Hyperuricemia and Associated Factors in Adult Cardiac Patients in Western Oromia, Ethiopia

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ABSTRACT

BACKGROUND: Individuals who have hyperuricemia are at increased risk of cardiovascular diseases due to factors such as endothelial dysfunction, insulin resistance, and increased production of oxygen-free radicals. However, data on the prevalence and predictors of hyperuricemia among adults with cardiac diseases in Ethiopia are limited.

METHODS: A cross-sectional study was conducted on 269 participants at the Ambo University referral hospital from June to September, 2022. Participant demographics and relevant data were obtained through convenient sampling. Hyperuricemia was defined according to the manufacturer's cutoff criteria. Data entry and analysis were conducted using SPSS 25. The association between the outcome and explanatory variables was assessed using a binary logistic regression model.

RESULTS: Of the study participants, 56.9% were male. The mean age of participants was 51.1 years (±15.8). The prevalence of hyperuricemia was 43.1% (95% CI: 37.1-49.1). Males presented a significantly higher prevalence of hyperuricemia compared to females (23.4% vs 19.7%, $P = .026$). Males had 2.9 times higher odds of hyperuricemia compared to females. Significant associations with the prevalence of hyperuricemia were found for individuals with a BMI ⩾30 kg/m^2, age ⩾54 years, and male gender, with adjusted odds ratios (95% CI) of 2.3 (1.7-5.2), 2.9 (2.2-5.9), and 3.56 (2.1-12.8), respectively. Additionally, smoking, dyslipidemia, and waist circumference were also significantly associated with the prevalence of hyperuricemia.

CONCLUSIONS: Nearly half of the cardiac patients in the study were diagnosed with hyperuricemia. These findings underscores the importance of early identification and treatment of hyperuricemia, alongside lifestyle and behavioral modifications, to maintain the quality of life in this specific population.

KEYWORDS: Hyperuricemia, cardiovascular diseases, Ambo, Ethiopia

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Introduction

In 2019, approximately 17.9 million deaths worldwide were due to cardiovascular diseases, accounting for 32% of all recorded deaths.[1,2] Risk factors for cardiovascular diseases (CVDs) include hyperuricemia, dyslipidemia, obesity, hypertension, diabetes, physical inactivity, smoking, alcohol consumption, advanced age, and family history.[2-4]

Hyperuricemia is a disorder of purine metabolism. The uric acid concentration can be increased in the blood because of 2 main factors: either the liver produces too much XOR (xanthine oxidoreductase) or the kidneys do not excrete enough uric acid due to mutations in the kidney transporter gene and damage to the glomerulus's endothelial cells.[5,6]

The generation of amino carbonyl radicals, elevated oxidative stress, endothelial dysfunction, stimulation of local and systemic irritation, and propagation of vascular smooth muscle cells are among the harmful effects of serum uric acid (SUA) levels on cardiovascular health. In addition, risk factors like clonal hematopoiesis caused mainly by DNMT3A and TET2 gene mutation induce NLRP3 inflammasome activity and the secretion of IL-1β which in turn plays a key role in the pathophysiology of hyperuricemia.[7] Other recently discovered factors that result in hyperuricemia is microplastic exposure that leads to mitochondrial dysfunction in kidney proximal tubular epithelial cells through renal tubular cytoplasmic vacuolation, lipid drops, and collagen fiber accumulation.[8] Evidence has demonstrated its involvement in the progression of metabolic syndrome, diabetes, chronic kidney disease, high blood pressure, and cardiovascular diseases. Urate deposition in the vascular wall and damage to the vascular endothelium of both large and small vessels can induce coronary artery disease, which in turn can result in atherosclerosis.[9]

Hyperuricemia has the potential to induce hypertension via different mechanisms, including diminished renal perfusion, stimulation of the renin-angiotensin-aldosterone system (RAAS), and lowered nitric oxide synthase levels in the macula densa of the kidney. The accumulation of monosodium urate crystals on blood vessel walls can contribute to atherosclerosis and other cardiovascular issues associated with hypertension.[10] Hyperuricemia is associated with abnormal lipid profiles because it can cause inflammation, generate oxidized lipoproteins, and lead to atherosclerosis. This happens when the renin receptor in endothelial cells is stimulated, causing damage to the arteries. The trapping of low-density lipoprotein (LDL) is responsible for vascular injury and cardiovascular diseases (CVDs).[10,11]

