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Original Article

Prevalence of the kidney stone and its associated factors among the adult population in Arbegona Woreda, Sidama region, Ethiopia: a community-based cross-sectional study

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Abstract

Background: Kidney stones are a prevalent public health issue globally, with their prevalence increasing annually. Different factors contribute to the occurrence of kidney stones. However, few studies have been conducted among the adult population in Ethiopia, particularly in Arbegona Woreda, Sidama Region. This study aims to assess the prevalence of kidney stones and their associated factors among the adult population in Arbegona Woreda, Sidama Region, Ethiopia.

Methods: A community-based cross-sectional study was conducted. A total of 483 households across seven kebeles were selected using a multistage sampling technique. Data were collected using an interviewer-administered questionnaire. Screening for kidney stones was conducted using abdominal ultrasonography, while urine dipstick analysis was used to evaluate associated urinary findings. The data were cleaned, categorized, and analyzed using SPSS version 26. Variables with p-values <0.25 in bivariate analysis and those identified as significant in existing literature were included in the final multivariable model. Model fitness was assessed using the Hosmer–Lemeshow test, and multicollinearity was checked using the variance inflation factor. Crude and adjusted odds ratios (COR and AOR) were reported with 95% confidence intervals. Associations were considered statistically significant at $p < 0.05$ in the final multivariable logistic regression model.

Results: The overall prevalence of kidney stones among the adult population was 34.4% (95% CI: 30.2–

38.7). After adjusting for potential confounders, the following variables were significantly associated with kidney stones: hypertension (AOR = 6.6; 95% CI: 2.4–17.8), diabetes mellitus (AOR = 9.6; 95% CI: 1.0–87.7), family history of kidney stones (AOR = 13.7; 95% CI: 8.5–24.3), history of previous kidney problems (AOR = 8.8; 95% CI: 3.9–19.6), and daily consumption of Kocho (AOR = 4.8; 95% CI: 1.5–15.6).

Conclusion: The prevalence of kidney stones was high in the study community. Hypertension, diabetes mellitus, daily consumption of Kocho (a traditional fermented food made from enset), family history of kidney stones, and previous kidney problems were significantly associated with the presence of kidney stones.

Keywords: Kidney stone, prevalence, risk factors, Arbegona Woreda

Introduction

Kidney stones are hard mineral deposits that form in one or both kidneys (1). There are several types of kidney stones, including calcium oxalate, calcium phosphate, uric acid, struvite, and cystine stones. The most common type is calcium oxalate, which forms when calcium and oxalate combine in the urine, creating hard crystals (2).

Several risk factors contribute to the formation of kidney stones, including dehydration, family history, obesity, high salt or protein intake, certain medical conditions (e.g., hypertension, diabetes mellitus, inflammatory bowel disease, and gout), certain medications, a sedentary lifestyle, age, and gender (3,4). Untreated kidney stones can cause severe pain, urinary obstruction, hydronephrosis, and even kidney failure, resulting in poor quality of life and high healthcare costs (5).

Nephrolithiasis is estimated to affect up to 12% of the global population, with a lifetime risk of stone formation in adults of approximately 10–15% (6). Kidney diseases have risen from the 13th to the 10th leading cause of death worldwide, with deaths increasing from 813,000 in 2000 to 1.3 million in 2019(7). In industrialized countries such as the United States, kidney stones affect 10–15% of males and 3–5% of females, and the prevalence continues to rise. It is estimated that 600,000 Americans experience urinary stones annually (8). Similarly, the UK reports 40,000–45,000 premature deaths each year due to chronic kidney disease (CKD), and over a lifetime, 6% of women and 11% of men will experience kidney stones at least once (1).

In Africa, there is limited and often outdated research on kidney stones. The complications of kidney stones—such as renal damage—can be life-threatening, especially when patients are unaware of the severity of their condition and fail to seek timely treatment. This condition imposes a substantial economic burden due to the cost of treating kidney failure and associated morbidities (9).

