Research Article

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Prevalence And Predictors of Hyperuricemia Among Adults with Chronic Diseases in Ethiopia: A Systematic Review and Meta-Analysis 2025

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ABSTRACT

Introduction: Hyperuricemia has been linked to gout, cardiovascular diseases, resistant hypertension, insulin resistance, chronic kidney disease, and progression of type 2 diabetes mellitus. Current population wide estimates of hyperuricemia are limited; data from related conditions such as gout and other chronic disease indicate a rising trend in both prevalence and disability. So, this study is aimed to estimate pooled prevalence and predictors of hyperuricemia among adult with chronic disease in Ethiopia

Methods: PubMed, Scopus, PsycINFO, and goggle scholar databases were used for this analysis. We assessed methodological quality using the Newcastle-Ottawa Scale. An inverse variance-weighted random-effects model meta-analysis was performed to estimate the pooled prevalence and odds ratio (OR) of determinants with a 95% confidence interval (CI). The I2 test statistic was used to check between-study heterogeneity, and the Egger's regression statistical test was used to check publication bias. A p-value of less than 0.05 used to declare statistical significance.

Results: All ten articles had good methodological quality and included 2917 participants. The prevalence of hyperuricemia ranged from 22-66.1%. The highest prevalence 47.0%; (95% CI: 27.9-, 66.2), was seen in Amhara region and the lowest 31.5%; 95% CI: 12.6-50.5), seen in Oromia region: whereas the pooled prevalence hyperuricemia among adults with chronic disease with a random-effects model was 37.5% (95% CI: 30.6). From extracted variables BMI is significantly associated with hyperuricemia.

Conclusion: Despite of hyperuricemia can be easily diagnosed and largely preventable this study showed that hyperuricemia is highly prevalent among adults with chronic diseases, with more than one-third of patients affected. Also, above-normal BMI showed a significantly associated with hyperuricemia. So early identification and targeted prevention strategies needed to reduce the burden of hyperuricemia and complications on these risky groups.

Keywords: Hyperuricemia, Adult, Chronic Disease, Ethiopia, Systematic Review, Meta-Analysis

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Introduction

Hyperuricemia, defined as an abnormally elevated serum uric acid concentration, usually greater than 6 mg/dL in women and 7 mg/dL in men [1]. Elevated uric acid has been linked to gout, cardiovascular diseases (CVD), resistant hypertension, insulin resistance, chronic kidney disease (CKD), and progression of type 2 diabetes mellitus (T2DM) [2-5] through mechanisms involving oxidative stress, endothelial dysfunction, and inflammation [6-9].

Current global population wide estimates of hyperuricemia are limited, data from related conditions such as gout indicate a rising trend in both prevalence and disability worldwide [10,11]. Also, similar scenario exists with other chronic health conditions [12].

Hyperuricemia has several side effects that have been linked to different chronic diseases. Endothelial dysfunction, oxidative stress, inflammation, and activation of renin-angiotensin systems, encouraging insulin resistance, promotion of vascular smooth muscle proliferation is associated mechanisms with the diseases [13-16].

In developing countries, report of hyperuricemia prevalence shows around 21 % of adults, with substantial gender differences and increasing trends over time [17].

Despite its recognized clinical importance of hyperuricemia, comprehensive national epidemiological data on hyperuricemia remain limited; several institution-based studies have reported relatively high prevalence within specific adult populations in Ethiopia. Examining these patterns is particularly important given the nation's rising chronic disease prevalence and the potential contribution of hyperuricemia to adverse outcomes. Additionally, limited access to diagnostic and preventive health services in Ethiopia may delay identification and management of hyperuricemia and its associated comorbidities, strengthening their clinical impact [18,19].

Therefore, this study aims to determine the prevalence of hyperuricemia and predictors among adults living with chronic diseases in Ethiopia.

Objectives of the Study

- To determine Prevalence of hyperuricemia among adult with chronic disease in Ethiopia
- To identify predictors of hyperuricemia among adult with chronic disease in Ethiopia

Methods and Materials

Study Design

Systematic review and meta-analysis design was conducted to report the study findings.