High levels of UA can increase the risk of developing DM. The body's resistance to insulin can be caused by the death of pancreatic β-cells, as well as a decrease in insulin secretion and signaling in different types of cells such as adipocytes, hepatocytes, cardiomyocytes, and endothelial cells.[12]

Smoking, alcohol consumption, khat chewing, and gaining visceral fat have all been associated with high uric acid production. The liver requires a significant amount of ATP to convert alcohol into adenosine monophosphate (AMP), leading to a rapid increase in SUA levels.[13]

Several studies have shown a strong link between increased levels of uric acid and increased vulnerability to cardiovascular complications.[14] People with hyperuricemia are 30 times more likely to develop gout than those with normal levels. The presence of this specific condition has been recognized as an independent risk factor for heart-related complications, as demonstrated by hazard ratios associated with mortality caused by coronary artery disease (CAD) and CVD.[15]

Even though it's still a controversial condition, a number of recent investigations provided evidence that asymptomatic hyperuricemia may be independently associated with cardiovascular disease. Studies showed that more than 80% of people with hyperuricemia had no symptoms at all and had the condition for the rest of their lives so, countries updated their hyperuricemia care guidelines, recommending that patients with conditional asymptomatic hyperuricemia be treated with medication to prevent further deterioration.[16,17]

The impact of hyperuricemia can indeed vary significantly among individuals due to a multitude of factors such as age, overall health conditions, dietary patterns, and lifestyle choices. While hyperuricemia itself may not directly cause CVD, however its co-occurrence with other risk factors in cardiac patients can exacerbate the progression of atherosclerosis and increase the probability of cardiovascular-related morbidity and mortality. Understanding the frequency and potential reasons for hyperuricemia in patients with CVD is crucial for effectively managing their condition and preserving their quality of life. This study sought to fill the existing knowledge gap by examining the prevalence and risk factors associated with hyperuricemia in CVD patients.

Methods

Study area and population

The study was conducted at Ambo University Referral Hospital (AURH) which is located in Western Ethiopia.[1] A cross-sectional study was conducted on adults aged 18 years or older with cardiac disease, from June to September 2022. Eligible participants for the study were previously diagnosed and confirmed cardiac cases who were regularly followed up at the chronic disease clinic. Initial diagnoses were established through clinical assessments, which included medical history, physical examination, and diagnostic tests such as electrocardiography (ECG), echocardiography, cardiac stress tests, or coronary angiography. Participants taking medications affecting uric acid levels, patients with severe illnesses (those who were unable to explain their condition during the interview), and individuals with a history of chronic liver or renal failure (previously diagnosed and confirmed cases) were excluded from the study.

Sample size and sampling technique

The sample size calculation was based on a formula for a single population proportion, taking into account a prevalence rate of 69% for hyperuricemia in patients with CAD.[18] A 95% confidence interval (CI) with a margin of error of 5% necessitated a sample size of 269, adjusted using the correction formula for a source population of fewer than 10 000. The participants were then selected using a consecutive convenient sampling method.

Assessments and measurements

Data for the study were collected using structured questionnaires via face-to-face interviews by trained nurses. The WHO's step-by-step approach to monitoring non-communicable diseases was used to gather data on anthropometric variables and waist circumference (WC).[19] Additionally, blood pressure measurements were taken from each participant to evaluate their blood pressure status, and an assessment of physical activity levels was also carried out.[19] The subjects' height and weight were measured while they were wearing lightweight clothing and without shoes. The BMI was determined by dividing the weight (in kilograms) by the square of the height (in meters^2), and the recorded results.[1] Each participant underwent venipuncture to obtain a 5-ml venous blood specimen following an overnight fast. The lipid profile and uric acid levels of serum samples were analyzed using an automated chemistry analyzer (COBAS-311: Roche, Germany).