In the study setting, a large number of patients from Arbegona Woreda have been admitted to Hawassa University Comprehensive Specialized Hospital (HUCSH) for kidney stone surgery, more than from neighboring woredas. This raises the question: why is there such a high hospital admission rate for kidney stones in Arbegona Woreda? Proper research is needed to answer this question with evidence.

Understanding the risk factors for kidney stone formation is essential for public health planning and informed decision-making. Despite anecdotal evidence of a higher number of kidney stone cases in Arbegona Woreda, no community-based study has yet been conducted to determine

the actual prevalence and associated risk factors. Therefore, this study aims to assess the magnitude and associated factors of kidney stone disease among adults living in Arbegona Woreda.

Methods and materials

Study Area

This study was conducted in the Sidama Regional State of Southern Ethiopia. The region comprises 37 woredas, including Arbegona Woreda, the study site. Arbegona is located 77 kilometers from Hawassa, the regional capital, and 342 kilometers from Addis Ababa, the capital of Ethiopia. It borders Kokosa and Gorche woredas to the north, Bona Zuria to the south, Bura and Bensa to the east, and Shafamo to the west.

Arbegona Woreda lies at an altitude between 1,320 and 2,915 meters above sea level, with a climate classified as 75% Dega (highland) and 25% Woina Dega (midland). The woreda has 30 rural kebeles and 1 urban kebele, with a total population of 156,038 residents (77,332 males and 78,706 females). The main economic activities include agriculture, livestock rearing, and small-scale trade, with major crops such as coffee, maize, beans, and vegetables. The population is predominantly of the Sidama ethnic group, and the primary language spoken is Sidaamu Afoo(10).

Study Design and Period

A community-based cross-sectional study was conducted from March 2024 to April 2024.

Source and Study population

All adult population residents who were living in Arbegona woreda were the source population. The study population includes all adult residents living in the selected kebeles of Arbegona woreda.

Eligibility criteria

The inclusion criteria of participants were the age of >18 years old and who have lived for more than 3 years in Arbegona woreda. Household members who were unable to give a voluntary response were excluded from the study.

Sample Size Determination

The sample size was determined by using the single population proportion formula and the double population formula for the factors associated with kidney stones using the Open Epi Info software. For a single population proportion, $N = (Z\ \alpha/2)2\ P\ (1-P)\ /d2$, where $Z\alpha/2$ = the value under the standard normal table at 95 % level of CI, which is 1.96, proportion for 7.4 % taken from previous findings (11), and margin of error d, which will be set at 3 %. The assumptions for the calculation were a 95 % CI, 80 % power, design effect of 1.5, and a 10 % non-respondent rate. Finally, the total sample size was 483. Finally, taking by largest sample size, 483 households were included in the study.

Sampling Procedures

Arbegona Woreda, which has 31 kebeles, was selected purposively due to a large number of patients from Arbegona Woreda having been admitted to Hawassa University Comprehensive Specialized Hospital (HUCSH) for kidney stone surgery, more than from neighboring woredas. A multi-stage sampling technique was used. Seven kebeles were selected simple random sampling technique using the lottery method. Then, the sample was proportionally allocated based on the number of households in each selected kebele. A systematic random sampling method was used within each kebele, selecting households at every k^{th} interval. If a household had more than one eligible adult, one was selected randomly. If a selected household was unavailable or locked, the adjacent household was automatically substituted.

Variables

Dependent variables: Presence of kidney stones (yes/no).

Independent Variables: Socio-demographic characteristics: age, sex, educational status, occupation, income, and source of drinking water. Behavioral and dietary factors: intake of milk and milk products, meat, vegetables, fruits, sugar, amount of daily water consumption, salt intake, alcohol consumption, cigarette smoking, and Kocho consumption. Medical conditions: diabetes mellitus (DM), hypertension (HTN), personal history of kidney problems, family history of kidney stones, and joint pain.

Operational Definitions

Kidney stone: Presence of mineral deposits in the renal calyces or pelvis, either free or attached to the renal papillae, ureter, bladder, or urethra, confirmed via ultrasound and urine dipstick analysis.