Search Strategy

To get eligible studies PubMed, Scopus, PsycInfo, and Google scholar data bases were utilized. The Cochrane acronym POCC (population, Outcome, Condition, and Context) was employed to guide the retrieval of studies across different databases, using appropriate medical subject heading (MeSH) terms and Boolean operators "AND" and "OR". The search terms included "hyperuricemia" OR "Uric Acid" OR "AND "Prevalence" OR "Risk Factors" OR Predictors AND "Adult" AND "Chronic Disease" OR comorbidity OR" hypertension" OR diabetes OR "Kidney Diseases" AND "Ethiopia". Additionally, manual searching and references of retrieved articles were reviewed to get additional studies. The researchers used the PRESS evidence-based checklist to asses' electronic search strategy [20] and reported the findings in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) 2020 guidelines [21] (Supplementary file 1).

Eligibility Criteria

- Study period- this study included studies published up to December 2025.
- Study type- this study included all observational studies
- Language -this study included studies published in English languages.
- Population-This study included studies that were conducted among adults with chronic non-communicable disease.
- The study included studies both published and unpublished articles conducted in Ethiopia
- Review articles and studies that did not report the desired outcome will be excluded.

Data Extraction

After finalizing the searching, we conducted data extraction in pairs. The extracted data was recorded in a Microsoft Excel 2013 spreadsheet and included the following information: author's name, publication year, study design, sample size, setting, prevalence of hyperuricemia, and predictors for each specific chronic disease along with their corresponding odds ratios. We focused on extracting variables that were considered factors in more than two studies.

Data Items /Outcome

The primary outcome of this review is to assess the prevalence of hyperuricemia. The secondary outcome is to identify predictors. These factors were determined using the odds ratio (OR), extracted from bivariate analysis of included primary studies.

Study Risk of Bias Assessment /Quality Assessment of Studies

The researchers utilized the modified Newcastle-Ottawa Scale (NOS) for cross-sectional studies to assess the quality of studies. The scale consists of three components: Selection, Comparatively and outcome assessment methods, with a total score of 10 points [22]. Studies that scored five or higher on the NOS were included in the analysis [23]. The quality assessment was independently conducted by the authors, and any discrepancy in the result was resolved through careful examination of the studies by all authors together.

Effect Measures

Proportions were used to measure the effect for the prevalence, while Odds ratio (OR) was used to measure the effect for the risk factors.

Data Analysis and Synthesis Methods

After extracting the eligible studies, the data was exported to Stata software version 14 for analysis. A random-effect model was used due to heterogeneity of studies, which varied across factors such as study setting, patient's characteristics, demographics,

and different risks for the outcome. Heterogeneity among the studies was assessed using Higgin's I2 to quantify between-study heterogeneity and Cochran's Q method to identify significance between-study heterogeneity. An I2 test statistics of <50 was declared as low heterogeneity, 50–75% was moderate, and >75% was high heterogeneity [24]. Subgroup analysis was conducted based on region. The funnel plot and Egger's test were utilized to check for publication bias; while sensitivity analyses were performed to assess robustness of the synthesized results.

Results

Study Selection and Characteristics

The search strategy retrieved a total of 8469 published articles: 4,307 from PubMed, 2451 from Scopus, 1299 from PsycInfo, and 412 from Google Scholar. After removing duplicates using reference management software, 6766 articles remained. Following further screening, 764 articles were assessed for eligibility. Out of these, 754 articles were excluded because they didn't meet the inclusion criteria. Finally, ten studies were included in the analysis (Figure 1).

The ten studies [25-34] included 2917 participants. All of the included studies were cross-sectional studies and the sample size ranged from 218 to 402 [29,30]. Most studies were conducted in Amhara region. Among the included studies, the prevalence of hyperuricemia ranged from 22% [32] to 66.1% [30] (Table 1).