Operational definitions

"Patients with cardiac disease" typically refers to individuals diagnosed with various cardiovascular conditions. These includes: CAD, CHF, myocardial infarction (heart attack),

arrhythmias (irregular heart rhythms), VHD, HHD, cardiomyopathy, and PAD[20]

According to the guidelines set by NCEP-ATP III, dyslipidemia is identified by specific cut-off points that indicate the risk for cardiovascular disease. These cut-off points include Total Cholesterol (TC) levels of ⩾200 mg/dl, HDL cholesterol (HDL-c) levels below 40 mg/dl, LDL cholesterol (LDL-c) levels of ⩾130 mg/dl, and Triglyceride (TG) levels of ⩾150 mg/dl.[21]

Individuals with hyperuricemia have serum uric acid levels exceeding 7.0 mg/dl for men and 6.0 mg/dl for women.[22]

BMI: was classified as underweight if the BMI was less than 18.5 kg/m^2, normal if the BMI was between 18.5 and 24.9 kg/m^2, overweight if the BMI was between 25 and 29.9 kg/m^2, and obese if the BMI was between 30 and 34.9 kg/m^2.[23]

Abdominal obesity was characterized by males having a WC of 102 cm or greater, and females having a WC of 88 cm or greater.[23]

Low fruit/vegetable intake: refers to the consumption of fruits and vegetables during a particular week being below a certain threshold, which means less than 4 days of fruit and vegetable consumption per week.[24]

Statistical analysis

Each questionnaire's data was reviewed and entered into SPSS version 25, which was then used to export and analyze the data. Descriptive statistics was for data summary while continuous variables were described using means and standard deviation. The significant differences between the outcome and explanatory variables were assessed using the chi-square test. In addition, bivariable and multivariable binary logistic regressions models were used to assess the associations between outcomes and explanatory variables. Variables with a significance level of <.25 in the bivariate analysis were included in the multivariable logistic regression model. Odds ratios (ORs) and their corresponding 95% confidence intervals (CIs) were used to describe significant associations, with a *P*-value of less than .05 set for statistical significance.

Data quality issues

The Quality of the data was ensured by evaluating 10% of the questionnaires in other health centers before the data were collected. The necessary adjustments were subsequently madeon the bases of the feedback received from the pretest. The principal investigator provided detailed instructions to the data collectors on the proper methods for gathering all pertinent data for the research. Furthermore, all laboratory protocols were performed in strict accordance with established standard operating procedures (SOPs).

Results

Characteristics of the study population

Overall 269 adult cardiac patients were recruited for this study, 153 (56.9%) of whom were male. The average age of the subjects was 51.13 ± (15.83) years. The majority of the participants lived in urban areas (163, 60.6%) and had an educational level beyond secondary School (141, 52.4%). In terms of occupation, most of the participants were farmers (76, 28.3%), and in terms of marital status, the majority were married (164, 61%).

In addition, 46 (17%) had a history of smoking and 59 (21.9%) had a history of alcoholism. Eighteen (6.7%) and 28 (10.4%) individuals were currently smoking and drinking alcohol, respectively. Approximately 190 (70.6%) individuals had sedentary lifestyles, and 162 (60.2%) had low fruit/vegetable intake habits. Overall 116 (43.1%; 95 CI: 37.1-49.08) cardiac patients had hyperuricemia (Table 1).

Pattern of hyperuricemia in relation to cardiac disease type

Hyperuricemia was more common among study participants with ischemic heart disease followed by hypertensive heart diseases (HHD), which account for 13% and 11.9%, respectively (Figure 1).