Dipstick urine analysis: A rapid screening test used to assess chemical properties of urine, including pH, haematuria, proteinuria, and indicators of urinary tract infection, which are commonly associated with kidney stone disease.

Ultrasound test for kidney stones: A non-invasive imaging method using sound waves to visualize the kidneys, ureters, and bladder. It helps detect the presence, number, and size of kidney stones.

Daily Kocho consumption is defined as consumption at least once per day with a standard household serving.

Data collection tools and procedures

Data were collected using a pretested, structured questionnaire adapted from previously published studies, initially prepared in English, translated into Sidaamu Afoo, and back-translated to ensure consistency. The questionnaire contained closed-ended items assessing socio-demographic characteristics, behavioral and dietary factors, and medical history. Data collection was conducted through face-to-face interviews in Sidaamu Afoo by two BSc nurses and two BSc midwives, supervised by three public health professionals, all of whom received two days of training on study objectives, ethical issues, and procedures. Prior to interviews, health extension workers informed residents and supported participant mobilization. Selected adults were invited to Arbegona Primary Hospital, where transportation costs were covered. Screening for kidney stones was performed at no cost using portable ultrasound by a radiologist and urine dipstick tests by a trained laboratory technologist to evaluate associated urinary findings. Participants diagnosed with kidney stones were counseled and referred for further medical evaluation and treatment.

Data Quality Control

A pretest was conducted on 5% of the total sample in Bona Woreda, a neighboring area excluded from the main study, to assess the clarity and consistency of the questionnaire. Two days of training were provided for data collectors and supervisors on study objectives, confidentiality, and standardized data collection procedures. Supervisors reviewed questionnaires daily for accuracy, provided feedback, and ensured adherence to the study protocol through regular field supervision.

Data entry and Analysis

Data were entered into EpiData version 4.6 and exported to SPSS version 26 for analysis. Descriptive statistics were computed to summarize the data, with measures of central tendency and dispersion used for continuous variables, and frequencies and percentages for categorical variables. Results were displayed using tables and graphs. Data were analyzed using logistic regression. Variables with a p-value < 0.25 in the bivariable analysis were

entered into the multivariable logistic regression model. The goodness of fit of the final model was assessed using the Hosmer–Lemeshow test. Multicollinearity among independent variables was evaluated using the Variance Inflation Factor (VIF), with values greater than 10 indicating serious multicollinearity. A p-value < 0.05 was considered statistically significant.

Results

Socio-demographic Characteristics

A total of 483 eligible participants were enrolled, and all completed the interview and screening procedures, resulting in a response rate of 100%. The median age of respondents was 34 years (IQR: 28–45), and the majority (64.0%) were within the 19–40-year age group. Males constituted 55.9% (n = 270) of participants. Most respondents were married (86.5%), and almost half (49.3%) reported farming as their main occupation. The median monthly household income was 2,000 Ethiopian Birr (ETB). Regarding water sources, more than half of the participants reported using spring water as their primary source of drinking water (Table 1).

Table 1: Socio-economic and demographic characteristics of study participants in Arbegona woreda, Sidama region, Ethiopia, 2024 (n=483)

Variables	Category	Frequency	Percent
Sex	Male	270	55.9
	Female	213	44.1
Age	19-30	154	31.9
	31-40	155	32.1
	41-50	96	19.9
	51-60	47	9.7
	61-70	20	4.1
	71-82	11	2.3
Marital status	Single	59	12.5
	Married	418	86.5
	Others	6	1.2
Occupation	Farmer	238	49.3
	Government employee	127	26.3
	Merchant	54	11.2
	Student	64	13.2
Educational status	unable to read and write	141	29.2
	read and write	24	5.0
	Primary and secondary school	171	35.4
	College and above	147	30.4
Monthly income (Median 2000 ETB)	<2000 ETB	302	62.5
	>=2000 ETB	181	37.5
Source of drinking water	Spring water	253	52.4
	Tap water	225	46.6
	Ground water	5	1.0