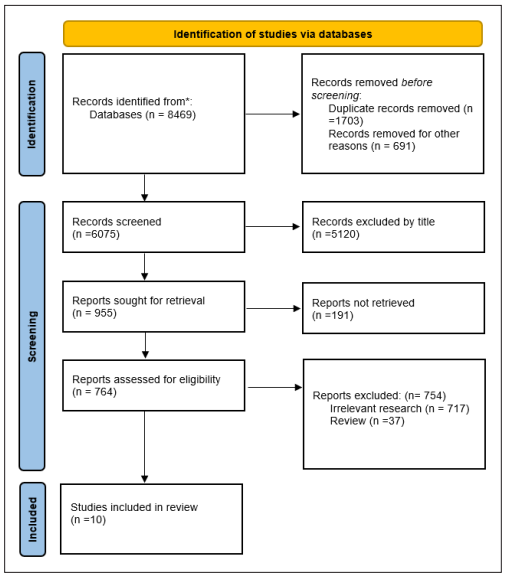


Figure 1: PRISMA flow diagram of study selection for Prevalence of hyperuricemia among adult with chronic disease in Ethiopia

Table 1: Characteristics of the Included Studies in the Systematic Review and Meta-Analysis

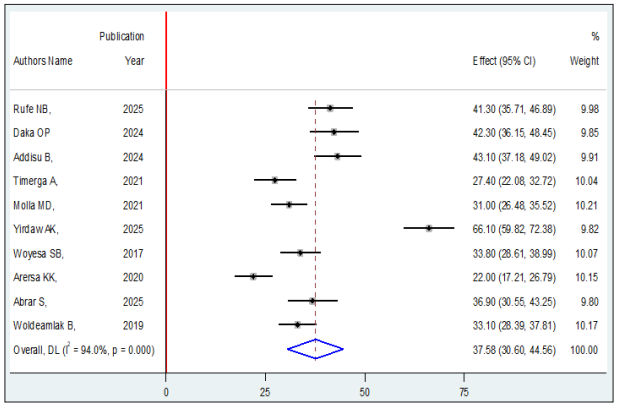
Authors Name	Publication Year	Study area	Study design	Sample size	Prevalence with 95 %CI
Rufe NB,	2025	Fitche	Cross-sectional	298	41.3(35.7-56.8)
Daka OP	2024	Gonder	Cross-sectional	248	42.3(36.1-48.4)
Addisu B,	2024	Mekelle	Cross-sectional	269	43.1(37.1-49.0)
Timerga A,	2021	Wolkite	Cross-sectional	270	27.4(22.0-32.7)
Molla MD,	2021	Addis Ababa	Cross-sectional	402	31(26.4-35.5)
Yirdaw AK,	2025	Gonder	Cross-sectional	218	66.1(59.8-72.3)
Woyesa SB,	2017	Hawassa	Cross-sectional	319	33.8(28.6-38.9)
Arersa KK,	2020	Jimma	Cross-sectional	287	22(17.2-26.7)
Abrar S,	2025	Gurage	Cross-sectional	222	36.9(30.5-43.2)

Systematic Review and Meta-Analysis

Prevalence of Hyperuricemia

A DerSimonian and Laird random-effects model was fitted to determine the pooled effect size.

Accordingly, the pooled prevalence hyperuricemia among adults with chronic disease with a random-effects model was 37.5% (95% CI: 30.6, 44.5) with heterogeneity index (I2) of 94.0% (p <0.001) (Figure 2).

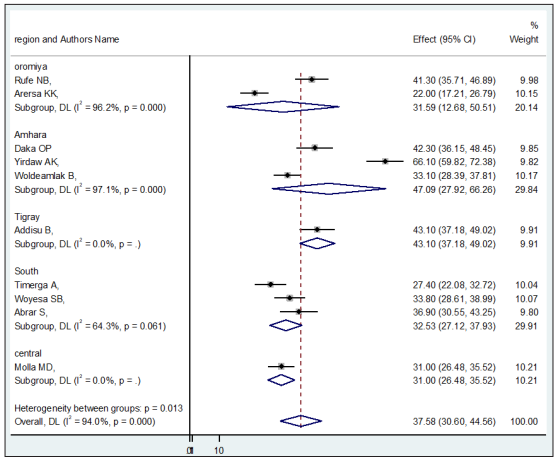


Note: Weights are from random-effects model

Figure 2: Forest plot showing the pooled Prevalence of hyperuricemia among adult with chronic disease in Ethiopia

Heterogeneity and Publication Bias

To adjust and minimize the reported heterogeneity of this study (I2=94.0%); we performed a subgroup analysis based on the region. The subgroup analysis result is only valid for studies conducted more than once in mentioned region. Accordingly, the highest 47.0%; (95% CI: 27.9-, 66.2), I2 = 97.1%) seen in Amhara region and the lowest 31.5%; 95% CI: 12.6-50.5), I2 = 96.2%) seen in Oromia region (Figure 3).