The frequency of hyperuricemia in relation to different variables

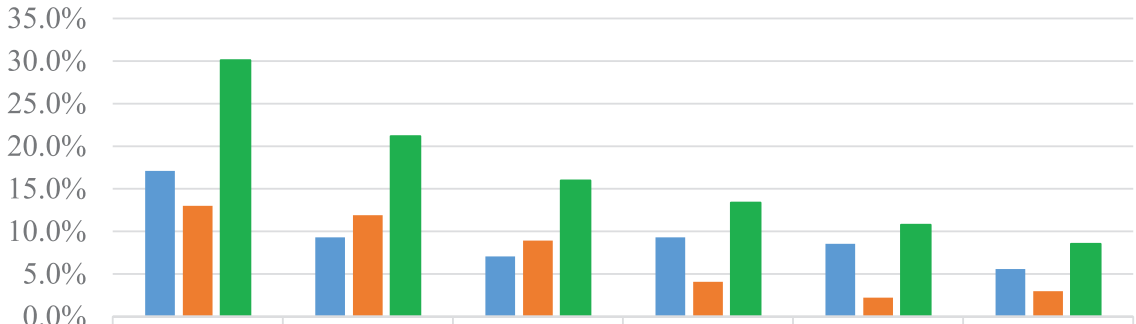
The study participants had mean (±SD) values of 132.83 ± 14.9 mmHg for SBP, 85.5 ± 7.4 mmHg for DBP, 24.39 ± 4.02 kg/m^2 for BMI, and 91.42 ± 10.4 cm for WC. About 68 individuals (25.3%) were classified as overweight, 43 individuals (16%) were categorized as obese, and 18 individuals (6.7%) were considered underweight. Moreover, 148 individuals (55%) had a history of hypertension, whereas 77 individuals (28.6%) were found to have diabetes mellitus (DM). Furthermore, 106 individuals (39%) had a family history of cardiovascular disease. Men had a higher rate of hyperuricemia than women (23.4% vs 19.7%, *P* = .026). Participants over the age of 54 years had higher uric acid levels than those aged 54 years or younger, but the difference was not statistically significant (45.4% vs 41.2%, *P* = .28). Obese individuals had a higher prevalence of hyperuricemia compared to non-obese individuals (*P* = 0.04). Individuals with an abnormal waist circumference had a greater rate of hyperuricemia than those with normal waist circumference (53% vs 38.7%, *P* = 0.02; Table 2).

Factors associated with the occurrence of hyperuricemia among individuals

Variables such as age >54 years, sex, residence, current alcoholism, smoking status, low vegetable/fruit intake, physical activity, dyslipidemia, BMI, and high WC were significantly associated with hyperuricemia in the bivariable analysis. The multivariable analysis accounted for potential confounding factors. Notably, age >54 years (adjusted odds ratio [AOR] 2.3; 95% CI: 1.7-5.2, *P* = 0.025) and male sex (AOR: 2.9; 95% CI: 2.2-5.9, *P* = 0.036) were significantly associated with hyperuricemia. The AOR and 95% CIs of smoking and dyslipidemia were 2.6 (1.4-6.2) and 2.3 (1.9-6.27), respectively. Additionally,

Table 1. Characteristics of the study population.