Others: Divorced and Widowed

Behavioral and Dietary Factors

Regarding dietary practices, 62.7% of respondents reported daily consumption of Kocho, a traditional fermented food made from enset. Most participants consumed injera or bread occasionally (74.1%), and 93.4% consumed meat occasionally. Regular vegetable consumption was reported by 42.0%, while 53.6% consumed fruits occasionally. Notably, 92.3% of participants reported drinking less than two liters of water per day, a figure below the recommended daily fluid intake for kidney stone prevention. Participants with low water intake showed a higher crude prevalence of kidney stones compared with those drinking ≥2 liters daily (Table 2).

Clinical Information

The majority of participants (90.3%) had heard of kidney stones, with health professionals (47.1%) and friends or neighbors (44.4%) serving as the main information sources.

Awareness levels were relatively high: 71.6% correctly identified at least one symptom of kidney stones, and 84.1% believed that kidney stones can be cured. Almost all respondents believed that kidney stones are preventable through adequate water consumption (93.4%), improved diet (94.6%), and lifestyle modification (93.2%). Regarding self-reported symptoms, 24.6% of participants experienced flank pain, and 38.5% reported urinary complaints (Table 3).

Table 2: Behavioral and dietary characteristics of study participants in Arbegona woreda, Sidama region, Ethiopia, 2024

Types	Frequency of consumption	Frequency (n=483)	Percent (%)
	Every day	303	62.7
Kocho	Usually	112	23.2
	Occasionally	68	14.1
	Every day	25	5.2
Injera or bread	Usually	100	20.7
	Occasionally	358	74.1
	Every day	6	1.2
Meat	Usually	26	5.4
	Occasionally	451	93.4
Vegetable	Every day	105	21.7
	Usually	203	42.0
	Occasionally	175	36.3
	Every day	38	7.9
Fruits	Usually	186	38.5
	Occasionally	259	53.6
	Every day	84	17.4
Sugar	Usually	178	36.8
	Occasionally	221	45.8
	Every day	60	12.4
Milk	Usually	198	41
	Occasionally	225	46.6
Amount of daily water	<2 liter	446	92.3
	>2 liter	37	7.7
	Total	483	100

Table 3: Clinical information of study participants for kidney stone in Arbegona woreda, Sidama region, Ethiopia, 2024 n = 483

Variables	Responses	Frequency (n)	Percent (%)
Have you heard about renal stones?	Yes	436	90.3
	No	47	9.7
Source of information	Friends and neighbor's	194	44.4
	Radio and television	37	8.5
	Health workers	206	47.1
Do you think a kidney stone can be diagnosed?	Yes	451	93.4
	No	32	6.6

Do you think drinking a lot of water can prevent kidney stones	Yes	460	95.2
	No	23	4.8
Do you think improving the eating system can prevent kidney stones?	Yes	457	94.6
	No	26	5.4
Do you think improving lifestyle can prevent kidney stones?	Yes	450	93.2
	No	33	6.8
Do you know the symptoms of a kidney stone?	Yes	346	71.6
	No	137	28.4
Do you think kidney stones to be cured?	Yes	406	84.1
	No	77	15.9
Do you think a kidney stone can cause long-term problems?	Yes	451	93.4
	No	33	6.6
Do you have flank pain	Yes	119	24.6
	No	364	75.4
Do you have a urinary complaint	Yes	186	38.5
	No	297	61.5

Medical Conditions and Symptoms

Among all participants, 12.0% reported a history of hypertension (HTN) and 3.1% had diabetes mellitus (DM). Previous kidney-related treatment was reported by 17.6% of respondents, and 28.4% had a family history of kidney stones. A smaller proportion (4.8%) reported joint pain (Table 4).

