁸

In addition to pharmacological treatment, non-pharmacological management is also

important in the management of gouty arthritis. Lifestyle modifications, including dietary changes and exercise, can reduce the frequency of gout attacks. Avoiding foods high in purines, such as red meat and seafood, and reducing alcohol consumption can help lower blood uric acid levels. Weight loss can also reduce the risk of gout attacks, especially in obese individuals, as found by McCormick, et al. (2020), who stated that BMI management can prevent most cases of gout in men.¹⁴

Prevention of gouty arthritis includes a healthy lifestyle approach that can reduce the risk of developing the disease. Zhang, et al. (2022) revealed that a healthy lifestyle can reduce the risk of gout, even in individuals with a high genetic predisposition. Prevention of gout attacks can be done by using colchicine or NSAIDs regularly in patients starting urate-lowering therapy.¹⁵ A study by Shekelle, et al. (2017) showed that daily prevention with colchicine or NSAIDs can reduce the risk of acute gout attacks by up to 50%. The recommended

duration of prevention is more than 8 weeks for optimal effectiveness.¹⁴

Genetic factors play an important role in the development of gouty arthritis. According to Zhang, et al. (2022), individuals with high genetic risk are more likely to develop gout. Although genetic factors are difficult to change, adopting a healthy lifestyle can reduce the impact of genetic factors on the development of this disease. Therefore, a more personalized approach to gout prevention and management needs to be considered, especially for individuals with a family history of this disease.¹⁵

Cardiovascular disease is often found in gout patients, with a higher risk compared to the general population. Janssens, et al. (2017) reported that gout patients have a higher risk of developing cardiovascular disease, with a hazard ratio (HR) of 1.44. Hypertension, obesity, and a history of heart disease are common risk factors found in gout patients. Therefore, it is important for medical professionals to include gout in cardiovascular risk management guidelines, especially in patients with

other risk factors such as diabetes or hypertension.¹²

Prevention of gout is very important, especially in high-risk individuals. Safiri, et al. (2020) stated that the prevalence of gout is higher in men and increases with age. In addition, unhealthy lifestyles, including excessive alcohol consumption and an unbalanced diet, worsen the risk of this disease. Therefore, education about risk factors and the importance of lifestyle changes should be an integral part of gout prevention, especially in high-risk groups such as middle-aged men.¹⁶

Medical therapy for gout aims not only to relieve symptoms but also to prevent recurrent attacks. Urate-lowering therapy with allopurinol or febuxostat is essential in the long-term management of gout. In addition, the use of colchicine or NSAIDs as a preventive measure can reduce the risk of acute gout attacks. With proper management, patients with gout can have a better quality of life and reduce the impact of this disease. With a holistic approach, both pharmacological and non-

pharmacological, as well as proper prevention, gouty arthritis can be managed well, reducing the incidence of attacks and preventing long-term complications.¹⁹

CONCLUSION

Treatment of gouty arthritis is done through a combination of pharmacological therapy and lifestyle changes. Prevention involves managing risk factors such as hypertension, obesity, and alcohol consumption. Education and appropriate long-term treatment can reduce attacks and improve the patient's quality of life.

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