PARAMETERS	CATEGORY	FREQUENCY (%)	HYPERURICEMIA		*P*-VALUE
			YES, N (%)	NO, N (%)	
Age	18-25	28 (10.4)	12 (4.4)	16 (5.9)	0.950
	25-34	13 (4.8)	6 (2.2)	7 (2.6)	
	35-44	43 (16.0)	17 (6.3)	26 (9.7)	
	45-54	64 (23.8)	26 (9.7)	38 (14.1)	
	>54	121 (45.0)	55 (20.4)	66 (24.5)	
Sex	Male	153 (56.9)	63 (23.4)	90 (33.4)	0.026
	Female	116 (43.1)	53 (19.7)	63 (23.4)	
Residence	Rural	106 (39.4)	57 (21.2)	49 (18.2)	0.420
	Urban	163 (60.6)	69 (25.6)	94 (7.5)	
Education status	Illiterate	59 (21.9)	26 (9.66)	33 (12.3)	0.702
	Primary school	69 (25.7)	28 (10.4)	41 (15.2)	
	Secondary school	91 (33.8)	43 (16)	48 (17.8)	
	Higher education	50 (18.6)	19 (7)	31 (11.5)	
Occupation status	Student	19 (7.1)	10 (3.7)	9 (3.3)	0.710
	Merchant	46 (17.1)	23 (8.6)	23 (8.6)	
	Farmer	76 (28.3)	33 (12.3)	43 (16)	
	Gov't employee	66 (24.5)	24 (8.9)	42 (15.6)	
	Non-employed	42 (15.6)	17 (6.3)	25 (9.3)	
	Retired	20 (7.4)	9 (3.3)	11 (4.1)	
Marital status	Single	39 (14.5)	19 (7)	20 (7.4)	0.150
	Married	164 (61.0)	66 (24.5)	98 (36.4)	
	Separated/divorced	28 (10.4)	17 (6.3)	11 (4.1)	
	Widowed	38 (14.1)	14 (5.8)	24 (8.9)	
History of smoking	Yes	46 (17.1)	21 (7.8)	25 (9.3)	0.410
	No	223 (82.9)	95 (35.3)	128 (47.6)	
Currently smoking	Yes	18 (6.7)	9 (3.3)	9 (3.3)	0.031
	No	251 (93.3)	107 (39.8)	144 (53.5)	
Passive smoking	Yes	64 (23.8)	29 (18.2)	35 (5.6)	0.391
	No	205 (76.2)	87 (32.3)	118 (43.9)	
History of alcoholism	Yes	59 (21.9)	26 (9.6)	33 (12.3)	0.860
	No	210 (78.1)	90 (34.5)	120 (44.6)	
Current alcoholism	Yes	28 (10.4)	15 (5.6)	13 (4.8)	0.701
	No	241 (89.6)	103 (38.3)	138 (51.3)	
Physical exercise	Vigorous intensity	26 (9.6)	7 (2.6)	19 (7.1)	0.035
	Moderate intensity	53 (19.7)	17 (6.3)	36 (13.4)	
	Less active	102 (37.9)	46 (17.1)	56 (20.8)	
	Sedentary	88 (32.7)	46 (17.1)	42 (15.6)	
Fruit/vegetable consumption	Low consumption	162 (60.2)	61 (26.7)	101 (27.5)	0.026
	Sufficient consumption	107 (39.8)	55 (20.4)	52 (19.3)	



	Ischemic heart disease	Hypertensive heart disease	Rheumatic heart disease	Dilated cardiomyopathies	Combined	Other types
Hyperuricemia	17.1%	9.3%	7.1%	9.3%	8.6%	5.6%
Hyperuricemia	13.0%	11.9%	8.9%	4.1%	2.2%	3.0%
Total	30.1%	21.2%	16.0%	13.4%	10.8%	8.6%

Figure 1. Pattern of hyperuricemia in adult cardiac disease patients.

Table 2. Prevalence of hyperuricemia in relation to different variables.

VARIABLE	CATEGORY	TOTAL	HYPERURICEMIA (YES)	*P*-VALUE
Age	⩽54	148 (55)	61 (41.2)	0.28
	>54	121 (45)	55 (45.4)	
Body mass index (kg/m²)	Underweight	18 (6.7)	7 (38.9)	0.04
	Normal	140 (52)	56 (40)	
	Overweight	68 (25.3)	29 (42.6)	
	Obese	43 (16)	24 (55.8)	
Waist circumference (cm)	Normal	186 (69.1)	72 (38.7)	0.02
	Abnormal	83 (30.9)	44 (53)	
Systolic blood pressure	<130 mmHg	144 (53.5)	70 (48.6)	0.05
	⩾130 mmHg	125 (46.5)	46 (36.8)	
Diastolic blood pressure	<85 mmHg	142 (52.8)	69 (48.6)	0.05
	⩾85 mmHg	127 (47.2)	47 (37)	
History of hypertension	Yes	148 (55)	64 (43.2)	0.51
	No	121 (45)	52 (42.9)	
History of diabetes mellitus	Yes	77 (28.6)	36 (46.7)	0.26
	No	192 (71.4)	80 (41.7)	
Dyslipidemia	Yes	206 (76.6)	106 (51.4)	0.001
	No	63 (23.4)	10 (15.9)	
Family history of cardiac problem	Yes	105 (39)	50 (47.6)	0.23
	No	164 (61)	66 (40.2)	

Abbreviations: mmHg, millimeter of mercury; kg, kilogram; m, meter; SD, standard deviation.