Table 4: Medical condition of the study participants in Arbegona woreda, Sidama region, Ethiopia, 2024 n=483

Variables	Response	Freq ((n)	Percent (%)
HTN	Yes	58	12
	No	425	88
DM	Yes	15	3.1
	No	468	96.9
Previously treated for a kidney problem	Yes	85	17.6
	No	398	82.4
Family history of kidney stones	Yes	137	28.4
	No	346	71.6
Joint pain	Yes	23	4.8
	No	460	95.2

Laboratory Results of Urine Analysis

Urinalysis results revealed that 63.9% of participants had acidic urine (pH < 6), and 7.6% showed elevated specific gravity (>1.03), indicating concentrated urine. Hematuria was detected in 18.0% of participants, leukocyturia in 11.8%, and proteinuria in 21.3%. The prevalence of kidney stones was higher among those with urine pH < 6 compared to those with pH ≥ 6 (Table 5).

Prevalence of Kidney Stones

The overall prevalence of kidney stones among study participants was 34.4% (95% CI: 30.2–38.7%). The prevalence was higher among males (59.0%) compared to females (41.0%) (Figure 1).

Factors Associated with Kidney Stones

In the bivariate analysis, several variables with p < 0.25 were considered for multivariable logistic regression. These included flank pain, urinary complaints, family history of kidney stones, diabetes mellitus, hypertension, previous kidney treatment, Kocho consumption, milk intake, joint pain, gender, educational status, and urine pH.

Table 5: Urine analysis results of the study participants in Arbegona woreda, Sidama region, Ethiopia, 2024

Variables	Category	Kidney stone	
		Yes, n =166 (%)	No, n= 317 (%)
PH of urine	<6	92(19.0%)	217(44.9%)
	6-7.5	74(15.4%)	100(20.7%)
Specific gravity of urine	1.005-1.03	153(31.7%)	293(60.7%)
	>1.03	13(2.7%)	24(4.9%)
Blood in urine	+1	22(4.6%)	16(3.3%)
	+2-3	33(6.8%)	11(2.3%)
	No	111(33.0%)	280(58.0%)
Leukocyte in urine	+1	23(4.8%)	3(0.6%)
	+2-3	12(2.5%)	19(3.9%)
	No	131(27.1%)	295(61.1%)
Protein in urine	+1	26(5.4%)	11(2.2%)
	+2-3	59(12.2%)	7(1.4%)
	No	81(16.8%)	299(62.0%)

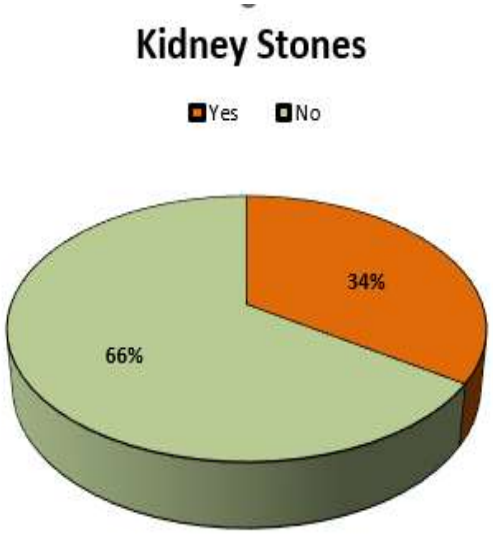

Figure 1: The prevalence of kidney stones among the study participants in Arbegona Woreda, Sidama Region, Ethiopia, 2024.

In the final multivariable logistic regression model, five variables remained significantly associated with kidney stone occurrence ($p < 0.05$). Participants with diabetes mellitus were nearly ten times more likely to have kidney stones than those without (AOR = 9.6; 95% CI: 1.0–87.7; p = 0.048). Those with hypertension were about six times more likely to develop kidney stones (AOR = 6.6; 95% CI: 2.4–17.8; p = 0.002). Having a family history of kidney stones was a strong predictor, increasing the odds nearly fourteen-fold (AOR = 13.7; 95% CI: 8.5–24.3; $p < 0.001$). Participants previously treated for kidney problems had significantly higher odds of developing kidney stones compared with those without such a history (AOR = 8.8; 95% CI: 3.9–19.6; $p < 0.001$). Furthermore, daily consumption of Kocho was independently associated with kidney stones (AOR = 4.8; 95% CI: 1.5–15.6; p = 0.009) (Table 6).