Note: Weights and between-subgroup heterogeneity test are from random-effects model

Figure 3: Subgroup analysis of Prevalence of hyperuricemia among adult with chronic disease in Ethiopia

To identify the source reported heterogeneity of this study (I2=94.0%); meta-regression was conducted using sample size and publication year as a covariate. It was indicated that there is no effect of sample size and publication year on heterogeneity between studies with a P-value of 0.930 & 0.656 respectively.

Furthermore, the presence of publication bias was assessed using Egger's regression test and visual inspection of a funnel plot. Egger's test showed statistically significant evidence of publication bias (0.020). Therefore, trim and fill analysis was performed to determine the final effect size. However, a similar effect size was obtained using the model. The visual inspection of the funnel plot suggested an asymmetrical distribution of studies with studies unevenly distributed around the pooled estimate, suggesting potential publication bias or small-study effects. This asymmetry may reflect between-study heterogeneity or selective publication of results rather than true publication bias alone (Figure 4).

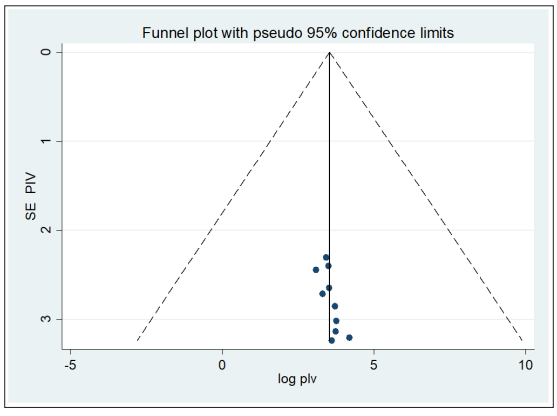


Figure 4: Funnel plot to test publication bias in 10 studies with 95% confidence limits

Sensitivity Analysis

Sensitivity analysis was carried out by removing studies step by step to evaluate the effect of a single study on the overall effect estimate. The result indicated removing a single study did not have a significant influence on pooled prevalence (Figure 5).

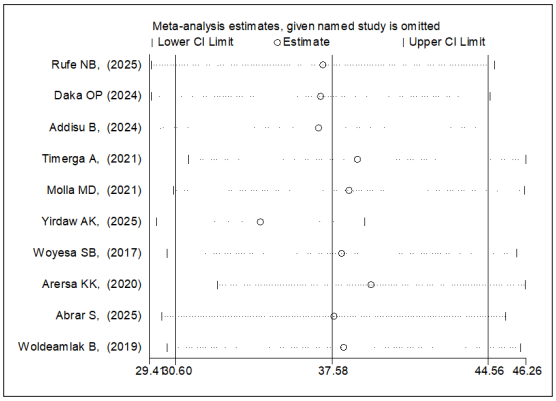


Figure 5: Sensitivity analysis of pooled Prevalence of hyperuricemia among adult with chronic disease in Ethiopia for each study being removed one at a time

Factor Associated Hyperuricemia Among Adults with Cardiovascular Disease

This meta-analysis examined several sociodemographic and behavioral determinants of hyperuricemia. Seven variables were extracted to identify risk factors associated with hyperuricemia among patients with cardiovascular disease: namely age, gender, place of residence, educational status, physical activity, alcohol consumption and body mass index. Age, gender, residence, education, alcohol consumption, and physical activity showed no statistically significant associations, and most exhibited substantial heterogeneity, suggesting variability across studies. But BMI has an association. Those participants with above-normal BMI had a significantly higher risk of hyperuricemia compared with those with normal BMI (OR = 0.26; 95% CI: 0.18–0.36; $p < 0.001$). There was no heterogeneity among studies ($I^2 = 0.0\%$), indicating consistent evidence (Table 2).