BMI ⩾ 30 kg/m² and high WC were associated with hyperuricemia: the AOR and (95% CI) were 3.56 (2.1-12.8) and 3.2 (1.9-10.7), respectively (Table 3).

Discussion

In this study, the prevalence of hyperuricemia among patients with cardiac disease was 43.1% (95% CI: 37.1-49.1). This

Table 3. Factors associated with hyperuricemia in adult cardiac patients.

INDEPENDENT VARIABLE	HYPERURICEMIA (YES)				
	CATEGORY	UNADJUSTED OR (95% CI)	*P*-VALUE	ADJUSTED OR (95% CI)	*P*-VALUE
Sex	Female	1.00		1.00	0.036
	Male	3.1 (2.08-7.43)	0.2	2.9 (2.2-5.9)	
Age	<54 years	1.00		1.00	0.025
	>54 years	1.6 (1.2-4.7)	0.057	2.3 (1.7-5.2)	
Residence	Rural	1.00			0.21
	Urban	1.54 (0.7-2.4)	0.22	1.71 (1.2-4.8)	
Current alcoholism	No	1.00		1.00	0.068
	Yes	1.6 (0.71-3.74)	0.063	2.4 (0.9-5.95)	
Past smoking	No	1.00		1.00	0.61
	Yes	1.34 (0.76-2.8)	0.14	1.26 (0.34-4.1)	
Current smoking	No	1.00		1.00	0.04
	yes	1.71 (1.08-3.98)	0.17	2.6 (1.4-6.2)	
Fruit/vegetable intake	Sufficient	1.00		1	0.35
	Low	1.15 (1.3-3.4)	0.12	1.92 (1.02-5.41)	
Lifestyle (sedentary)	No	1.00		1.00	0.57
	Yes	2.8 (2.2-6.3)	0.23	2.1 (1.7-9.2)	
Low-level exercise	No	1.00		1.00	0.44
	Yes	3.1 (2.6-6.7)	0.23	2.4 (1.74-5.9)	
History of hypertension	No	1.00		1.00	0.52
	Yes	1.65 (1.12-2.8)	0.19	2.9 (2.1-9.6)	
Family history of heart diseases	No	1.00		1.00	0.67
	Yes	1.3 (1.0-3.89)	0.24	1.8 (0.86-4.8)	
Dyslipidaemia	No	1.00		1.00	0.033
	Yes	1.6 (1.21-4.5)	0.018	2.3 (1.9-6.27)	
Treatment duration	<5 y	1.00		1.00	0.09
	>5 y	0.4 (0.67-1.3)	0.071	0.64 (0.32-2.55)	
BMI	18.5-24.9 kg/m^2	1.00		1.00	
	<18.5 kg/m^2	0.73 (0.36-3.4)	0.36	1.6 (0.4-6.4)	0.15
	25-29.9 kg/m^2	2.3 (1.45-5.6)	0.051	2.8 (1.76-6.1)	0.064
	⩾30 kg/m^2	3.1 (2.2-9.26)	0.013	3.56 (2.1-12.8)	0.0042
WC	<88 cm (female) and <102 cm (male)	1.00		1.00	
	⩾88 cm (females) and ⩾102 cm (males)	2.0 (1.3-7.6)	0.003	3.2 (1.9-10.7)	<0.0001

Abbreviations: BMI, body mass index; CI, confidence interval; WC, waist circumference; cOR, crude odd ratio; aOR, adjusted odds ratio; kg, kilogram; m, meter.

finding is in line with a similar study done in Poland, where the prevalence was reported as 41.2%[25]. However, our finding is higher than the reports of different studies such as elsewhere in Ethiopia,[6] China,[26] and Switzerland,[27] where the rates were 31%, 34.05%, and 37.4% respectively. Additionally, the present findings are lower than those of previous studies conducted in Poland,[28] China,[29] and Libya,[18] where the rates were 49.1%, 63%, and 69.1%, respectively. Variations in sample size, study design, and a cut-off value of the uric acid level to define hyperuricemia could account for the differences observed. In addition, genetic diversity and lifestyle disparities may also contribute to these variations.