Discussion

This community-based cross-sectional study aimed to assess the prevalence and determinants of kidney stones among adults residing in Arbegona Woreda, Sidama Region, Ethiopia. A total of 483 participants were enrolled, of whom 270 (55.9%) were male. The overall prevalence of kidney stones was found to be 34.4% (95% CI: 30.2–38.7), which is considerably higher

than figures reported in most global studies. Worldwide, kidney stone prevalence varies between 1% and 20% (12) with notable regional differences 1–5% in Asia, 5–9% in Europe, 7–15% in North America, 20% in Saudi Arabia, 4% in China(5), 8.8% in the United States (8), 24.1% in Iran(13), and 10.6% in Egypt (14). The relatively higher prevalence observed in this study could be attributed to variations in demographic characteristics, dietary habits, chronic disease burden, water quality, altitude, diagnostic methods, or environmental exposures unique to the study area.

Table 6: Factors associated with kidney stone among adult population in Arbegona woreda, Sidama Region, bivariable and multivariable analysis 2024

Variable	Category	Kidney stone		COR (95%CI)	AOR (95%CI)	P value
		Yes	No			
DM	Yes	13	2	13.4 (3.0, 60.0)	9.6(1.04, 87.7) **	0.046
	No	153	315	1	1	
HTN	Yes	36	22	3.7 (2.1, 6.6)	6.6(2.4, 17.8) **	0.001
	No	130	295	1	1	
Family history of kidney stones	Yes	98	39	10.3(6.7, 18.5)	13.7(8.5, 24.3) **	0.001
	No	68	278	1	1	
Previously treated for kidney problem	Yes	53	32	4.2 (2.6, 6.8)	8.8(3.9, 19.6) **	0.001
	No	113	285	1	1	
Joint pain	Yes	13	10	2.6(1.12, 6.0)	1.8(0.42, 7.9)	0.429
	No	153	307	1	1	
Flank pain	Yes	102	117	2.72(1.45, 15.2)	1.3(0.67, 9.4)	0.001
	No	64	200	1		
Urinary complain	Yes	79	107	1.8(1.2, 2.6)	0.69(0.32, 1.5)	0.339
	No	87	210	1	1	
PH of urine	<6	92	217	0.6(0.39, 0.84)	0.58(0.27, 1.22)	0.150
	6-7.5	74	100	1	1	
Gender	Male	98	172	1.2(0.8, 178)	1.25(0.59, 2.66)	0.558
	Female	68	145	1	1	
Educational status	Unable to read and write	53	88	1.6(0.95, 2.6)	1.96(0.35, 2.7)	0.940
	Read and write	15	9	4.3(1.75, 10.6)	4.9(0.89, 20.5)	0.069
	Primary and secondary school	57	114	1.3(0.8, 2.1)	1.54(0.55, 3.3)	0.522
	College and above	41	106	1	1	
Kocho	Every day	123	180	2.2(1.2, 4.1)	4.8(1.5, 15.6) **	0.009
	Usually	27	85	1.03(0.5, 2.1)	3.4(0.12,12.4)	0.067
	Occasionally	16	52	1	1	
Milk	Every day	29	31	1.9(1.1, 3.4)	2.17(0.6, 5.0)	0.300
	Usually	63	135	0.95(0.63, 1.43)	1.25(0.56, 2.8)	0.58
	Occasionally	74	151	1	1	

Unlike many international studies reporting male predominance in kidney stone formation, this study found no significant association between sex and stone occurrence. The divergence may reflect differences in lifestyle, occupational exposure, or sampling structure across populations.