Discussion

Gout and hyperuricemia are increasingly recognized as systemic metabolic conditions that extend beyond joint involvement and are associated with a substantially elevated risk of cardiovascular outcomes, including heart failure, myocardial infarction, and stroke, as well as significant metabolic and renal complications [35]. Globally, these conditions contribute to a growing healthcare burden and are linked to multiple comorbidities and increased mortality, emphasizing the importance of comprehensive clinical recognition and management [36]. Notably, the prevalence of hyperuricemia has been steadily rising in developing countries, largely driven by rapid lifestyle transitions, dietary changes, urbanization, and population aging, further straining already limited health systems [37].

The pooled prevalence of hyperuricemia among adults with chronic diseases (37.5%; 95% CI: 30.6–44.5) is markedly higher than the prevalence reported among type 2 diabetes mellitus patients in Africa (27.28%) and the general population in China (17.4%). this variation might be due to individuals with chronic diseases often present with multiple coexisting risk

factors, which adversely affect uric acid metabolism and renal excretion. In contrast, while type 2 diabetes is a strong metabolic risk factor for hyperuricemia, diabetic populations may still be more heterogeneous in disease duration, treatment status, and renal involvement, resulting in a comparatively lower pooled prevalence. Also, variation in socio-demographic characteristics and health system capacity for screening may further contribute to variability in prevalence estimates [38,39].

Table 2: Factor Associated Hyperuricemia Among Adults with Cardiovascular Disease

Determinants	Comparison	No of studies	Sample size	OR (95%CI)	P –value	I2 (%)	Heterogeneity test (p value)
Age	Below 55 years Vs above	4	1084	1.95(0.89-4.27)	0.095	86.9	< 0.001
Gender	Female vs male	3	903	1.11(0.61 – 2.02)	0.740	77.0	0.0013
Residence	Rural vs urban	3	961	1.23(0.94-1.62)	0.129	0.0	0.571
Education	Illiterate vs literate	4	1201	1.41(0.840 -2.38)	0.192	74.9	0.007
Alcohol consumption	Yes vs No	4	1065	2.85(0.59-13.8)	0.194	95.6	< 0.001
Physical activity	Low Vs moderate and above	4	1201	1.65(0.82-3.31)	0.158	85.2	< 0.001
BMI	Normal vs above normal	3	816	0.26(0.18-0.36)	< 0.001	0.0	< 0.001

The subgroup analysis result revealed, the highest prevalence 47.0%; (95% CI: 27.9-, 66.2) seen in Amhara region and the lowest 31.5%; 95% CI: 12.6-50.5) seen in Oromia region. This difference might be due to differences in population risk profiles, lifestyle patterns, access to diagnostic services, and urbanization level.

Those participants with above-normal BMI had a significantly higher risk of hyperuricemia compared with those with normal BMI (OR = 0.26; 95% CI: 0.18–0.36): different evidence shows that above normal BMI has been shown to causally increase the risk of hyperuricemia via mechanisms involving insulin resistance and adipocytokine pathways that reduce uric acid excretion and promote metabolic dysfunction [40,41].

Conclusion

Given that hyperuricemia can be easily diagnosed through simple laboratory testing and is largely preventable through weight management, dietary modification, and early clinical screening, this study showed that hyperuricemia is highly prevalent among adults with chronic diseases, with more than one-third of patients affected. Also, above-normal BMI showed a significantly associated with hyperuricemia. So early identification and targeted prevention strategies needed to reduce the burden of hyperuricemia and complications on these risky groups.

Limitation of the Study

This systematic review and meta-analysis provided groundbreaking insights on prevalence and predictors of hyperuricemia among patients with chronic disease. However, there are certain limitations to be considered. First due to significant heterogeneity of studies, result should be interpreted with caution. Secondly, we encountered difficulties when comparing our findings due to the absence of systematic reviews and meta-analyses on similar population groups.

Declaration

Ethics Approval and Consent to Participant

Not applicable

Consent for Publication

Not applicable

Availability of Data and Materials

All the data analyzed during the current systematic review and meta-analysis is available with reasonable request from corresponding author

Competing Interests

All the authors declare that they have no competing interests

Funding

Not applicable

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