In this study, the prevalence of hyperuricemia was significantly higher among male cardiac patients (23.4%) compared to female cardiac patients (19.4%).

Similar findings were reported in previous studies from China[26] and Ethiopia,[6] but a study from Libya[18] reported contradictory results. The variation in results could be attributed to the larger number of female participants compared to male participants in the study conducted in Libya.

The current study revealed a significant association between hyperuricemia and cardiac disorders individuals aged over 50 years. This finding is in line with studies conducted in the USA,[27] China,[30] and Ethiopia.[6] The potential rationale behind this association may be related to decreased uric acid excretion, increased inflammation, and oxidative stress in older individuals.

Furthermore, this finding revealed that male cardiac participants were 2.9 times more likely to have hyperuricemia than female cardiac participants and it was in line with the study reported from other parts of Ethiopia[6] and China.[31] One potential explanation is that estrogen stimulates uric acid excretion in females, whereas testosterone promotes muscle anabolism and increased muscle mass in males. Additionally, alcohol consumption is a significant factor contributing to these differences between sexes.[31,32]

Additionally, the findings of this study provide compelling evidence of a significant association between smoking and the prevalence of hyperuricemia among cardiac patients. This finding is similar to a study reported from another part of Ethiopia,[6] which indicated a similar association. The underlying mechanism for this relationship could be attributed to the release of reactive oxygen species induced by smoking, which in turn can lead to detrimental effects on endothelial cells and renal cells.[6,33]

Moreover, this study revealed a significant association between dyslipidemia and the prevalence of hyperuricemia among cardiac patients. Similar findings were reported in studies conducted in Poland,[25] and Pakistan.[34] Additionally, our study revealed that cardiac individuals with a BMI $\geqslant 30\,kg/m^2$ and abdominal obesity were more likely to experience hyperuricemia. This result was consistent with other studies conducted in the USA,[35] China,[26] Bangladesh,[36] and Ethiopia.[32] The potential explanation for this could be the overproduction of uric acid accompanied by elevated reactive oxygen species derived from xanthine oxidoreductase.[10]

Limitations of the study

This study could not establish causal relationship between hyperuricemia and related factors. Additionally, since it was hospital-based and focused on cardiac patients without a comparison group, its findings aren't generalizable. In addition, we did not assess the impact of diuretics known to potentially increase uric acid (UA) levels. Moreover, the study couldn't assess the data regarding the kidney function of the study participants. Despite these limitations, the findings of this study could guide future research in similar areas.

Conclusion

Our research revealed that 43.1% of individuals with cardiac conditions have hyperuricemia. We also found a significant association between hyperuricemia and factors such as age, sex, smoking, dyslipidemia, BMI, and abdominal obesity. Early screening and proactive management of hyperuricemia in patients with cardiovascular problems is recommended, as it could prevent complications and improve overall cardiovascular health outcomes. Integrating routine hyperuricemia screening protocols into cardiovascular care practices may effectively manage these interconnected health factors. A large-scale study across diverse populations is needed to understand other hidden risk factors of hyperuricemia in cardiac patients.

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Author Contributions

Each author contributed to the data collection, analysis, and interpretation of the findings, as well as to the writing and reviewing of both the initial and final drafts of the manuscript. All authors have reviewed and endorsed the final version of the manuscript.

Availability of Data and Materials

The dataset of this study will be accessible upon request to the corresponding author.

Ethical Approval

The ethical committee of the Jimma University College of Public Health and Medical Sciences granted ethical approval. Informed consent was obtained from all study participants, and for individuals who were illiterate, consent was acquired from a parent or legal guardian. Additionally, each participant was

provided with a detailed explanation of the study's protocol. All data collected for the study was handled in strict confidence.

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