Hypertension showed a strong and statistically significant association with kidney stones (AOR = 6.6; 95% CI: 2.4–17.8), corroborating evidence from China (15), Iran (13), Saudi Arabia (5), the United States (16), Switzerland (17), and the United Kingdom (18. The biological link may involve increased urinary calcium excretion or vascular changes affecting renal function. In contrast, a previous Ethiopian study reported no such association (19), possibly due to methodological or contextual differences.

Similarly, diabetes mellitus (DM) was found to increase the likelihood of kidney stone formation (AOR = 9.6; 95% CI: 1.0–87.7), in agreement with findings from the UK (20), Iran(13), Iraq(21), China(15), and Saudi Arabia(5). Insulin resistance and altered urinary composition among diabetic individuals may underlie this relationship.

A strong familial predisposition was also evident; participants with a family history of kidney stones were significantly more likely to develop the condition (AOR = 13.7; 95% CI: 8.5–24.3). This finding aligns with reports from Saudi Arabia(5), China(15), Iran(13), the United States(16), and Switzerland (17) and British (18), United Kingdom (20), and Iraq (21), underscoring possible genetic or shared environmental risk factors.

Participants with a history of kidney disease or treatment exhibited an elevated risk (AOR = 8.8; 95% CI: 3.9–19.6), consistent with previous studies in in Saud Arabia (5), China (15), Iran (13), America (16), Switzerland (17) and British (18), United Kingdom (20). Recurrent infections, renal impairment, or residual crystal deposits may contribute to this increased susceptibility.

Interestingly, the study identified a novel association between daily consumption of Kocho—a traditional fermented food derived from the enset plant—and kidney stone formation (AOR = 4.8; 95% CI: 1.5–15.6). Although no prior research has documented this link, potential mechanisms may involve the mineral or oxalate content of Kocho or its fermentation by-products. Further biochemical and dietary investigations are warranted to clarify this relationship.

Strengths and Limitations

This study's strengths include its community-based design, use of ultrasound and urine dipstick testing, and high response rate, which enhance representativeness and diagnostic accuracy. However, the cross-sectional design limits causal inference, and biochemical parameters such as serum calcium, uric acid, and citrate levels were not assessed and Lack of qualitative data limits understanding of cultural practices and health beliefs related to kidney stones. Residual confounding, potential overdiagnosis due to sensitive ultrasound detection, and unmeasured environmental factors may also have influenced the observed associations.

Conclusion

This study revealed a high prevalence of kidney stones (34.4%) among adults in Arbegona Woreda, highlighting a substantial public health concern. The condition was significantly associated with hypertension, diabetes mellitus, family history of kidney stones, previous kidney-related treatment, and daily consumption of Kocho—a traditional fermented enset-based food.

Recommendations

For Policy Makers and Health Planners:

- Develop and implement community-based screening programs for early detection of kidney stones, especially among high-risk groups (e.g., those with DM or HTN).
- Promote preventive public health strategies focused on lifestyle modification, dietary education, and hydration.

For the Community:

- Raise awareness on the importance of adequate water intake, early detection, and management of kidney stone symptoms.
- Encourage individuals with a family history or prior kidney problems to seek regular screening and follow-up care.

For Researchers:

- Conduct nationwide studies to assess the broader burden and trends of kidney stone disease across different regions and populations.
- Investigate the potential link between Kocho consumption and kidney stone formation through biochemical and longitudinal studies (including oxalate content, fermentation effects, and influence on urine pH) and link these to the observed high proportion of acidic urine.

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Ethical considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of the Department of Public Health, College of Medicine and Health Sciences, Hawassa University (Approval No: IRB/215/16). Permission to conduct the study was obtained from the Arbegona Woreda Health Office. Written informed consent was obtained from all participants before data collection. Participants were informed of the purpose, benefits, and potential risks of the study, and that their participation was voluntary. Confidentiality was maintained by assigning code numbers instead of personal identifiers. All information was kept anonymous and used strictly for research purposes. Participants were informed of their right to withdraw at any time without penalty.

Data availability statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflicts of interest

The authors declared that no conflicts of interest exist.

Funding statement

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